

Enhancing food security through disaster risk reduction and climate change adaptation policies and legislation: South African context

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ABSTRACT

Climate-related hazards have aggravated disaster risks and food insecurity on the African continent. South Africa is no exception as climate change is affecting food security and people's livelihoods. As such, there is wide acceptance that Climate Change Adaptation (CCA), Disaster Risk Reduction (DRR) and Food Security policies must operate mutually to counter disaster risks, adapt to a changing climate and enhance the resilience of both food security and people's livelihoods.

South Africa's CCA, DRR and food security policies have been criticised for operating in isolation. Therefore, the central incentive and purpose of this study were to assess the interaction and gaps between CCA, DRR and food security policies/legislation. This helped understand and intensively evaluate the successful implementation of DRR/CCA policies and identify key areas of concern, which is critical for developing positive outcomes for food security in South Africa. Moreover, crucial intervention points for policy and legislative (in)capacity could be identified.

The study is qualitative in nature. The data was collected through a literature review and semi-structured interviews with senior officials in different departments (i.e., the Department of Environment, Forestry and Fisheries (DEFF) previously known as the Department of Environmental Affairs (DEA); the Department of Agriculture, Land Reform and Rural Development (DALRRD) previously known as the Department of Agriculture, Forestry and Fisheries (DAFF); National, Provincial and Local Disaster Management Centres; Scholars and organisations that have considerable knowledge regarding the study's research objectives, such as AgriSA and farmers' unions).

The literature study and interviews with relevant technocrats revealed that climate change and food security policies and legislation are centred on production, while other food system activities are largely neglected and/or poorly reflected. There is an implementation challenge of CCA, DRR and food security efforts on ground level due to maladministration and interdepartmental incoherence. Moreover, no consistent and clear communication channels exist between the DEFF, NDMC and DALRRD on matters pertaining to natural hazards and food security. The size of government, continuous change in ministry, difference in opinion and priority have affected policy integration.

The overall consensus is that there is a weak connection between CCA, DRR and food security policies in South Africa. The study argues that there needs to be a consistent communication channel and collaboration between the DEFF, DALRRD and NDMC. A food system resilience framework needs to be developed, which involves key stakeholders and marginalised groups.

Key Words: Climate Change Adaptation, Disaster Risk Reduction, Food Security, Food System Resilience

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ACRONYMS

CCA	CLIMATE CHANGE ADAPTATION
DALRDD	DEPARTMENT OF AGRICULTURE, LAND REFORM AND RURAL DEVELOPMENT (PREVIOUSLY KNOWN AS DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES)
DEFF	DEPARTMENT OF ENVIRONMENT, FORESTRY AND FISHERIES (PREVIOUSLY KNOWN AS DEPARTMENT OF ENVIRONMENTAL AFFAIRS)
DMA	DISASTER MANAGEMENT ACT
DOH	DEPARTMENT OF HEALTH
DRR	DISASTER RISK REDUCTION
DSD	DEPARTMENT OF SOCIAL DEVELOPMENT
EDD	DEPARTMENT OF ECONOMIC DEVELOPMENT
FAO	FOOD AND AGRICULTURE ORGANIZATION
IFSS	INTEGRATED FOOD SECURITY STRATEGY
NAS	NATIONAL ADAPTATION STRATEGY
NCCR	NATIONAL CLIMATE CHANGE RESPONSE
NDMC	NATIONAL DISASTER MANAGEMENT CENTRE
NPFNS	NATIONAL POLICY ON FOOD AND NUTRITION SECURITY
UNISDR	UNITED NATIONS OFFICE FOR DISASTER RISK REDUCTION

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CHAPTER 1: INTRODUCTION, ORIENTATION AND METHODOLOGY

1.1 INTRODUCTION AND ORIENTATION

Climate change, disasters and food (in)security are directly connected (Vermeulen *et al.*, 2012). The impacts of climate change have increased societies' exposure of risk to natural hazards and hunger (WFP, 2011). Consequently, natural hazards continue to affect all dimensions of food security (access, availability, utilisation and stability) particularly in developing countries where the most vulnerable populations reside (Gregory *et al.*, 2005; Vincent *et al.*, 2008). Floods, drought and other natural hazards have negative consequences on agriculture, livelihoods and other coping measures that people depend on (WFP, 2013). To survive, poor people and communities often sell assets and other necessities, making them more vulnerable to food insecurity and natural hazards (Trujillo *et al.*, 2014). It is important to note that disasters involve a combination of natural hazards and their intensity to affect a vulnerable community/population beyond its coping capacity.

The interconnections of climate change, disasters and food security have called for closer interaction between climate change adaptation (CCA), disaster risk reduction (DRR) and food security fields (Hill & Pittman, 2013; Solecki *et al.*, 2011). The agriculture sector is an important division because most developing countries' Gross Domestic Product (GDP) is highly depended on agriculture. Ethiopia, Nigeria, Mozambique and other developing countries' agricultural GDP accounts for over 30% and over 70% of total employment in countries such as Chad, Cambodia, Mozambique etc. (FAO, 2013; Trujillo *et al.*, 2014). As such, it is important for closer collaboration between the CCA, DRR and food security policy fields.

A policy, which is a “deliberate and a careful decision that provides guidance for addressing selected public concerns” (Torjman, 2005:9), is therefore put in place to achieve a desired goal by considering the best interests of all members of a nation/country. It is important for a country to have policies in place for dealing with public concerns. Considering that extreme climate change conditions and food security are interconnected, it is imperative to include policy and/or policies that deal with these two public concerns in an integrated approach. Therefore, climate

change and related policies (i.e., DRR) should provide support for food security outcomes, especially for the most vulnerable.

The WFP (2011) stresses that weak institutions may amplify the impact that disasters have on food security by creating structural parallels indifferent from climate-related hazards and food security. This highlights the importance of having solid policies that help with the fight against climate change and food insecurity, interdepartmentally and consistently, through governance structures. Failure to create an enabling environment for policies to be implemented not only undermines development programmes, but also gains to enhance resilience against climatic shocks and food security (Gebreyes, 2017).

The primary goals of the Sustainable Development Goals (SDGs) have been to reduce poverty, end hunger and have sustainable development without amplifying the negative impacts of climate change (UNDP, 2019). By this, it is expected that developing countries that suffer from policy and institutional challenges (Ahrens & Rudolph, 2006; Gebreyes, 2017), would enhance the resilience of agriculture and other livelihood assets against climatic shocks to protect those vulnerable to food insecurity and exposed to disaster risks. This would be done through policy reform and creating an environment where CCA and DRR could help to enhance food security and vice versa (Pingali *et al.*, 2005). However, this has not been the case as most developing countries suffer from poor management and capacity to establish good institutional structures to enhance food security in the face of a changing climate (Beddington *et al.*, 2012).

As climate change is expected to worsen disaster risks, food insecurity, poverty and weak governance in developing countries (Beddington *et al.*, 2012; Termeer *et al.*, 2018), there have been calls for more effective collaboration between CCA and DRR (Becker *et al.*, 2013; Birkmann & Teichman, 2010; Mitchell & Van Aalst, 2008). Venton and Trobe (2008) note that CCA and DRR communities have mainly operated in isolation. This has led to the duplication of efforts and a waste of resources and if not promptly addressed, will continue to keep developing countries vulnerable to climate-related disasters.

The isolation between the CCA-DRR community and the negative effects of having ineffective implementation disproportionately fall on the poor due to their lack of coping mechanisms (Becker *et al.*, 2013). In terms of resilience, developing nations are most vulnerable to climatic shocks largely due to their lack and poor management of resources, weak adaptive capacity and instability of institutions (Klein *et al.*, 2003; Pelling, 2010). The lack of effective

integration between CCA-DRR has also hindered the development of agriculture and the enhancement of food insecurity in developing nations. The FAO (2017a) pointed out that, between 2005-2016, 23% of all damage and loss in the agriculture sector in developing countries have been caused by disasters. This has led to the agriculture sector losing over 90 billion dollars due to a decline in crop and livestock production following climate-related disasters (FAO, 2017a).

As the intensity of natural hazards such as drought, floods and other hydro-meteorological is expected to increase (FAO, 2016; Thomas & López, 2015) and keep hindering the development of agriculture, the reinforcement of CCA-DRR and food security policies needs to be high on government's agenda throughout developing countries to enhance resilience rather than vulnerability. Conversely, Habiba *et al.* (2016) caution that the implementation of the CCA-DRR and food security node will not be an easy one because the entire connection between the three fields is still in its infancy and institutions are struggling to delegate which department will deal with which aspect.

The overlap of CCA-DRR and duplication of efforts (which are dealt with later in other chapters) are problematic in developing countries due to the confusion of how CCA can contribute to DRR (and vice versa) in a way that highlights specific roles and differences (WFP, 2011). The interlinkage should work in harmony and not operate in isolation from one another (e.g., CCA-DRR operating in exclusion from a food security lens) (Vincent *et al.*, 2008). Focus should be put on policies and whether institutions put in place can successfully ensure food security during a changing climate (Habiba *et al.*, 2016). Therefore, CCA and DRR policies and legislation should be able to assist one another, through appropriate institutional arrangements, to be able to enhance food security during extreme climate change conditions. The World Bank (2007) states that policy reform and application should be context specific as countries and their geographical locale differ. Practitioners and policymakers of CCA-DRR and food security should, in consultation with local communities, modify existing policies for implementation to acknowledge and be considerate of the complexities of different regions (Habiba *et al.*, 2016). In addition to being context-specific, much of the integration and theory between the CCA-DRR and food security policy field have largely been on paper rather than on practice and when given an opportunity, application is often parallel and isolated (Wilkes *et al.*, 2013; Tirivangasi, 2018). Accordingly, the mainstreaming of DRR in the food security

scope has excluded CCA (Trujillo *et al.*, 2014). The same can be said for CCA practices which operate in isolation from DRR to enhance food security through adaptation (Ziervogel & Ericksen, 2010).

As such, a comprehensive study on a successful integration and application is missing or often limited. Therefore, the central argument of this paper is that the CCA and DRR need to work in accordance with food security policies and vice versa, to enhance resilience and sustainability and to ensure food security, even during extreme weather conditions.

The reinforcement of CCA-DRR and food security policies should be of the most conscripted and implemented policy synergies in developing countries as it is expected that, by the year 2050, the global population will reach 9.5 billion (Godfrey *et al.*, 2010). Global population increase and a simultaneous rise of extreme weather conditions are problematic for the governments of developing countries and urgent action of effective implementation is therefore needed.

1.2 PROBLEM STATEMENT

As mentioned before, climate change is increasing the risk of exposure to hunger, malnutrition and food insecurity, particularly for the poor (Parry *et al.*, 2001). This has led to the forceful pushing of the poorest and most marginalised communities beyond their responsive capacity (Field *et al.*, 2012; Pettengell, 2010). Climate change increases disaster risk by changing the scale and frequency of extreme weather conditions, the average climatic conditions and state which affect underlying risk factors and produce new threats, all which pose a significant threat to food security (Venton & Trobe, 2008). Therefore, it is important for both Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) policies to work together sufficiently to reduce the adversity of impacts imposed by disaster risk and climate change on food security.

Recent literature has provided that South Africa is no exception as it is one of the African countries that is naturally susceptible to climate related hazards and this has had a negative impact on the country's household level of food security (Calzadilla *et al.*, 2014; Shisanya & Mafongoya, 2016). As a response, the South African government has developed an excessive amount of DRR and CCA policies/plans and legislation to counter disaster risk(s) and to adapt to a changing climate, in an effort to enhance food security and resilient livelihoods. Despite the positive enactment of DRR and CCA policies and legislation in South Africa, less attention

has been given to the successful implementation of these policies, legislation and strategies on their overall improvement of food security (Baudoin *et al.*, 2017).

South Africa's institutional capacity may threaten the efficacy of climate change, disaster risk and food security policy interventions. Some of the challenges identified include the lack of horizontal coordination which often results in the duplication of efforts and limited understanding, the lack of implementation commitment at the local level and a lack of statutory reporting which may lead to the incapacity to attain rigorous evaluation and assessments (Hendriks, 2016). The Department of Agriculture, Land Reform and Rural Development (DALRRD) also declares that there are weak supporting structures between the food security and disaster management systems, which highlights a significant gap between policy assessments on disasters and food security in South Africa (South Africa, 2002; Zembe, 2016). Inability to correct these inconsistencies can lead to inaccurate decision-making, fruitless implementation and waste of resources. This not only undermines development but also the right enshrined in the Constitution of the Republic of South Africa which reads that everyone has the right to sufficient food, water and basic nutrition (South Africa, 1996). Therefore, the question under study was whether DRR and CCA policies and legislation successfully (in a collaborative and cross-sectoral approach) enhance food security, through a specific focus on implementation across all food system activities (e.g., production, distribution etc.). One of the reasons for this is because not only do climatic shocks affect the 'production' of food, but also the 'processing' which can affect 'consumers' in a variety of ways. The study will help understand and intensively evaluate the successful implementation of DRR/CCA policies and identify key areas of concern, which is critical for developing positive outcomes for food security in South Africa. Furthermore, this will identify critical intervention points for policy and legislative (in)capacity.

1.3 RESEARCH QUESTIONS

Based on the problem statement, the following were identified as the research questions and objectives of the study:

1. What is the policy setting of CCA/DRR and food security in South Africa?
2. What are the interactions and constraints between food systems and disaster risks(s)?

3. What are the challenges and/or progress in implementing DRR and CCA policies, plans and legislation in relation to enhancing food security?
4. What recommendations can be gathered from the literature review and the data analysis on how to improve food security through a DRR and CCA policy perspective?

1.4 RESEARCH OBJECTIVES

The research objectives of the study were:

1. Describe the policy setting of CCA/DRR and food security in South Africa.
2. Evaluate interactions and constraints between food systems and disaster risk(s).
3. Identify challenges/progress in implementing DRR and CCA policies, plans and legislation in relation to enhancing food security.
4. Provide recommendations gathered from the literature review and the data analysis on how to improve food security through a DRR and CCA policy perspective.

1.5 LITERATURE STUDY

The literature used in this study included government publications, books, conference papers, internet documents/scientific journals and technical reports related to food security, DRR and CCA policies and strategies. These sources were used to establish grounding on the relationship and current progress between all policies, strategies and legislation related to food security and DRR/CCA. The study should lay a foundation which could help to comprehensively grasp the policy setting of DRR/CCA and food security in South Africa.

In a more thorough assessment of food security, the whole food value chain was evaluated. Literature included technical reports and documents from the DALRRD, DEFF and relevant academic journals. On issues dealing with Food Security, DRR and CCA, the main scholars/institutions who contributed to this study were Altman, Campbell, Devereux, van Niekerk, the Food and Agriculture Organization (FAO), United Nations Office for Disaster Risk Reduction (UNDRR), Godfray, Vermeulen, United Nations Framework Convention for Climate Change (UNFCCC) and Hendriks and Pereira who presented issues concerning the relationship between DRR, CCA and food security. Legislative frameworks included the Disaster Management Act of 2002, the National Climate Change Response White Paper of 2011, the National Adaptation Strategy, National Disaster Management Framework, the

National Policy on Food and Nutrition Security. The following databases were also useful in gathering the necessary data:

1. The North-West University Ferdinand Postma Library
2. Internet searchers (i.e., Google Scholar and EBSCO Host)
3. Catalogue of thesis and dissertations from South African Universities

1.6 RESEARCH METHODOLOGY

Research methodology refers to a systematic process which is followed by the researcher to attain pertinent information on a specific topic (Khotari, 2004). For this study, a qualitative approach was used. The data was collected through a literature review and semi-structured interviews with key informants across various government sectors. The literature review is presented in chapter two and three. The rationale behind the literature review was to create a foundation between DRR, CCA and food security to assess and identify the gaps and correlation (Objective 1 and 2). The literature review also aimed to assess the policies in South Africa concerning DRR, CCA and food security to evaluate inadequacies/progress that will be in alignment with the findings and recommendations (Objective 3 and 4).

A qualitative approach was suitable for the study because it is flexible and gives a more holistic and descriptive understanding of complex issues. Furthermore, it is primarily an inductive process of categorising data and identifying relationships between patterns (McMillan & Schumacher, 1993).

1.6.1 Sampling

The sample of the study included senior officials in different departments and industries, i.e., the Department of Environment, Forestry and Fisheries (DEFF), the Department of Agriculture, Land Reform and Rural Development (DALRRD), National, Provincial and Local Disaster Management Centres and the South African Agriculture Industry (e.g., AgriSA and farmers' unions).

The researcher made use of a purposive sampling method and it was deemed appropriate to interview the relevant technocrats (i.e., National, Provincial and Local Disaster Management Centres, DEFF, DALRRD and other relevant South African Agriculture Industry workers and

scholars). Snowball sampling, which means recruiting other relevant participants for the study (Goodman, 1961), was made use of in a situation where the researcher was exposed to other experts of CCA, DRR and food security.

1.6.2 Data collection and analysis

Data was collected through semi-structured interviews which involved asking participants a series of pre-determined but open-ended questions (Given, 2008). A total of 12 participants was interviewed. This involved two technocrats from the NDMC, two from the DEFF, two from the DALRRD, two from the South African Agriculture Industry (i.e., AgriSA and the Agricultural Research Council) and 2 scholars who had sufficient knowledge of the researcher's topic and problem under investigation. The researcher made use of telephonic, Skype and in-person interviews to gather in-depth insights regarding the issues related to CCA/DRR and food security policies and whether the interplay of the former mentioned policies enhances food security.

Data was collected from the sample groups given above until saturation was reached. Data collected was analysed and grouped in themes and to reduce biasness and improve information accuracy, the researcher made use of the triangulation method (Rahman, 2012). Triangulation involves comparing different kinds of data and different methods (i.e., interviews, document reviews) to assess whether the results corroborate and/or converge with one another (Greene *et al.*, 1989). The triangulation method provides qualitative derived richness, enhance validity and support findings by highlighting agreement and minimising inadequacies (Miles & Huberman, 1984). Grouping the data in themes focused on identifying gaps/constraints and synergies between three policy areas (climate change adaptation, disaster risk reduction and food security).

1.7 SIGNIFICANCE OF THE STUDY

Since 1994, the government of South Africa has endorsed and adopted a variety of policies which may be favourable for the populace as it signifies signs of reform and/or transformation; however, this can be a drawback as it may lead to policy and legislative paralysis. This was further reiterated by the Diagnostics report of the National Planning Commission (NPC) which alluded to the certitude that one of the impediments of progress in South Africa has been the lack of success in implementing policies.

Subsequently, because ineffective legislative and policy implementation is considered a significant issue in South Africa and with climate change adding to the issues of food insecurity and disaster risks, it is extremely important to assess whether CCA and DRR legislation/policies contribute to enhancing food security. Therefore, this study aimed to evaluate whether CCA and DRR policies in South Africa contribute to enhancing food security.

1.8 ETHICAL CONSIDERATIONS

The researcher took precautionary measures by applying for ethical clearance (ethics number: NWU – 01388 – 20 – A9) which involved completing a research proposal and getting a signed approval from the scientific committee indicating the proposed risk category, which for this study was minimal. The researcher also completed an online ethics training programme (see Annexure A) as a requirement for obtaining an ethical clearance.

The protection of human subjects and/or respondents was highly upheld. It was important for the researcher to apply appropriate ethical principles, as such the following values were upheld during the research (Orb *et al.*, 2001:93-95; Ritchie *et al.*, 2013):

- The respondents were adequately informed about the study and given the power of choosing whether to participate or not. The respondents were assured that participation was voluntary and choosing to withdraw during the research would not affect their job.
- Anonymity and confidentiality were respected by not revealing the names and/or identity of the participants.
- Care was maintained throughout the study to not physically or emotionally harm the participants.
- The researcher conducted the study in an impartial manner and did not exploit or abuse any of the respondents.
- Data gathered from the participants was protected during data collection and analysis. Physical/transcribed copies were put in a secured cabinet.
- There were no cultural and linguistic barriers present during the study.
- All respondents were advised to withdraw from the study if they felt any of the questions caused emotional distress.

1.9 LIMITATIONS OF THE STUDY

The limitations of the research include:

- Attaining access to specific respondents (i.e., NDMC, DALRRD) who were knowledgeable on the research topic from a policy standpoint; however, employees from both the NDMC and DALRRD directed the research to all the relevant technocrats who supplied the researcher with enriched data to draw concrete conclusions.
- Access to sufficient data because, despite extensive information regarding the effects of climate change and disaster risks on food security/system, in-depth studies regarding CCA and DRR enhancing food security through a policy and legislation perspective were relatively new. It was only recent that South Africa's policy arena had tried to integrate CCA/DRR with food security (and vice versa). Due to this reason, data could be limited. Several academic scholars who had conducted similar research augmented the data to be able to draw accurate results and conclusions and highlight gaps/inconsistencies.
- Financial restraints led to some of the interviews (esp. academic scholars) being conducted telephonically.

The researcher made use of purposive and snowball sampling which helped augment data by getting hold of more relevant participants, especially those dealing with policy integration. This was beneficial for the researcher to make up for data which had been insufficient during the incipient stages of the study.

1.10 CHAPTER LAYOUT

Chapter 1 provided an introduction and the holistic matters pertaining to the field of disaster risk reduction, climate change adaptation and food security. An overview of the research problem and the DRR-CCA-food security nexus was given. The research problem stressed was that post-1994 in South Africa has brought forth an abundance of policies which have created legislative paralysis in different departments. Concerning the study topic, it was important to assess whether the CCA-DRR legislations/policies are satisfactorily implemented and contribute to enhancing food security. The study also highlighted an urgent need to identify inconsistencies and/or irregularities for CCA-DRR-food security policies to be effective for the development of South Africa. The chapter also included the research questions, objectives, a

brief overview of the methodology and ethical considerations suitable to thoroughly conduct the study.

Chapter 2 consists of the first section of the literature review. The literature in Chapter 2 includes an in-depth review of the relationship between CCA-DRR and food security. The review first starts by highlighting the connection and importance of ‘DRR-CCA-food security’ while also providing an analysis from a South Africa perspective. Secondly, the review gives an overview of the value chain in South Africa and efforts to have a resilient food system.

Chapter 3 consists of the second part of the literature review. The chapter comprises of a detailed overview of CCA-DRR and food security policies in South Africa. The overview of the policies is followed by a detailed analysis of lessons learned across Africa and key findings from applying a resilience point of view in enhancing food security. In conclusion, the final phase highlights the importance of good governance as a measure to encourage the resilience of food security against climatic shocks.

Chapter 4 includes an in-depth review of the research methodology used in the study. The chapter gives a detailed description of the sampling, data analysis, data acquisition and processes used.

Chapter 5 includes the findings of the study as well as the collection and analysis of the findings gathered through interviews and document reviews. A discussion of the results highlights discrepancies relating to the CCA-DRR-food security nexus and whether CCA and DRR policies in South Africa enhance food security.

Chapter 6 includes the conclusion part of the study. The conclusion is based on the research questions stated in Chapter 1 and recommendations are made based on the results which could be important to enhance the CCA-DRR-food security policy relationship in South Africa.

CHAPTER 2: CLIMATE CHANGE ADAPTATION, DISASTER RISK REDUCTION AND FOOD SECURITY: A LITERATURE REVIEW

2.1 INTRODUCTION AND ORIENTATION

The world is currently experiencing the effects of climate change and the less developed countries are generally more affected than developed countries (Kreft *et al.*, 2014). The FAO (2018) states that more than 800 million people across the world are suffering from undernutrition and the number of extreme weather conditions (i.e., heat, droughts, floods and storms) has doubled since the early 1990s. The continual climate change effects on the four dimensions of food security (i.e., access, availability, utilisation and stability) make the need to build resilient communities against climatic shocks more urgent because the human and socio-economic costs of undernutrition fall hardest on vulnerable groups (Krishnamurthy *et al.*, 2012).

Nelson *et al.* (2016) state that, although policies call for enhanced resilience against climate change effects and food insecurity, extant policy is far from this realisation. The UN Office for Disaster Risk Reduction (UNDRR) advocates for a coherent synergy between Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) policies with the aim to reduce disaster risk(s) and responding to climate change (UNDRR, 2019). The existence of climatic shocks and disaster risk(s) has often aggravated issues of food insecurity (Frankenberger *et al.*, 2012). Therefore, the strengthening between the two policy fields should be in alignment with food security policies to eradicate the triple challenge of climate change, disaster risk(s) and food insecurity.

The literature review of this study contains two chapters. The first chapter (Chapter 2) creates a setting for CCA, DRR and food security where the relationship between the three fields is described and the importance outlined. This is followed by the causal factors which can enhance vulnerability to food-insecurity and climate-related disasters in South Africa. The concluding part involves the importance of having a resilient value chain rather than one aspect of it. The second chapter (Chapter 3) of the literature review describes the different policies that govern CCA, DRR and food security in South Africa. It is followed by lessons learned from countries that have (or have not) implemented a DRR-CCA integral approach in the fight against food insecurity. In conclusion, different institutional arrangements needed to enhance the resilience of food insecurity against climatic shocks are outlined.

The essence of this study was to evaluate whether DRR and CCA policies in South Africa are sufficiently contributing towards enhancing food security. This is in support of the notion that a policy supported by ineffective, conflicting implementation and/or overlapping tasks leads to redundancy and hinders development. This is extremely crucial because, commonly, national, provincial or local policies can be fruitlessly implemented and can lead to unintended outcomes (Howden *et al.*, 2007). Therefore, for this analysis to be properly addressed, a food security in the context of DRR and CCA was needed to be understood and addressed and the first stage of assessment included a setting for food security, DRR and CCA.

Subsequently, following the links between food security, CCA and DRR, the literature review should provide insight on the urgency to integrate DRR and CCA in food security policies and food systems. Therefore, the aim of the literature chapters was to:

1. review the importance of CCA and DRR in food security and vice versa;
2. review CCA, DRR and food security policies/legislation in South Africa (identify gaps, conflicts and interactions);
3. evaluate the link between food security, food systems and climate change; and
4. establish grounding for good governance; adaptation and resilience: reducing vulnerability of food security through CCA and DRR.

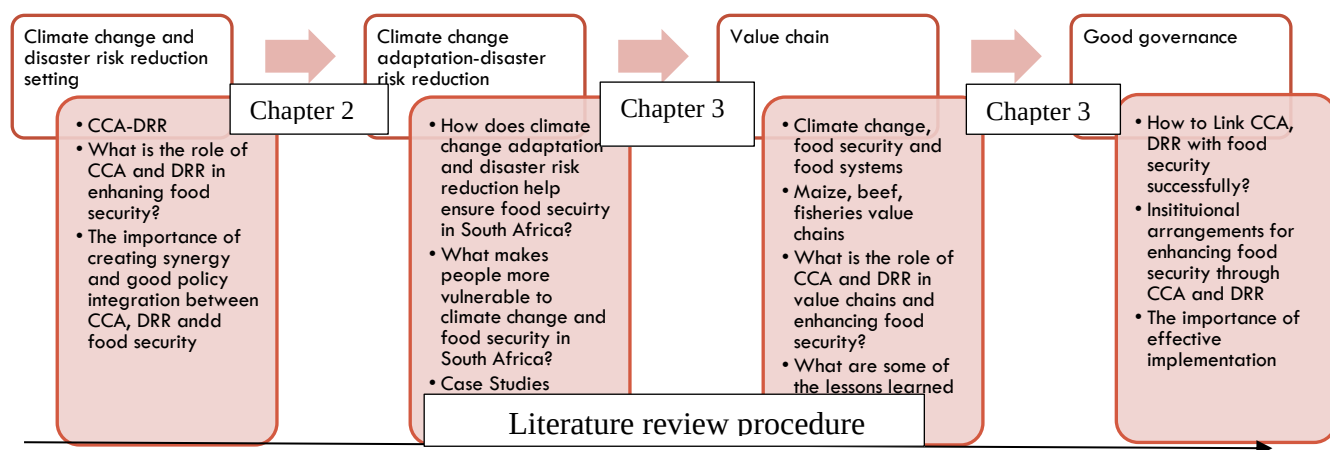


Figure 2. 1: Literature review process¹

The literature review flow above supports the notion adopted by the Food and Agricultural Organization (2016) that ensuring food security in the face of climate change begins from creating an enabling environment for CCA and DRR policy practices to successfully produce resilient agricultural systems. To create an enabling environment, all elements of DRR, CCA, food security and good governance need to be encompassed and upheld to ensure a successful implementation of policies in a timely, efficient and sustainable manner (FAO, 2014), therefore the reason behind the literature review.

In relation to South Africa, Vermaak and Van Niekerk (2004) state that the country is not prone to massive disasters such as earthquakes, tsunamis and volcanic eruptions. South Africa is mainly dominated by localised incidents such as “droughts, seasonal flooding, veld and informal settlement fires and also human-induced disasters such as oil spills and mining accidents” (Vermaak & Van Niekerk, 2004:555). Successively, South Africa is considered food secure on a national level (Abdu-Raheem & Worth, 2011). As a result, one would ask why it would be deemed necessary to have an integration of CCA, DRR and food security. For that, various authors (Blaikie *et al.* 2014; Devereux, 2006; Fourie & Schönteich, 2001) stress that South Africa is food insecure at household level where droughts and other related hazards that go unnoticed may pose threats and affect access to food, availability and stability of nutritional food supplies and consumption intake, if unchecked. Consequently, integration is

¹ The literature will start of from giving a DRR-CCA setting and how it is beneficial to align the policies from a food security lens. This will be followed by policy implications in South Africa and elsewhere and the literature will end by describing the value chains in South Africa and why good governance is important in enhancing food security in a changing climate.

also very important because issues of extreme weather conditions and disaster risks are cross-cutting and a single organisation will fail to efficiently address the complexity (Van der Ven, 1976, as cited in NemaKonde, 2017).

Rivera (2014) states that CCA and DRR are multidisciplinary and require more than one institution (particularly dealing with food insecurity issues) and, for as long as integration is lacking, sustainable development is improbable. This is also the case for several developing countries that still suffer from a coherent integration between CCA, DRR and food security practices and this has had negative effects throughout climate-vulnerable countries (FAO, 2002; Habiba *et al.*, 2016). Overall, to reduce the negative effects of extreme climate change on food security, Birkmann and Teichman (2010) suggest it is important to successfully create synergy between CCA, DRR and food security policies. The following section forms a foundation of food (in)security and DRR.

2.2 FOOD (IN)SECURITY AND DRR SETTING

Food security is a comprehensive term and has a broad range of definitions that vary across the political spectrum. However, for this study, the general definition for food security by the Food and Agricultural Organization (FAO) (1996:1) was used which states that “food security exists when all people, at all times, have physical and economic access to sufficient, safe, nutritious food to meet their dietary needs and food preferences for an active life”.

Food insecurity is the opposite and includes the state whereby people do not always have reliable and consistent access to sufficient and adequate food (Napoli *et al.*, 2011). Therefore, food security requires people to have means to access secure and adequate food on a daily basis (FAO, 1996). This can differ for national and household levels. The distinction between the two was laid out by Andersen (1990) who stated that national food security includes the state when a country is self-sufficient in producing or importing food that meets the demands of the population, whereas household food security exists when a household has access to sufficient and adequate food at all times.

Food Security is defined around four fundamentals, which include food availability, accessibility, utilisation and stability. Food availability is achieved when people have adequate food at their disposal on a consistent basis. Accessibility is ensured by a households/individuals

ability to acquire access to satisfactory nutritious food, whereas the utilization of the food is achieved when the same households/individuals make good use of the adequate food they have consistent access to. Stability is important for a household/individual to be food secure at all times, despite sudden and cyclical economic/climatic shocks (Gross *et al.*, 2000; Gibson, 2012). All these four dimensions are integral and should be properly managed in DRR-CCA policies and legislation.

One of the main drivers of food insecurity is climate change and natural hazards (Habiba *et al.*, 2016) which reduces people's resilience against disasters. This is because most food insecure people are situated in areas susceptible to natural hazards (WFP, 2011). In this regard, DRR plays a crucial role in reducing people's vulnerability against natural hazards.

According to the UNISDR (2009:3), DRR "is the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment and improved preparedness for adverse events". This means that a policy with an objective to reduce exposure to hazards, vulnerability and anticipate risks is termed as DRR. It is important for DRR policies and programmes to protect people's livelihoods and strengthen their resilience in the face of natural hazards.

Subsequently, resilience against climatic shocks such as drought, floods and other natural hazards needs to be well reflected in social and development policies as disaster impacts not only affect economic development but also infringe other social aspects such as nutrition and mental health (Stanke *et al.*, 2013). For the purpose of this study, resilience is termed as the "the ability of individuals, communities and states and their institutions to absorb and recover from shocks, whilst positively adapting and transforming their structures and means for living in the face of long-term changes and uncertainty" (OECD, 2013:1).

Successful DRR requires effective governance which includes a combination of top-down and bottom-up structures that embrace partnerships between state institutions and local communities (UNISDR, 2011). It is imperative to include policymakers, civil society and various stakeholders in the plight against reducing disaster risk(s). This would consist of activities such as risk identification, risk avoidance, risk transfer, risk reduction, prevention, mitigation and preparedness.

DRR does not operate in isolation; it needs to be incorporated across various sectors (i.e., agriculture) and different spheres of government for successful planning and implementation (FAO, 2016). Failure to do so is futile and increases the chances of misguidance and inaccurate decision making. Furthermore, because climate change impacts are increasing globally (Turnball *et al.*, 2013), DRR should not operate separately from adaptation efforts. This is largely because natural hazards and climate change are leading causes of hunger in less developed communities and countries and they further affect all dimensions of food security (WFP, 2011). This highlights the need to not make DRR operate in isolation, making the integration of climate change and food security dimensions an essential requirement. The following section discusses the importance of integrating DRR, CCA and food security.

2.3 LINKING CLIMATE CHANGE ADAPTATION AND DRR

The IPCC (2007:1) defines CCA as “an adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits benefit opportunities”. The main objective of CCA is to enhance resilience against the impacts of climate change such as droughts, floods and other meteorological hazards (Lobell *et al.*, 2008). CCA, as with DRR, is a combination of both bottom-up and top-down approaches where local communities and local, national and international government strategies play a critical role (Butler *et al.*, 2015). National policies for CCA include National Adaptation Programmes of Action (NAPAs), whereas community-level policies include risk identification and preparedness, i.e., early warning systems (Mercer, 2010).

There has been confusion between DRR and CCA communities regarding their similarities and differences, making their functions overlap (Thomalla *et al.*, 2006). Mitchell and Van Aalst (2008) state that this is largely due to the management of hydro-meteorological hazards where DRR needs to take in consideration the changing of hazards while adaptation needs to build resilience to their impacts. Rivera (2014) further adds that CCA and DRR integration is still not clear for many institutions and failure to address this problem puts food security at risk. Moreover, a common problem regarding implementation lies in the differences in language and terminology used in both CCA and DRR and collaboration is often difficult due to institutional, financial and political barriers (Gero *et al.*, 2011; Schipper & Pelling 2006).

The main difference laid out by Venton and Trobe (2008) is that DRR is most concerned with addressing existing present risks while CCA is more focused on future risk-outcomes that may arise. Consequently, the DRR, as laid out by Tearfund (2008), is considerate of all hazard types while CCA is concerned with climate-related hazards. In the past, it was assumed that DRR deals with all hazards including both hydro-meteorological and geophysical hazards, while CCA deals largely with climate-related hazards and conditions (IFRC, 2013). This has been largely ridiculed by various scholars and practitioners (Forino *et al.*, 2015; Kelman *et al.*, 2017) who argue that development in both communities have enhanced focus and reach where both CCA and DRR are complimentary in their efforts. This means CCA and DRR encompass current conditions, future predictions and past experiences to identify and determine best cost-effective practices (Kelman, 2015). Furthermore, Birkmann and Von Teichman (2010) state that both CCA and DRR focus on increased climate-related hazards such as floods, storms and droughts. Despite the overlapping and confusion of principles, consensus has lied on both community's main aim to reduce vulnerability and improve resilience. Both communities are in support of one another as both their conceptual frameworks have a mutual connection in risk reduction: in that exposure and vulnerability should be minimised and capacity reinforced in ways to address both disaster and climatic risks (Turnbull *et al.*, 2013). In essence, both communities deal with achieving resilience and enhancing sustainability. This is important as we in an era of socio-ecologically linked systems where hazards and their effects should not be treated as distinct entities.

The following section highlights the importance of creating a synergy between DRR-CCA and food security. The relevance of integration and evaluation lies in the fact that many developing countries have disaster management offices which still think climate change is not an issue and similarly, climate scientists which do not frequently associate with disaster management officials (Schipper & Pelling, 2006). This has left food security and other development outcomes vulnerable.

2.4 THE CONNECTION BETWEEN DRR, CCA AND FOOD SECURITY

It is vitally important to integrate CCA and DRR in the aim of improving economic and social development to ensure food security for all. There have been calls by scholars and practitioners for governments to form a coherent integration between the three communities as climate change is expected to result in more intensive climatic shocks that would inadvertently lead to disasters, especially for those already vulnerable (FAO, 2013). Despite calls to improve

integration between DRR and CCA to improve food security, theoretically, this is poorly represented in policies and therefore leads to fragmented implementation (Habiba *et al.*, 2016; Tirivangasi, 2018). The lack of coherent integration between DRR and CCA policies remains one of the biggest obstacles towards ensuring sustainable development and resilience, especially in aims to enhance food security. For as long as CCA and DRR communities continue to operate in isolation or standalone entities (Venton & Trobe, 2008; Ziervogel & Ericksen, 2010), fewer gains may be achieved and as a result, poor communities will be hit the hardest.

To counter climate change and disaster risks with the aim of ensuring food security, CCA, DRR and food security communities need to mutually interact with one another (see Figure 2.2).



Figure 2. 2 Integration between CCA, DRR and food security (Source: Author)

To make integration effective, more political will and strengthened institutional capacity are important. Progress in adapting to climate change and reducing risks for livelihoods in government agencies depend on political commitment and institutional capacity, reflected in robust policies favourable to minimising risk and climate change (Few *et al.*, 2006). Lack of political and institutional momentum leads to incoherent funding structures and fruitless

implementation at the local level (Birkmann & Von Teichman, 2010; Chu *et al.*, 2016). The extremity of climate change and food insecurity is a result of a lack of prioritisation.²

In most developing countries, CCA and DRR still continue to operate in isolation from each other (Mitchel & Van Aalst, 2008; Nemaokonde, 2016) and this has largely had a negative impact on food security. The lack of interdepartmental coordination and funding processes leads to redundancy and waste of resources, especially with the aim of achieving food security (Edame *et al.*, 2011). Largely, food security should be ensured in a changing climate through a strong convergence between CCA and DRR policies (Habiba *et al.*, 2016).

There are several examples of good efforts made to integrate CCA and DRR in ensuring food security which is stated by Venton and Trobe (2008) and FAO (2019):

- The United Nations (UN) establishing a committee of DRR and CCA specialists where information is shared and policies improved.
- The Malawian consortium of DRR and other government officials working on the countries National Adaptation Programme of Action (NAPA). The consortium offers stakeholders a chance to engage in negotiations about CCA and DRR integration.
- Initiatives that integrate DRR and climate-smart agriculture such as the Framework for Resilience Development in the Pacific (2017-2030).
- The 2016-2020 Climate Change Priorities Action Plan for Agriculture, Forestry and Fisheries Sector which promotes reciprocity between CCA-DRR in the aim of achieving food security.

The intention of good integration between policies that share a common goal is an act of good governance (FAO, 2014). In this regard, if CCA and DRR operate in isolation from food security practices, then only minimal gains may be achieved in tackling food security, disaster risk and climatic issues. This can be the case in the Agriculture sector where DRR and CCA policies function in isolation from agricultural practices. DRR-CCA practices working in isolation from food security practices result in inadequate preparedness and recovery measures, miscommunication and lack of proper early warning systems to better monitor multiple food

² As climate change (extreme weather events) increases, this gives rise to existing and new risks, which can all have a negative impact on food security and developmental efforts (Campbell *et al.*, 2016). This is also reversible as the more people are food insecure, the more they are susceptible to disaster risks and climatic shocks (Habiba, 2016).

dimensional threats and suitable practices to build resilient livelihoods (Bendito & Barrios, 2016; FAO, 2014). For instance, key CCA and DRR institutions may aim to reduce climate related hazards and disaster risks, but often not do it in a way that would tackle food insecurity. Presumably, this may inadvertently lead to national food and agricultural policies not being strongly guarded against present and future climate-related disaster risks (Gregory *et al.*, 2005). Therefore, a strong integration between DRR, CCA and food security communities is critical.

CCA and DRR communities should also bear local agricultural contexts in consideration when forming policies that would ensure food security. This is strongly advocated by Bours *et al.* (2014) who state that good practice involves mainstreaming CCA and DRR into development policies and agricultural sectors within which farming, fishery and husbandry techniques are in alignment with local contexts. Therefore, both indigenous and non-indigenous knowledge plays a crucial role and neither one should be confined during the forming of policies and during implementation.

The certainty of climate change creates the need for a strong integration between DRR, CCA and food security policies to be robust and decentralised. Agrawal and Ribot (1999) state that the decentralisation of responsibilities to lower governance levels enhances efficiency, transparency, accountability and responsiveness of government citizens. The transfer of CCA and DRR responsibilities from national to sub-national government levels is important especially since climatic shocks and disaster risks are localised (Kellet *et al.*, 2014). The same can be said for food insecurity in Southern Africa which is most prevalent in the household level (Misselhorn, 2005). With that being said, the lower levels of government are better positioned to deal with climatic and disaster risk shocks that threaten food security and developmental outcomes (Frankenberger *et al.*, 2012; UNDP, 2010). The UNDP (2010) further caution that this should not give national level a subsidiary role but rather, one that oversees the operations on the ground level to ensure implementation of policies are adequate.

CCA, DRR and food security should be unified into programme design, monitoring and evaluation strategic frameworks (Bouers *et al.*, 2014). Bad practice would include integrating CCA and DRR with the exclusion of a food security outlook (FAO, 2014). Attention should also be put in all processes of policymaking within the three communities and how to best enhance policies for better application. In addition, policy in developing countries has created structural inconsistencies between policy and execution (Hendriks, 2014).

2.5 THE IMPORTANCE OF CREATING SYNERGY BETWEEN CCA, DRR AND FOOD SECURITY – INTERNATIONAL AND CROSS-REGIONAL COMMUNITIES

As previously mentioned in the discourse of this literature, reducing counter-effects to enhance food security is the premise of this research. It is important for countries aiming to enhance food security to be underpinned by comprehensive institutional arrangements and knowledge of managing extreme weather conditions and disaster risks from a food security lens and vice versa.

Ensuring food security involves more than having a good set of policies on paper. Sasson (2012) indicates that most developing countries are undergoing a food crisis due to the overwhelming mismanagement of policies in the handling of climatic-induced food shortages and the abandoning of livelihood strategies. The FAO (2018) states that food insecurity continues to worsen in Africa and many countries in Eastern and Southern Africa continue to be affected by prolonged droughts and flooding. Without adequate climate-risk resilience measures and timely responsive implementation action, Africa, particularly Southern Africa will continue to suffer negative impacts on agriculture and the four food security outcomes (food availability, access, stability and utilisation) will continue to be negatively affected by climate change impacts (FAO 2005; Lobel *et al.*, 2008). In the last 20 years, the FAO (2018:52) states that, not only has exposure to climatic shocks risen in both frequency and intensity, but this has transpired in countries already vulnerable to the risks of food insecurity and malnutrition.

Subsequently, food safety, health and the conditions of infrastructure such as roads and railways which transport food, will be compromised by climate variability and change (Bahta *et al.*, 2016; Wlokas, 2008). Therefore, with the scare of water shortages and population increase, context-specific policies need to be target-bound and mutually supportive (Thompson, 2006). A lack of an effective integrated policy/policies which approaches CCA and DRR from a food security perspective may make the above listed threats add more pressure in the already suffering food insecure households. This has been evident in some countries in the Southern Africa (i.e., Zimbabwe, Angola) as lack of policy coherence, weak institutions and effective implementation have undermined the poor and vulnerable (Misselhorn, 2005). Muyambo (2017) states that governments limited involvement and slow responsiveness to disasters continue to affect the livelihoods and socio-economic factors of those already food-insecure and vulnerable. To ensure food security nationally and on ground-level, it is important

to have regular assessments to evaluate whether climate change policies are present and are effectively enhancing food security.

For any country that aims to ensure food security, adaptation and disaster risk measures are important to have in national and local policies. Due to the current increase of extreme climate change conditions i.e., drought, floods and storms, Wlokas (2008) states that areas where adaptation and mitigation are appropriate include disaster management, food security, water resource management, rural livelihoods and poverty alleviation strategies. Consequently, Gregory *et al.* (2005:2139) assert that “the relative importance of climate change for food security differs between regions” and therefore, this literature review evaluates the current DRR-CCA conditions to ensure that food security is effective. The discourse is from a South African perspective, delving into food system outcomes.

2.6 CCA AND DRR: PERSPECTIVES ON FOOD SECURITY IN SOUTH AFRICA

South Africa is considered nationally food secure (Altman *et al.*, 2009); however, one in four people currently experiences hunger and a large proportion of the population lives in unfavourable conditions (Tsegay *et al.*, 2014) where climate change impacts can have great negative impacts if policies and strategies are not adequately formed.

Despite attempts to reduce hunger in households, the same cannot be said for malnutrition which has been persistent (Devereux & Waidler, 2017). It is safe to argue that climate change has been a major role player in this outcome. For this reason, policy coherence and coordination are also important as food security cannot function in isolation from DRR and CCA policies and strategies. Lack thereof can result in profound institutional barriers to successfully implement policies. Therefore, it is important to have strong links between government sectors, civil society and private institutions. Below are various reasons as to why CCA and DRR are important in enhancing food security in South Africa.

2.6.1 Vulnerability

Despite economic and political advancements in South Africa since 1994, as above-mentioned, a large quantity of South African citizens (mostly rural and urban poor) is underprivileged (Labadarios *et al.*, 2011), which makes them vulnerable to both food insecurity and climate change impacts such as floods and drought. Vulnerability is known as the “extent to which a

society, structure, service or geographical area is susceptible to a hazard” (Ćosić *et al.*, 2011;52).

The increase in drought, flooding and other climatic shocks has placed severe pressure on those already struggling to have access to nutritious food. Climate change has affected food security by exacerbating prevalence of diseases, water quality and availability, the stability of food systems (this is extensively covered in the next section), agricultural employment and increased food prices and negatively affected market access and overall food supply, particularly in the Southern African region (Tirivangasi, 2018). South Africa is no exception where the food basket for the poor is expected to double in the next ten years (DEA, 2016b³). Climate change is also expected to have an impact on crop allocation and total wheat production, food prices and employment in the maize industry due to a drying climate (DEA, 2016b). As vulnerability levels are high for the poor, climate change impacts will interact with various stresses to which both small-scale and commercial farmers are exposed as well as those already living in disaster risk areas. Therefore, it is useful to consider CCA and DRR in both small-scale and commercial farming. Inability to achieve this can result in food shortages or price hikes for those vulnerable to food insecurity. It is important to acknowledge that most vulnerable households who take part in small-scale farming in South Africa do so for extra food (Altman *et al.*, 2009), which makes CCA and DRR an important integral part of ensuring food security for the most vulnerable.

2.6.2 Socio-economic issues: A disaster-risk perspective

Since 2015, South Africa’s poverty rate has been increasing. This means over 25 million people suffer from the weak and low economic growth, high unemployment rates, fluctuating commodity prices, increasing food prices and lack of policy uncertainty (Stats SA, 2017). Climate change effects and rural-urban mass migration in South Africa have destabilised progress to fighting poverty and ensuring food security where in-migration and urban sprawl have led to many households living in high-risk areas or areas which are not economically or mentally supportive (Drimie & McLachlan, 2013; Lukamba, 2010). This exposes those already struggling with food security to floods, droughts and other risk factors, while also making

³ The reference for DEA will remain the same throughout the chapters despite its name change due to the year of the publication(s).

current attempts to fight food insecurity under harsh conditions redundant and unessential. Therefore, climate change is more likely to affect the rural-urban poor where most small-household producers are located and at very high risk. The UNISDR (2017a) argues that this affects both development gains and food security.

Critical knowledge gaps exist between DRR, CCA and food security in South Africa. This is because both the DRR and CCA fields do not adequately work together and they lack comprehensive literature on plans to ensure and enhance food security (Baudoin *et al.*, 2017; Vincent *et al.*, 2008). The Department of COGTA (2016) adds that, despite South Africa's progress to a well-developed legislative framework to enhance DRR (i.e. DMA and NDMC) and CCA (i.e. National Climate Change Response (NCCR) policy and NAS), several challenges that undermine implementation still exist and these include: i) capacity shortages, ii) inadequate institutional placement of the disaster management function in provincial departments and municipalities, iii) inadequate funding for proactive risk reduction efforts, iv) integrating progress in integrating DRR into everyday operations, and v) limited technical expertise and capacity to promote integration, particularly at the local government level.

Subsequently, the DMA (Disaster Management Act No. 57 of 2002) makes no mention of food security, which questions its efficacy in enhancing food security. The NCCR policy does not comprehensively give input on how it will enhance food security, instead, much focus has been on what to do. This threatens the poor farmers, rural-urban consumers and food security as a whole. This gap needs to be filled by evaluating the progress made to enhance food security through DRR and CCA in all its forms (Beddington *et al.*, 2012; Pingali *et al.*, 2005).

2.6.3 Spiral tensions of vulnerability and socio-economic issues on food security, DRR and CCA

Poverty plays a huge role in vulnerability and socio-economic imbalances, which makes it hard for those on the poverty margin to protect themselves from natural or human-made hazards, which in turn, can turn a hazard into a disaster. Habiba (2016) states that most food insecure people live in areas susceptible to natural hazards and the World Bank (2016) estimated that approximately 34% of South Africa's population resides in rural areas, this is coupled with more than half of the population that is considered poor. Stats SA (2016) states that the North West (21%) and Gauteng Provinces (19%) had the highest proportion of households still living

in informal dwellings. Furthermore, access to sanitation and drinking water is still an issue for households living in rural areas and informal dwellings. This is not to imply that people are automatically food-insecure when they reside in rural areas or informal dwellings (Kent, 1997), but are rather more vulnerable to food insecurity, climate change and/or extreme weather events that can lead to a disaster (Devereux & Sussex, 2000). The World Food Programme (2015) (see Figure 2.3) evaluates the impacts of disasters on hunger. CCA, DRR and food security should therefore be a central place of interest in curbing disasters.

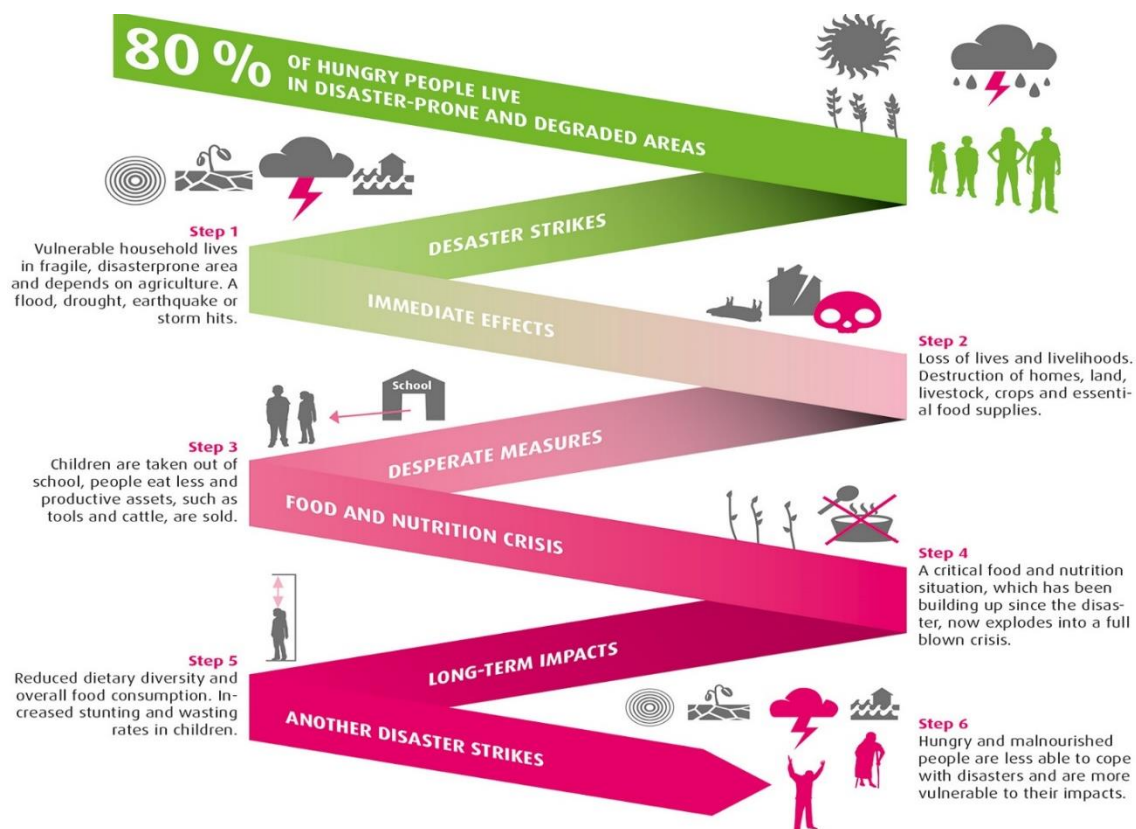


Figure 2. 3: Impacts of disasters on hunger (Source: WFP, 2015)

It is widely detailed that food security and disasters are directly connected; therefore, disasters can increase food insecurity and food insecurity in return, can influence disaster risk. A study by Garschagen *et al.* (2015) states that food insecurity can force people to stretch their agricultural production in places with high exposure to natural hazards and further force them to sell their valuables or assets as an adaptive or coping strategy. It is imperative for DRR and CCA fields to take such matters in consideration when developing policies. By this, it is implied that, under climate change and disaster risk(s), strategies that aim to sustainably enhance resilience and food security, should be of central importance. Resilience gives a framework to

be proactive in planning positive chain reactions and curbing negative chain reactions (Hart, 2016). A good and effective DRR and CCA governance with an aim to ensure food security can mutually reinforce resilience by protecting those in rural areas and the urban poor (WFP, 2011; O'Brien *et al.*, 2006). Furthermore, mutual understanding and support between DRR, CCA and food security policies are beneficial as it leads to poverty alleviation and enhances livelihoods for those vulnerable to food security and climate change impacts (WFP, 2011; Rasul & Sharma, 2016). This highlights the need for effective food security, DRR and CCA policy-based approaches.

2.6.4 Confines in ensuring food security - a policy perspective

Focus to ensure food security is largely on crops (Campbell *et al.*, 2016) and slight attention has been put on livestock disease and pests, even though these are some of the direct drivers of food (in)security in Southern Africa (Misselhorn, 2005). More minimal attention has been put on fisheries and value chains. This is evident as both the DRR and CCA policies in South Africa (NCCR policy, 2011; Disaster Management Act No. 67 of 2002) fail to mention strategic approaches for the aquaculture and small-fish farmers to adapt to a changing climate. Furthermore, CCA and DRR policies stress more importance on production rather than the whole food security arrangement (availability, access, stability and utilisation). This neglect marginalises food security, particularly the livestock, aquaculture and the whole food security community from investment, education and early warning system opportunities.

Several studies (Baudoin *et al.* 2017; Drimie & Ruysenaar, 2010; Muyambo *et al.*, 2017) suggest that South Africa has implementation problems that mainly originate from institutional paralysis. Implementation is often inadequate (often too minimal and lack of evaluation if intended outcomes are achieved) or unsatisfactory, and, due to institutional arrangements, response time is problematic. For instance, the study by Baudoin *et al.* (2017) states that, on paper, the DMA has a strong legislative context which promotes proactive and reactive risk responses, drought reduction and vulnerability assessments; however, implementation is hindered by lack of capacity development and increased bureaucracy, creating barriers for immediate responses. Failure to address research-implementation gaps in South Africa is detrimental for interventions that aim to enhance food security,

Subsequently, despite several DRR, CCA and food security policies and strategies in South Africa, in practice, there is minimal evidence of the policies' collective implementation on ground-level. The policies operate in isolation or in pairs (Masipa, 2017); however, there is lack of documented evidence to suggest the three policy fields working together in harmony. To enhance food security, integration among all three policy environments is crucial. As a result, problem-solving approaches are critical in enhancing food security.

2.6.5 Integral policy approach and resilient food systems

Based on the reason that climate change is one of the leading causes of hunger in poor communities (WFP, 2011) it is important to connect food security, DRR and CCA together. Failure to do so perpetuates the existing status quo of climate-related disasters being a norm. At regional level, this is important, as climate change continues to destabilise current progress to eradicate hunger and malnutrition. Policies, strategies and legislation play an important role in shaping the actions that need to be taken for set-outcomes. Without effective integration and coherence between the DRR, CCA and food security policy arena, only minimal gains may be attained. Rural communities and the poor who are dependent on agricultural activities will be hit the worst by the ineffective institutional processes recently faced in the region (Campbell *et al.*, 2016; Vogel & Smith, 2002). Climate change effects are expected (Mugambiwa & Tirivangasi, 2017) to worsen malnutrition, hunger and living conditions in Southern Africa and fewer opportunities will be engendered for the agriculture sector and the poor if policies are not integral and effectively implemented on ground-level.

South Africa has a grave task of protecting farmers and the vulnerable population from the impacts of climate change and if CCA, DRR and food security integration and implementation are still difficult tasks, ending hunger, malnutrition and reducing vulnerability will be a great challenge (Masipa, 2017; Ngema *et al.*, 2018). A further challenge is in enhancing the weak institutional support networks between food security and disaster management systems (DOA, 2002). Food security policies fail to make coherent linkages with risk reduction policies and vice versa. Furthermore, women, despite being more vulnerable than men to food security and climate-related hazards in South Africa, are often overlooked during food security, DRR and CCA policies (Altman *et al.*, 2009). Altman *et al.* (2009) state that women, who make approximately 61% of all those involved in farming, are neglected by policy-planners and overlooked during the implementation phase. Problem solving approaches have a pressing gender bias that favours men.

In achieving enhanced food security, Edame *et al.* (2008) unveiled that government institutions and policies need to be rapid and well-coordinated and should include a multidisciplinary and flexible response measure(s) to climate change and other emerging risks. CCA and DRR's policy direction needs to be context-specific in enhancing food security. The circumstances that farmers and vulnerable households live under need to be incorporated into decision-making and implementation processes. More fundamentally, a strong evaluation process needs to be accompanied to ensure that implementation leads to intended outcomes. For example, Vincent *et al.* (2008) argue that CCA and DRR policies need to be evaluated if whether they are successfully enhancing food security outcomes without impeding any progress that aims to sustainably uplift vulnerable households and the agriculture sector.

In deduction, on a regional scale, the FAO (2014) proposes four pillars, namely:

- Pillar 1: Enable the environment: good governance and institutional strengthening.
- Pillar 2: Watch to safeguard: information and early warning systems.
- Pillar 3: Apply Prevention and mitigation: agriculture practices and technology for disaster prevention and mitigation.
- Pillar 4: Prepare to respond: preparedness to improve disaster response and recovery.

The first pillar stresses the importance of enacting and implementing reliable risk reduction and adaptation policies and laws on national and local level. The pillar requires the DRR and adaptation policies to be integrated into poverty reduction and development policies. The second pillar's objective is to "strengthen and harmonise food and nutrition security information and early warning systems to better monitor the multiple threats and inform decision-making in preparedness, response, policy, advocacy and programming" (FAO, 2013:32). The third pillar aims to proactively curb and minimise disaster risk(s) that aim to hinder progress on food security through technologies and good practice knowledge and methods applied in the farming, aquaculture and forestry sectors. The final pillar aims to reinforce preparedness and response capacities at all levels for communities to recover from food security threats.

One of the most important yet overlooked climate change impacts, as already mentioned in the literature, is the direct and indirect disruption of the food value chain. Emphasis has been placed on food production while the other elements of the food system have been largely neglected

(Miller *et al.*, 2013). As a result, communities' and governments' knowledge and understanding of risk factors that impact food systems are limited. This is important because a large amount of people in developing countries spend a great amount of their income on food and failure to address shortcomings faced in food systems trap poor people in a cycle of poverty and high vulnerability (WFP, 2015). According to Feenstra (2002), food systems include activities in food production, processing and packaging, distribution and consumption. Integrating resilience into food systems is therefore a necessity as it has a high potential to successfully enhance food security (Tendall *et al.*, 2008).

When most studies focus on food production and neglect the entire food system, Godfray *et al.* (2010) assert that government disinvests in processing and distribution systems, this creates a context where focus on managing disaster risks lies solely on food production on the local level. This seldom contribute to enhancing food security and resilience for poor vulnerable communities and at worst, denies the very real experiences of people who live with the realities of food insecurity and disaster risks.

The FAO (2014) emphasises that failure for countries (particularly those in Southern Africa) to understand the underlying risk factors that affect their food value chain, inadvertently augments food chain emergencies and threats such as zoonotic and transboundary diseases which reduces the productivity of crops and animals and can further have severe out-turns for food safety and public health in the case of food contamination. A good example in South Africa is the case of Listeriosis. The case of Listeriosis in South Africa, which was a major concern at the beginning of 2017, affected all nine provinces leading to the death of 183 out of 674 patients (WHO, 2018). Chersich *et al.* (2018) argue that climate change has fuelled the Listeriosis outbreak and the government has overlooked this aspect.

The need for an evaluation of South Africa's food value chain is therefore mandatory; however, for this research, focus and importance were only in drawing linkages between CCA-DRR and food systems as it will shape current policies from the constraints and gaps which were discovered for further studying, including actual evaluation. Moreover, failure to draw linkages may intensify underlying drivers of climate risk, for instance, funding projects and processes that intensifies greenhouse gas (GHG) emissions instead of reducing them. Vermeulen (2015) espoused a value chain checklist (see Table 2.1 below) which can be used by both commercial and small-holder farmers to produce climate-resilient outcomes, particularly in developing countries.

Table 2. 1: Climate change risk assessments in the value chain (Source: Vermeulen, 2015)

Value chain outcomes	Climate risk issues	Climate risk management opportunities
Agricultural Production		
Soil and Water Management	Increasing temperatures can cause soil erosion and a decline in soil organic content. Lack of water management can create greater crop evapotranspiration, reduced groundwater recharge and salinity intrusions into soil and groundwater.	Establish measures that curb soil erosion (i.e., terracing, drainage etc.) and soil carbon practices. Also establish water efficiency techniques (i.e., irrigation, flood management etc.).
Production infrastructure	Production infrastructure (such as fields, livestock facilities etc) face climate-related risks e.g. droughts and floods.	Establish physical risk control measures at farm-level (e.g. windbreaks, flood control dikes etc.) and create buffer zones for most sensitive areas where farmers can relocate sensitive infrastructure.
Farmers skill-base	Farmers have already adapted to climate-related risks; therefore, local knowledge should be integral in implementation stages.	Invest in local decision-making processes, training and research on farmer adaptation methods.
Post-production: storage, processing, transport and retail		
Post-harvest management and placement of processing facilities	High volumes of waste in harvests, disease outbreaks and a decline in nutritional status. Climate-related risks may destruct processing facilities and cause an increase in transport prices.	Establish waste reduction and control measures and make provision for renewable energy sources. Establish hazard exposure maps for processing facilities to equip themselves or relocate, also establish protective features.
Transport hubs, routes and refrigeration facilities	Extreme weathers can disrupt logistics and increase refrigeration costs as well as GHG emissions.	Establish contingency plans for road, rail, water and air carriage as well as storage facilities.

		Enhance storage and transport management and conduct cost-benefit analysis.
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Climate change has a high potential of causing trade-offs between economically viable options and those food insecure and vulnerable to climate change impacts. Meaning the poor and vulnerable farmers are often marginalised in value chain projects. To make matters more demeaning, women are the ones most affected. Female farmers are commonly neglected in access to technology and in post-production systems, this affects and disrupts women's CCA and risk reduction strategies (Chaudhury *et al.*, 2012; Khoza *et al.*, 2019). Therefore, gender equity and participation in value chain projects are essential for enhancing food security through CCA and DRR measures.

The following section outlines the need to have a resilient food system to counter negative impacts. This is to influence government and stakeholders to enhance risk reduction and adaption measures successfully even in post-production to prevent one outcome of the chain from affecting the other and vice-versa.

2.7 ADAPTATION AND DISASTER RISK RESILIENCE IN AGRICULTURE VALUE CHAIN

Risk reduction and adaptation play a pivotal role in ensuring food security across the value chain. As seen from Table 2.1, risk reduction and adaptation can play a role across the entire value chain spectrum to minimise vulnerability and exposure to hazards. What climate and disaster-resilient measures noticeably do is enhance resilience for input suppliers, producers, processors and consumers (Bell & Taylor, 2015). Each node in the agriculture value chain is vulnerable and equally exposed to disaster risks and each node has implications for other nodes if not properly managed. For example, droughts in the production phase can alter food security progress by putting vulnerable farmers out of business and increase food prices for consumers. It is important to note that exposure is mainly dependent on location and the resiliency of a farmer to be able to absorb shocks and adapt to severe conditions.

The value chain is directly inter-connected, high vulnerability to disaster risks may fragment the inter-connection causing more high vulnerability. This is articulated by Hill and Pittman (2013) who state that the reluctance of input suppliers to give credit to farmers in hazard-prone areas increases their vulnerability and unproductivity. This enlarges the gap between input

suppliers and producers in the agriculture value chain. Therefore, more need and action for climate-adaptation and risk reduction measures across the value chain are required. This part of the research is necessary to influence government policies to consider the entire value chain and not place emphasis only on production.

2.7.1 Overview of food systems (value chains and food system governance) in South Africa

There is urgent need to enhance the resilience of agriculture against extreme weather conditions at all nodes of the value chain to enhance food security (Antle & Capalbo, 2010; Hill & Pittman, 2013). Due to DRR and CCA studies in South Africa focusing more on food production as means to enhance food security, our understanding and knowledge of the causal factors contributing to food system resilience is often limited. This not only affects food production but also food access, utilisation and stabilisation (Muller, 2017). Moreover, studies (Pereira, 2014; Vermeulen & Campbell, 2012) prove that climate change impacts do not act on farmers and consumers in isolation, they are a result of various pressures where food security is severely affected. Therefore, it is appropriate to include adaptation and risk resilience measures in food systems and give it equal importance in enhancing food security.

The FAO (2019) states that some commodities in the value chain may be more vulnerable to others. For instance, raw fruits and vegetables may be more exposed to climatic shocks during transportation and storage rather than being vulnerable in the production stage. Therefore, adaptation and risk reduction interventions are needed in post-harvest and processing stages.

Evaluating adaptation and risk reduction in South Africa's food value chain is equally important because both policy fields do not mention adaptive capacities in a changing climate, rather, much focus is on food production (Termeer *et al.*, 2018). An adaptation and risk resilience-approach are mandatory to fill the existing gap of a resilient food system against climate change in enhancing food security in South Africa. Failure to do so undermines food security, not only on the national level, but on the household as well (Altman *et al.*, 2009).

Current climate-related risks often have a negative shock on food quality and prices, particularly in South Africa where the poor spend most of their income on food (Altman *et al.*, 2009; Fanzo *et al.*, 2018). As aforesaid, drought or floods can increase food quality/prices in

the value chain and can inadvertently put farmers out of business if policies are not properly aligned and mutually supportive. The following value chains in South Africa are to influence value chains to effectively integrate adaptation and risk reduction measures in their processes and components.

To evaluate South Africa's food value chain and the inclusion of DRR and CCA as a form of resilience, the researcher aimed to briefly evaluate the current Agro-food parks, the beef, maize, small-scale fisheries and the apple value chain. The need for this is to create an enabling environment for risk-reduction and climate-adaptation to be included in value chains.

2.7.1.1 *Agro-food parks*

To enhance food security and rural economic transformation in a sustainable way, the government of South Africa, in 2015, established Agri-parks. The Department of RDLR (2017;1) terms Agri-parks as “networked innovation system of agro-production, processing, logistics, marketing, training and extension services, located in a District Municipality. As a network it enables a market-driven combination and integration of various agricultural activities and rural transformation services”.

The main aim of Agri-parks is enhancing South Africa's agriculture and strengthening agro-processing. Through this, the government of South Africa aims to foster small-holder farmers and generate jobs in the production, processing, logistics, marketing, training and extension facilities. This will improve food security and livelihoods of both the rural-urban poor because the Agri-parks will be a network innovation system of both rural-urban areas.

The guiding principles of Agri parks are that they: are farmer controlled; must be the catalyst of rural industrialisation; must be supported by government for economic sustainability; must establish partnerships between government and private sector stakeholders for water, energy, transport access and create new markets for the value chain; must enhance existing state land with agricultural potential and access to farmers preferable emerging and rural famers; must maximise the use of high value agricultural land and existing agro-processing, logistics infrastructure; and support the growth and enhancement of rural towns in terms of high economic growth (DRDLR, 2017).

Agri-parks include three components. The first is the farmer production support unit (FPSU) which links farmers with markets and include primary collection, storage and processing facilities and mechanisation for extension services to support small and emerging farmers through subsidisation. The second component is the Agri-hub (AH) where processing, packaging, logistics and training initially happens. The last component is the Rural Urban Market Centre (RUMC) which aims to connect rural and urban areas by means of domestic and international market access, provide holding facilities for produce and market intelligence where latest communication techniques will be used (Agri SA, 2017). The components are a strategic objective to improve household food and nutrition security in rural and urban areas (DRDLR, 2017).

Like the maize and beef value chains which are discussed below, limited research has been done on how the entire value chain of Agri-parks is vulnerable to climate change impacts and its resilience thereof. In an area where growing population and internal/external drivers of change which increase vulnerability to shocks, soil degradation, pest outbreaks and other related climatic tremors, it is important to include resilience measures across the value chain (Tendall *et al.*, 2015). Agri SA (2017) states that climate change has altered the suitability of certain commodities and market access in South Africa, yet there are no formal documented methods of including resilience and adaptation in the current Agri-park models. Lack of resilience measures in the entire value chain threatens both food security and major carbon emission cuts.

The emerging climatic shocks around the globe have called for agri-food supply chains to adapt to a changing climate (Galbreath, 2014); however, this has been significantly under-researched and the analysis below aims to highlight such incongruities.

2.7.1.2 Beef value chain

Figure 2.4 below is a sketch of the beef value chain in South Africa from the DEFF (2015). It is estimated that there are over 45 000 commercial farmers and an access of 240 000 emerging farmers and 3 million subsistence farmers (DAFF, 2015)⁴. The Beef supply chain is vertically

⁴ The reference for DAFF will remain the same throughout the chapters despite its disestablishment due to the year of the publication(s).

integrated and contributes to the country's food security and nutritional value. The value chain includes a procedure of feedlot where livestock are slaughtered, processing and access to markets where consumers can purchase. It should be noted that the value chain has become increasingly integrated that some feedlots/abattoirs can directly sell to the consumers through their own existing wholesalers. Local markets include butchers, auctions and festivities which gives previously disadvantaged groups an opportunity to commercialise.

The value chain also has both formal (e.g. supermarkets, butchers) and informal markets (e.g. hawkers, spaza shops) where consumers for the latter are mostly emergent and for the former are mostly considered affluent.

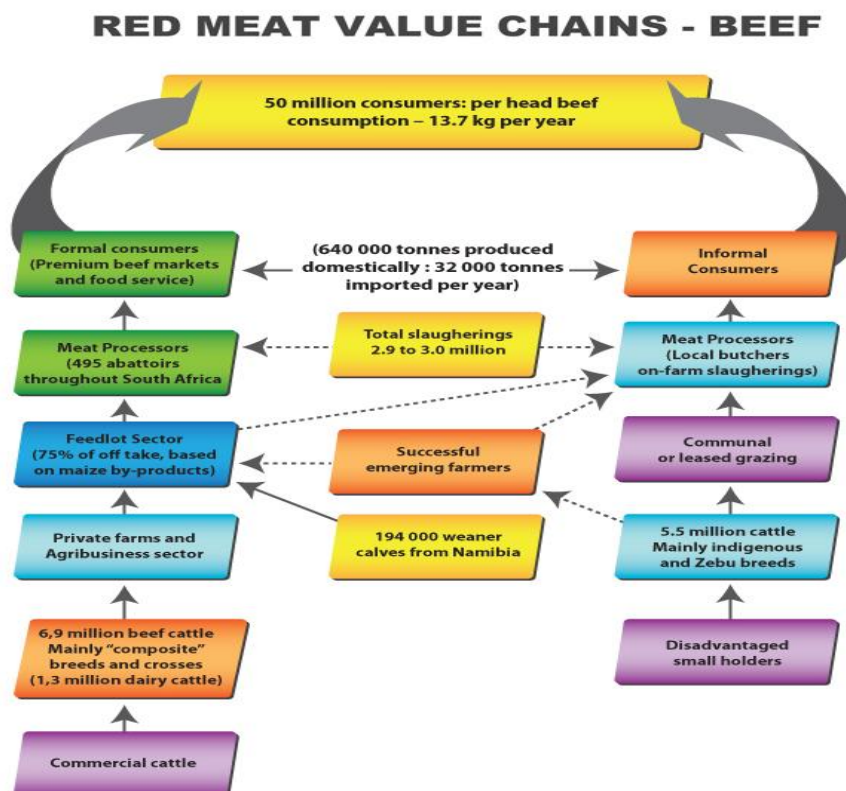


Figure 2. 4: South African Beef Value Chain (Source: RMRDSA, 2017)

On a climate change lens, Labuschagne *et al.* (2011) state that drought and extreme weather conditions will affect South Africa's beef industry, mainly the food safety and quality assurance. Despite threats such as droughts, pollution and land degradation, there is lack of climate and disaster risk-resiliency being integrated into South Africa's livestock value chain, particularly for the previously disadvantaged groups (Hove, 2017; Louw *et al.*, 2018). Therefore, the beef value chain is vulnerable to extreme climatic conditions. A lack of

adaptation and risk reduction measures in the value chain conflicts with the goals of the SDGs of ending hunger, poverty and target actions to combat climate change (UNDP, 2019).

2.7.1.3 Maize value chain

South Africa's maize value chain includes farmers (producers), silo owners (who provide storage facilities for themselves or for others), traders who market and sell the maize, millers who convert the maize into usable form and lastly consumers (end users). Figure 2.5 below shows South Africa's maize value chain.

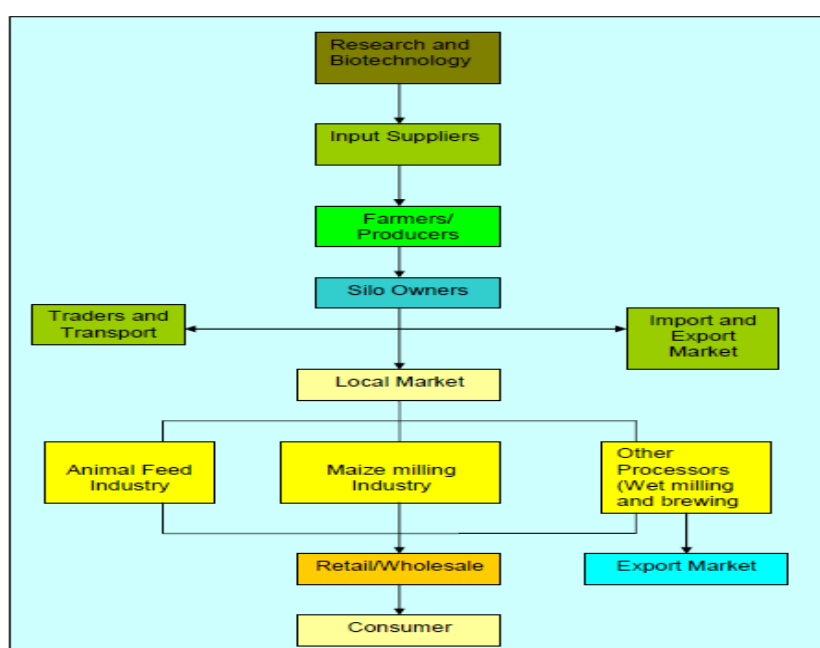


Figure 2. 5: South Africa's maize value chain (Source: DAFF, 2012)

Note: The maize value chain consists of a primary, secondary and tertiary sector.⁵

Paremoer (2018) states that South Africa is becoming more reliant on agricultural imports due to climatic shocks and constraints on water. As such, with the lack of effective climate-

⁵ The primary sector includes input suppliers, producers and silo owners. The secondary sector includes millers, who convert maize for consumption and animal feed manufacturers who use the maize for broiler manufacturing and layer feed rations. The tertiary sector includes traders, transport and retailers (DAFF, 2012)⁵

adaptation and resilience measures, agricultural value chain is at threat especially since production is largely dependent on climatic conditions (DAFF, 2017b).

The lack of an integrated climate-adaptation and resilience measures threatens the livelihood of small-scale farmers and the constraints of water also affects commercial farmers (Wilk *et al.*, 2013). The National Development Plan of South Africa proposed that small-scale farmers be integrated into corporate value chains for rural development (National Planning Commission, 2011); however, if resiliency and adaptation measures are to be excluded in the integration it is safe to argue that only minimal gains may be achieved in the face of extreme weather conditions (Gbetibouo & Ringler, 2009; Thomas *et al.*, 2007; Yaro, 2013). Despite the crucial objective for rural development and uplifting small-scale farmers, climate change is also a concern for commercial producers, millers, markets and the entire value chain. For example, if climate change affects millers, it may cause distress on the relationship between the miller and those who have contractual agreements with him/her due to shortage of supply and in turn, lead to importing maize and cause an increase in food prices and/or shortage. A perfect example is the 2005-2006 drought in Brazil that affected crops and both lead to imports and increases in food prices (Mitchel, 2008). Due to the value chains interconnection, consumers can be affected by the rising of food prices during and after droughts. As a result, the researcher suggests that possible resolutions are needed in mitigating and preparing for climate risks along the entire value chain rather than small fractures of the chain. Winter and Jang (2017) propose that the maize value chain should consist of the following:

- Integrated platforms for producers to consumers which include productivity with climate resilience.
- Improving post-harvest management through post-harvest technology distribution.
- Farmer aggregation and financing mechanisms.
- Market linkages and mechanisms to share climate risks across the value chain for example climate risk modelling, social impact bonding and weather insurance.

2.7.1.4 South Africa's small-scale fisheries and aquaculture value chain

Small-scale fisheries are an important, integral part of poverty alleviation and food security as the sector “generate livelihoods, employment and income through harvesting, processing and marketing for approximately 250 million people” (Wintink *et al.*, 2017:1). In South Africa, there is no documented current estimate of people who generate livelihoods, employment and

income across the small-scale fisheries value chain. In the year 2000, approximately 30 000 subsistence fish farmers were estimated to be directly involved in subsistence fish farming; however, it is possible to be an under-estimate (Snowman *et al.*, 2014).

Despite the policy for the small-scale fisheries sector which was promulgated by the DALRRD in 2012, the sector has been systematically neglected (Snowman, 2006; Young, 2013) and this poses a threat to food security, poverty alleviation and rural development. Due to the systematic neglect, resiliency is often overlooked. The small-scale fishers are often marginalised in value chains and they are unable to have access to credit, proper processing facilities and market participation (Limuwa *et al.*, 2018; Ponte, 2008). Small-scale fish farmers are often neglected; therefore, perceived impacts of climate change on various actors across the value chain often go unnoticed (Navy *et al.*, 2017). Timmers (2012) suggests that post-harvest losses from climatic shocks often affect women the most because they are among the most vulnerable and marginalised.

Like small-scale fish farming but more extensive, aquaculture (see figure 2.6) has a high value in global food security and despite its consistent growth in South Africa since the year 2000, producing environmentally sustainable seafood is still an issue (Britz & Venter, 2016). The aquaculture also lacks comprehensive evidence of resilience in its value chains. South Africa's fisheries sector is very sensitive to climate change and the large number of people and communities involved in fish-farming is generally poor, unskilled and has limited capacity to adapt to climate change (Hampton *et al.*, 2017).

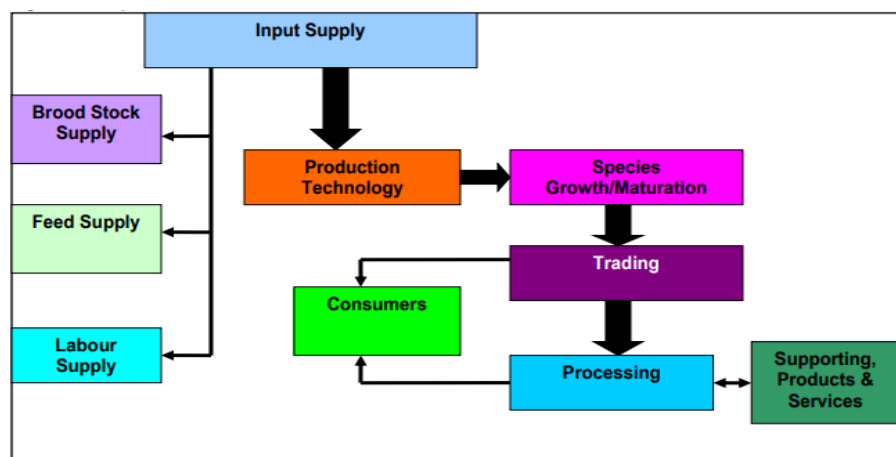


Figure 2. 6: Aquaculture market value chain (Source: DAFF, 2017a)⁶

There have been several adaptation and resilience measures for the fisheries sector (i.e., refining detection and capturing abilities; developing refrigeration infrastructure at catch-sites to enhance food quality; improving access to climatic predictions and other relevant information) (Augustyn *et al.*, 2018, as cited in Van der Lingen & Hampton, 2019). In addition, the application (called ABILOBI) was developed to help poverty alleviation and to improve communication among fish-farmers; however, all the adaptation options have helped a few and were limited to adapt to short-term climate change shocks (Van der Lingen & Hampton, 2019).

2.7.1.5 Lessons learned from Uganda's fisheries value chain sector analysis and the South African apple value chain

To enhance food security in South Africa and adaptation practices, it is important to evaluate important lessons learned in many parts of the world in relation to value chain analysis and reducing vulnerability of food systems. Uganda was chosen due to being one of the countries that consistently and successfully carry out value chain analyses for the fisheries sector (Hempel, 2010) while the apple value chain was randomly selected to improve on the gaps revealed on both the maize and beef value chain of South Africa. It is critical to carry out vulnerability assessments across value chains for farmers and stakeholders to be resilient during extreme weather conditions and be able to reduce carbon emissions.

Table 2.2 below indicates Uganda's fisheries sector and climate change variability assessment. It is critical for South Africa to carry out similar value chain vulnerability assessments to reduce disaster risks and enhance resilience.

⁶ The aquaculture market value chain consists of an 'input supply' phase which includes i) stock supply from hatcheries where fish is artificially controlled for commercial purposes, ii) feed supply and iii) labour supply where workers carry out activities. The second phase includes the 'production technology' where the technology used helps in the growth and/or maturity of species. The third phase stems from the growth and/or maturity of species where trading takes place on either local or international markets. The traders have options whether to process the species themselves or sell it to consumers. The 'supporting, products and services' include research and technology elements of the value chain (DAFF, 2017a).

Table 2. 2: Impact pathways of climate change and variability for Uganda's fisheries sector (Source: Timmers, 2012)

Point on Value Chain	Impact	Potential outcome for Fisheries
Inputs and Services	- Increased exposure of inputs (gear, boats, labour) to extreme weather, winds and storms.	- Destruction of inputs and gear. - Increased danger to boat crew and fishers.
Production	- Changes in groundwater temperature, precipitation, soil moisture, function of land-use and hydrological variability. - Evapotranspiration. - Changes in water quality.	- Shifts in primary production. - Changes in food web structure. - Disease and species invasion. - Less predictable seasonality of lakes. - Decreased areas to Breed.
Trade and Transport	- Roads and trade routes become impassable.	- Lack of access to markets. - Changes in migratory/market routes and transport times.
Processing	- Processing facilities hit by unpredictable rain patterns.	- Post-harvest losses. - Changes in processing technologies and costs due to abundance of new species.
Marketing	- Supply scarcity.	- Price increases for available supply of fish. - Increased number fishers. - Decreased revenues from declines in catch and/or stock abundance.

The apple value chain is the same as the maize chain which consist of farmers, processors, cold storage facilities, retailers, packhouse operators, transporters and end consumers. HORTGO (2014) states that South Africa's apple value chain industry directly employs over 26 000

labourers for production and processing and support over 107 000 dependents. Which makes adaptation and resilience a critical aspect in enhancing food security and protecting livelihoods.

It is estimated by Gindaba and Wand (2005) that climate change and extreme weather conditions such as drought, extreme wind conditions and disease outbreaks can affect fruit size, distribution and food loss. Moreover, extreme weather conditions can affect job security and in turn lead to food insecurity. Extreme weathers can damage roads, infrastructure, irrigation systems, processing facilities and water treatment plants needed for packaging facilities which can alter the entire value chain if inappropriate resilience measures are not properly constructed (Midgley, 2016). With the increase of extreme weather conditions, it is expected there will be a need for increased capital to install improved transport routes, infrastructure and new post-harvest systems that can adapt to a changing climate (Baloyi & Zengeni, 2015). Additionally, water scarcity will inadvertently lead to an increase in water and energy pricing. This weakens the already vulnerable food system as Agriculture currently consumes 60% of South Africa's total water resource (Pereira, 2014). Due to the interconnection between food, water and energy (food-water-energy nexus), a demand from one leads to a demand for another (Rasul & Sharma, 2016; Temeer *et al.*, 2018), for example, a demand for more food production can increase demand for irrigation which can lead to water stress.

The Western Cape case study by Midgley (2016) shows that the apple value chain consists of a monitoring and quality control system across the entire value chain and farmers in the area have already adapted to the changing climate and extreme weather conditions through: efficient irrigation systems (i.e., drip systems), changing planting schedules, maintaining cold chains and packhouses, integrated pest management and managing post-harvest disorders. Climate smart agriculture (CSA) is practiced by farmers in the Western Cape; however, opportunities still lie in the value chain to; enhance extension officers to deal with climate change; create partnerships between stakeholders in the value chain; establish innovative risk insurance and analysis models, moving to a lower-cost carriage and mobilising government to monitor and quickly respond to post-harvest disorders along the value chain (UNIDO, 2017).

2.7.1.6 *Remedying South Africa's food systems*

The lessons learned above should not be seen as universal. The point is to have resilient value chains and to have the support of stakeholders across the entire value chain. In addition, adaptation and resilience building should fit the context of the environment. Therefore, any

food system policy intervention should manage trade-offs and be flexible enough to adapt to context specific environments (Hill & Pittman, 2013).

The main concern over the vulnerability of food systems under climate change is their condensed competency to ensure food security for vulnerable households (Myers *et al.*, 2017; Vermeulen *et al.*, 2012). Climate change is expected to affect the four elements of food security (i.e., availability, utilisation, access and stability) and the rural poor are the least to adapt (Fanzo *et al.*, 2018; Vermeulen *et al.*, 2012). Vermeulen *et al.* (2012) note that the more vulnerable the food systems, the weaker the adaptive capacity. Because the poor are more susceptible to climatic shocks and food price increases due to climate change effects on food systems, it is mandatory to cultivate climate change resilience across the food system spectrum (Muller, 2017).

Table 2.2 shows that climatic shocks can have a negative knock on each stage of a value chain. This emphasises the need for adaptive governance from both government and civil society to address the risks that vulnerable, food insecure people face. Ericksen (2008) and Muller (2017) argue that food systems require enhanced adaptive competence, effective governance arrangements and resilience building as a vital tool to address the susceptibility of food systems to climatic shocks.

In South Africa, the food system concept is poorly reflected in institutional terms (Termeer *et al.*, 2018), especially in terms of being climate resilient. Pereira and Drimie (2016) state that South Africa's food system is dichotomous in that it includes both a formal and informal side which involves the commercial sector and a large group of small-scale farmers respectively. The food system governance should effectively collaborate and be harmonised with climate change and disaster risk policies to enhance resilience of food security. There should also be better co-ordination, inclusiveness and integration among the three fields (food security, CCA and DRR) and different actors (state and non-state actors) for enhanced resilience (Hill & Pittman, 2013; Vermeulen *et al.*, 2012; Whitfield *et al.*, 2018).

To remedy South Africa's food system, good and comprehensive governance standards need to be high in both government's and stakeholder's agenda (Candel, 2014). Because of the limited amount of food security policies that qualify to be viewed from a food system perspective due to their focus on a single department or node in an entire food system, it is

important to only analyse those that are integral of other departments and give a holistic approach of the food system spectrum from a CCA and DRR perspective.

Subsequently, due to deregulation, the current food system has largely favoured the commercial sector and has marginalised poor small-scale farmers (Pereira & Drimie, 2016). This has created unfavourable conditions for those already vulnerable to food insecurity and living in severe weather prone areas. Therefore, Tendall *et al.* (2015) state that food systems at all levels (global, national and local) should be resilient and have the support from stakeholders and different government departments (e.g. energy). It is important to note that this research did not aim to evaluate the resilience of food systems in South Africa but to draw a network/link between food systems and resilience measures (CCA and DRR) which will help in enhancing the overall food system resilience. Thus, food systems resilience involves a practicality of multiple flows (Battersby, 2012). Climate-related disasters and food security are directly connected; therefore, it was important to consider policies and policy-based evidence of approaches applied elsewhere to enhance food security in South Africa, through a CCA-DRR policy perspective.

2.8 CONCLUSION

Following the discussion in Chapter 2, it is evident that a coherent integration between CCA, DRR and food security communities involves a reciprocal connection. Besides calls for a more comprehensible link between the three communities, in reality, this has been lacking. In theory, we have seen progress, but the same cannot be said about the implementation phase. Chapter 2 highlighted the importance of having adequate proactive measures and timely response to climate change and disaster risk(s) to curb the negative effects they have on food security.

The importance of having good set of policies should be in alignment with an effective implementation. A continued delay in developing efforts to adequately manage climate-related disasters that affect food security and plans to reduce the mismanagement of DRR-CCA-food security policies, will continue to put Southern Africa in an unfavourable position. The lack of political commitment and institutional capacity in Southern Africa has played a large role in causing disarray in efforts developed to integrate CCA/DRR and food security measures.

To this date, socio-economic issues in South Africa causes adaptation and food security problems for the poor and continues to make current efforts to fight food security under extreme

weather conditions impractical. Additionally, CCA and DRR policies often stress much importance on food production rather than the whole food security system (e.g. availability, access, stability and utilisation). This neglect has enhanced vulnerability against the entire food value chain in the region. To produce a resilient food system, the entire food value chain should be accounted for in policy planning and execution. The lack of commitment in this regard has created a gap between food security and climate-related efforts. In essence, rural communities and agriculture-dependent regions who have been marginalised from CCA-DRR efforts will keep being in an undesirable position during stressful seasons unless change to existing policies is fulfilled.

In conclusion, this chapter highlighted the importance of having an agriculture value chain which can be resilient to climate-related disasters and disaster risks. It further accentuated different value chains in South Africa to emphasise remedying the existing food system by learning from other regions which have successfully carried out value-chain assessments. The following chapter follows on Chapter 2 and discusses DRR-CCA and food security policies in South Africa while also assessing lessons learned elsewhere to enhance food security through a CCA-DRR policy-perspective. Chapter 3 concludes by drawing attention to good governance/institutional arrangements needed to effectively integrate DRR-CCA with food security efforts.

CHAPTER 3: ENHANCING SOUTH AFRICA'S FOOD SECURITY RESILIENCE THROUGH DISASTER RISK REDUCTION AND CLIMATE CHANGE ADAPTATION POLICIES AND GOOD GOVERNANCE

3.1 INTRODUCTION

The previous chapter created a foundation where the relationship between DRR, CCA and food security could be explored and understood. The foundation has highlighted inconsistencies between DRR-CCA operating in isolation from food security efforts and incorporating

adaptation measures which exclude local contexts. Additionally, Chapter 2 discussed DRR-CCA and food security issues in South Africa and why we need to enhance the entire food value chain instead of focusing entirely on production.

This chapter focuses on South African policies and legislation related to the aforesaid communities (CCA-DRR and food security) and lessons learned across different regions. The purpose in discussing the lessons learned elsewhere is to prove that a coherent DRR-CCA policy approach from a food security lens is beneficial to the populace whereas a peripheral approach can have deleterious effects on a vulnerable society, especially in terms of ensuring food security during extreme weather conditions. The discrepancies concerning the DRR-CCA and food security policies are further highlighted to draw attention to the effects these have on the local populace and how one can establish quality-based outcomes. The policies and their relevant department/structures are discussed to map the institutional arrangements of the relevant policy arenas. The rationale behind mapping the institutional arrangements is to form basic comprehension related to how the policy arena of the different communities cooperatively function and to also draw attention to the challenges they face.

The previous chapter revealed that a strong foundation between DRR and CCA is beneficial in enhancing food security and vice versa. This chapter is important in that South African policies related to DRR and CCA need to have a context-specific solid foundation in enhancing food security, especially in a sustainable manner. Among other issues, this chapter highlights the lack of DRR and CCA policies incorporating small-holder and subsistence farmers in their implementation phase. Furthermore, the policy and legislative complexity of DRR and CCA make prioritising food-security an arduous process as some government structures neglect it completely. This is also the case for local governance as there is an inconsistent and flawed relationship between CCA, DRR and food security departments which hinder overall progress. Below the researcher evaluates the different DRR, CCA and food security policy arenas and the challenges they face.

3.2 AN OVERVIEW OF CCA, DRR, FOOD SECURITY POLICIES AND THEIR GOVERNANCE IN SOUTH AFRICA

The first and second chapter stressed that because disasters and food insecurity are directly connected (FAO, 2013), it is important to have CCA, DRR and food security policies be mutually supportive of each other. This will build South Africa to not only be resilient towards

natural hazards, but also ensure those vulnerable to food insecurity are not inadvertently affected by weak integration, duplication of efforts and lack of capacity and knowledge. This section discusses relevant CCA, DRR and food security policies and provides insight on their current issues and foci.

3.2.1 Climate change policy and interplay in South Africa

The South African government approved and gazetted the National Climate Change Response (NCCR) White Paper in 2011 (DEA, 2011a). The policy aims to transition South Africa into a climate-resilient and decarbonised economy. According to Beaumont (2012), this is underpinned by two objectives, namely:

- To successfully control foreseeable climate change impacts through strategies that aim to shape and sustain South Africa's social, economic and environmental resilience and response capacity.
- To contribute to reducing greenhouse gas (GHG) emissions without negatively impacting the economic, social and environmentally sustainable development of South Africa.

The NCCR policy is short-term (reviewed every 5 years), medium-term (reviewed every 20 years) and long-term (extends to the year 2050). The White Paper strategic priorities include risk reduction and management, mitigation actions with significant outcomes, sectoral responses, policy and regulatory alignment, integrated planning, informed decision-making and planning, technology research development and innovation, facilitated behaviour change, behaviour change through choice and resource mobilisation (DEA, 2011a).

Southern Africa is a region facing challenges of both urban and rural poverty, food insecurity and severe climate shocks (Lobell *et al.*, 2008). Without adequate CCA policies and programmes, the region will suffer negative impacts on food insecurity and poverty levels. However, CCA policies need to be context specific. Therefore, South Africa needs to strive for CCA interventions which reduce vulnerability and enhance resilience (Davies *et al.*, 2009). This can be done through short-term interventions which forecast DRR patterns or medium and long-term climate projections.

The NCCR policy is integrated into sectoral plans such as the Strategic Plan for South African Agriculture and National Framework for Disaster Risk Management as a means to bring about food security in a changing climate. One challenge includes safeguarding food security while concurrently reducing GHG emissions. This is supported by a recent study done by USAID (2016) which states that South Africa's total GHG emissions grew by 44% from 1990-2012. However, extensive action has been taken in reducing GHG emissions in the agriculture sector and adapting to climate change, amongst others. These include climate-smart agriculture (CSA), access to finance, technology and capacity building (DAFF, 2012). Having access to finance, technology and exploiting CSA helps increase productivity in an efficient and sustainable manner that can improve yields despite extremely unpleasant weather conditions. CSA is also beneficial in reducing production inputs amid the high and rising input costs i.e., machinery and imported fertiliser (Lipper *et al.*, 2014).

The smallholder farmer sector has largely been excluded in terms of technical support, market access and adaptation policies in the implementation phase (DAFF, 2012). This was further alluded by Gandure *et al.* (2013) who stated that CCA policies coupled with other socio-economic policies lack in supporting small-holder farmers in technical and financial assistance as well as in creating awareness about CCA and reducing risk for greater success among small-holder farmers. The study contrasts with the NCCR white paper which calls for building resilience around all farmers including subsistence farmers. To ensure equitable food security, Gandure *et al.* (2013) indicate that small-holder and subsistence farmers need to also be prioritised in the implementation phase.

The urgency to build resilience to climate change in the agriculture sector as stated by the National Climate Change Response White Paper (2011) includes:

- Integrating agriculture into climate-resilient rural development planning to improve job creation, food security and livelihood levels through leveraging synergies between adaptation and mitigation.
- Using relevant risk and vulnerability research studies to develop and update short, medium- and long-term adaption strategies for best practice. This is to help the agriculture sector adapt to severe weather conditions in a profitable, sustainable manner.

- Invest in research that promotes water, nutrient and soil conservation methods to improve CSA and its financing models to boost agricultural harvests under harsh conditions.
- Improve early warning systems to detect extreme weather conditions and pest or disease outbreaks to protect farmers and evaluate their vulnerability to climate change, pest and disease occurrences.
- Invest in educational and awareness programmes in rural areas that include CSA where subsistence and commercial farmers can respond and adapt to climate change.

CCA policies and strategies should not be the sole responsibility of one government department but should be mainstreamed into almost all departments because climate change is a traverse concern (DEA, 2011a). Correct adaptation and mitigation of climate change are important for environmental, societal and economic development; therefore, coherent climate policy integration (CPI) into other sectors and departments is of great concern (Mickwitz *et al.*, 2009). The DEA (2011b) state that functional and procedural policy action should take place in three categories, namely: horizontal coordination/integration (i.e., includes different government departments and sectors), vertical coordination/integration (i.e., includes different spheres of government e.g., national, provincial and local) and stakeholder coordination/integration (i.e., includes public/private partnerships).

The lead department in climate related issues is the Department of Environment, Forestry and Fisheries (DEFF) and two facilitating horizontal coordination of two different structures are established: The Inter-Ministerial Committee on Climate Change (IMCCC) which consist of six ministers from various departments and the three clusters of directors-general (i.e. economic sector and employment cluster, infrastructure cluster and the international cooperation cluster) which emerge from the Forum of South African Directors-General (FOSAD) which was entrenched in 1998 (DEA, 2011b). Both structures are a means to an end in ensuring that climate change concerns are prioritised. This can still be a problem due to the various contending priorities in other key departments. Ziervogel *et al.* (2011) state that government tends to overlook climate change impacts due to contending priorities between other departments such as health care, manufacturing, mining and business services.

With regard to horizontal coordination, different key and supporting departments play a significant role in CCA. For instance, Transport (curbing CO₂ Emissions) and education (awareness building on CCA). However, for this study, more emphasis was put on the DALRRD and DEFF for their lead role and regulatory authority in directly ensuring food security and climate change response measures (DEA, 2011b; Nkoana, 2015). A sub-committee of the Intergovernmental Committee on Climate Change (IGCCC), with the support and coordination from the DEFF, was initiated and tasked to manage the mainstreaming of CCA into sectoral strategies (Averchenkova *et al.*, 2019).

With reference to vertical coordination, the three spheres of government all have a significant role to play in CCA. The provincial government performs the function of evaluating climate change efforts on the provincial level and it differs for every sector, i.e., health and agriculture. For local level, a Municipal Disaster (Risk) Management Centre must provide a risk profile for the area which the municipality governs and to be integrated into the Integrated Development Plan (IDP) to curb disaster risks. Moreover, local government roles are emphasised in the 'Let's Respond Toolkit' which drives climate change resilience (DEA, 2016).

The seriousness of CCA is pivotal for local development and ensuring food security; therefore, some municipalities in South Africa (e.g., Cape Town, Limpopo and Durban local municipalities) have already employed CCA by-laws. A critical concern lies in some of the CCA municipality bylaws directly excluding food security in its planning's which creates an inconsistent pattern and linkage between local government policies and adaptation strategies used by local farmers (eThekweni Municipality, 2011; Mbombela Local Municipality, 2015). Local municipalities commonly form CCA-food security bylaws as separate entities and initiatives outside the official local climate change response policy. For instance, the Mbombela Local Municipality's climate change response policy makes no reference to how food security initiatives will involve adaptation/resilience measures and be integral of the overall CCA strategies. On the contrary, the city has a food security strategy mentioned in their annual report and IDP (Mbombela Local Municipality, 2011). This highlights inconsistencies and gaps between local governments CCA response policy and food security policies on the local level.

3.2.2 National adaptation strategy

South Africa is currently in the works in developing a national adaptation strategy (NAS), which gained momentum after the enactment of the NCCR policy. The NAS plays a crucial role in making the national, provincial and local levels of government to have a common vision in their all-inclusive adaptation strategies. The approach to CCA in South Africa will be reinforced by the NAS and will be the basis for a unified and cross-sectoral approach for climate-resilient development. The NAS (DEA, 2016) aims to:

- Act as the primary guidance document for climate change adaptation efforts in South Africa, providing direction for all levels of government.
- Inform national, provincial and local development planning.
- Help gauge the degree to which development initiatives at different levels of government integrate and reflect critical climate change adaptation priorities and thus inform levels of resource allocation from revenue streams related to climate change resilience.
- Support South Africa in meeting its international obligations by demonstrating progress on climate change adaptation as well as serve as South Africa's national adaptation plan.
- Guide stronger coherence and coordination on climate change adaptation between different institutions and levels of government.

With similar aims of the NCCR policy, the NAS attempt to reduce susceptibility to climate change impacts and advocate the mainstreaming of climate-resilient development into sectoral policies and planning. Despite the NAS building from the NCCR policy and giving key responses in what it aims to do for the agriculture sector adapting to climate change, it fails to comprehensively mention how this will be done (DEA, 2016a). This not only highlights the inconsistency in communication and planning for CCA in all sectors and three levels of government, but also contributes to ineffective implementation. Moreover, this puts food security in an undermining position. Thus, CCA, in the aim of achieving food security, becomes redundant and limits positive responses when horizontal and vertical flows of communication are insubstantial (Ampaire *et al.*, 2017).

Like the NCCR policy, the DEFF is the lead department in the forming and execution of the NAS strategic objectives. It further organises and manages regulatory frameworks and allocation of resources that drive the NAS to achieve its aims. National, provincial and local government departments are responsible for developing and ensuring adaptation strategies are in alignment with the overall goal of the NAS in a sustainable manner. Moreover, business and civil society are important stakeholders that can influence policy direction and implementation. Both parties need to outline their adaptation strategies and report on the progress of their activities (DEA, 2017). The Department of CoGTA and South African Local Government Association (SALGA), help facilitate national and local coordination, so the activities of the two department's collaboration work effectively.

Investing in adaptation strategies is very costly and Nelson *et al.* (2009) estimate that funding for adaption programmes need to increase by at least US\$7 billion per year for developing countries. This includes additional annual investments on agricultural research and expansion. However, the estimates can vary from region to region. With both the NCCR and NAS being under the DEFF, a comprehensive funding/investment plan for ensuring food security in the form of adaptation is still lacking and often acts as a standalone and separate issue. This can hinder adaptation in South Africa if not properly reviewed and can lead to inefficient implementation.

It is important for CCA to work effectively with DRR efforts and the two communities to complement one another. With that being said, the following section outlines DRR policies, legislation and governance in South Africa.

3.3 OVERVIEW OF DRR POLICY, FRAMEWORK AND GOVERNANCE IN SOUTH AFRICA

Post-1994 brought forth a full-fledged set of DRR polices and a legislative framework in South Africa. Successful implementation of DRR policies and strategies play a crucial role in development. A paradigm shift from a purely responsive disaster risk governance to one that is both responsive and proactive in nature became part of the norm after the move towards democratisation in South African (Botha *et al.*, 2011). A good example is the Disaster Management Act (DMA) of 2002 which was later followed by the National Disaster Management Framework (NDMF) in 2005 (Van Niekerk, 2014).

3.3.1 The Disaster Management Act (2002)

The Disaster Management Act (2002) aims to: i) integrate and co-ordinate disaster management policy that focuses on preventing and reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recover; ii) establish national, provincial and municipal disaster management centres; iii) encourage disaster management volunteers; and iv) matters incidental thereto. The National Disaster Management in South Africa consists of an intergovernmental committee which is established by the President and comprise of Cabinet members. The chairperson of the National Disaster Management Centre is responsible for establishing an advisory forum and consists of several actors including members of the executive council (MEC) and senior provincial department representatives (DMA, 2002).

The DMA emphasises the importance of DRR, mitigation and prevention being high on governments agenda. This is evident in the act where the legislation makes provision for reducing, preventing and mitigating the risk of disasters. Despite progress towards the call for more enhanced DRR activities, it is safe to argue that successful implementation of the DMA is hindered by weak institutional structures (Hoossein *et al.*, 2017; Sithole, 2015; Zuma *et al.*, 2012). Implementation struggles to positively reflect the vision of DRR on ground-level, making both legislation and implementation feeble (Botha *et al.*, 2011; Van Niekerk, 2014).

3.3.2 National Disaster Management Centre

The DMA (Section 8 of the DMA, act No. 57 of 2002) makes provision for the establishment of the National Disaster Management Centre (NDMC) which is led by the Department of Co-operative Government and Traditional Affairs (CoGTA). Its main objective is to promote an integrated and co-ordinated system with more emphasis being put on prevention and mitigation on all spheres of government and other non-governmental role players (NDMC, 2016). Section 15 of the DMA gives general powers and duties for the NDMC to i) specialise in issues concerning disasters and disaster management, ii) act as advisory and consultative body on issues concerning disasters and disaster management, iii) promote the recruitment, training and participation of volunteers in disaster management, and iv) promote disaster management capacity building, training and education throughout the Republic, including in schools and to the extent that it may be appropriate in other Southern states (DMA, 2002). The NDMC plays

a crucial role in ensuring implementation is effective. Despite the NDMC's part in providing appropriate guidelines for the successful implementation of plans and procedures, Van Niekerk (2014) points out that implementation does not readily occur.

The NDMC is established within every sphere of government. The Department of CoGTA leads the functions within the national sphere while the provincial disaster management centres (PMDCs) made up of the provincial premier are situated in each province and they are responsible for local government (IFRC, 2012). The amended DMA of 2015 gives provision for local municipalities to establish disaster management plans and its implementation thereof (DMA, 2015).

3.3.3 National Disaster Management Framework

As aforementioned, the DMA includes objectives which aims to reduce disaster risks and prevent them from affecting large amounts of civil citizens. This is done through intensive energy and efforts in national, provincial and local government spheres. The same applies to the private sector and communities at large. This process of public and private synergies involves different views with the same aim; to reduce and prevent disaster risk. For this reason, the DMA established the National Disaster Management Framework (NDMF) in 2005, a crucial need for uniformity and consistency (NDMF, 2005).

The NDMF is a strategic framework which gives direction to DRR plans and development. National, provincial and local DRR strategies and interconnection between the three spheres of government must be consistent with the NDMF's vision. The protection of civil society against disaster risks should be at the centre of governments overall development and DRR policies and strategies (Sarewitz *et al.*, 2003). A flexible system, yet rigid DRR policy goals should be vigorously envisioned in all government spheres and should reflect through implementation.

The DMA allows for the promulgation of both provincial and municipal disaster management frameworks which have a shared vision and alignment that is consistent with the NDMF (see Figure 3.1 below). Both the provincial and municipal disaster management frameworks are responsible for establishing institutional arrangements and consultative processes for participative planning; configuring disaster risk assessments; establishing an integrated supportive DRR system; establishing and enhancing processes that build public awareness

capacities, educational, training and research initiatives and; forming funding mechanisms in the area which the provincial and district municipalities have jurisdiction (NDMF, 2005).

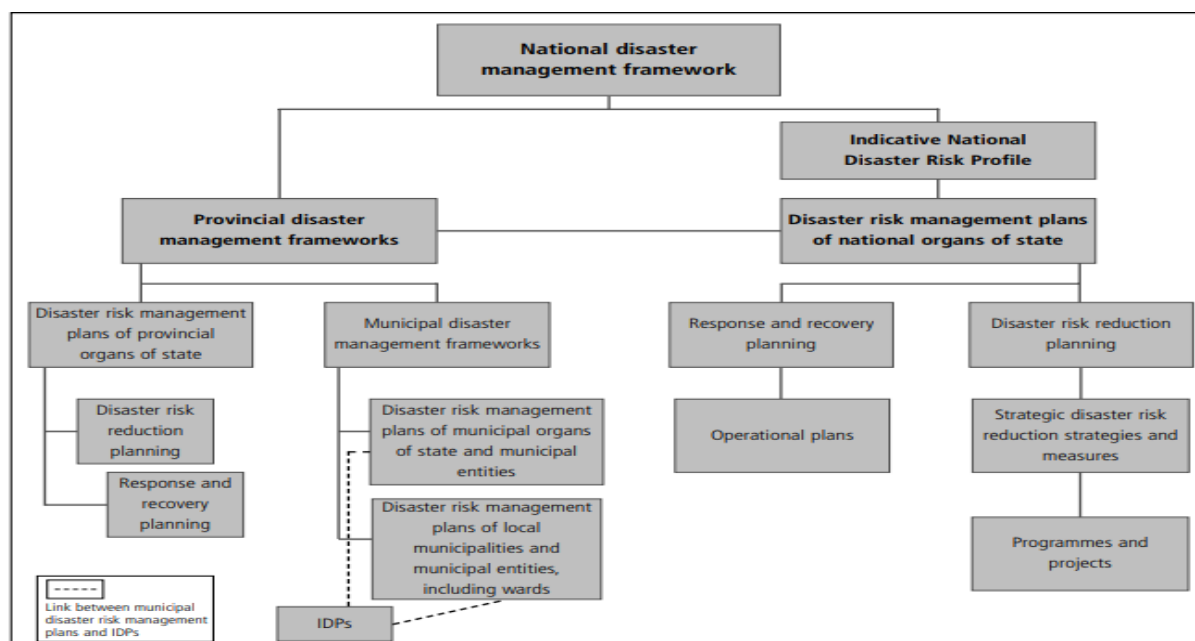


Figure 3. 1: Disaster management frameworks and plans across the spheres of government (NDMF, 2005)

DRR legislation and policy frameworks are extremely important as they provide a foundation for implementation and direction for all spheres of government and other relevant stakeholders. It should be highlighted that DRR policies and frameworks should not hinder progress towards food security, for this attainment, it is important to give an outline of food security policies in South Africa. This will serve as a branch for evaluation between CCA, DRR and food security policies and legislation in South Africa towards progress (or digress) in successfully ensuring food security through implementation efforts.

3.3.4 Overview of food security policies, strategies and governance in South Africa

Post-1994, in an attempt to enhance food security, the Department of Agriculture, Land Reform and Rural Development (now formally known as the Department of Agriculture, Forestry and Fisheries) in South Africa adopted the Agriculture White Paper in 1995 with the mission to “ensure equitable access to agriculture and promote the contribution of agriculture to the development of all communities, society at large and the national economy, in order to enhance income, food security, employment and quality of life in a sustainable manner” (South Africa,

1995; 5). The adoption of the Agricultural White Paper was not sufficient in attaining household food security and lacked a comprehensive plan to deal with food (in)security in South Africa (Hendriks, 2014).

To deal with food security in a much more comprehensive and unified manner without exclusively focusing on agriculture as the sole source of attaining food security, the government of South Africa established the Integrated Food Security Strategy (IFSS) in 2002. The IFSS was approved as means to integrate the isolated policies which aimed to ensure food security in South Africa. The four dimensions of ensuring food security (access, availability, utilisation and stability) were at the core of the IFSS and it included improving several pillars namely: household food production and trading; income generation and job opportunities; nutrition and food safety; safety nets and emergency management systems; capacity building and stakeholder dialogue (South Africa, 2002). The IFSS was criticised (Drimie & Ruysenaar, 2010) for its institutional challenges and inability to achieve its goals.

Following calls for a comprehensive national and household food security policy, the government of South Africa promulgated the National Policy on Food and Nutrition Security (NPFNS) in 2013 along with the Household Food and Nutrition Security Strategy and the Fetsa Tlala (End Hunger) Initiative (DAFF, 2013; Hendriks, 2014). Nationally, the DALRRD is the leading department in matters concerning food security, supported by other relevant national and provincial departments. This myriad of responsibilities leads to various task teams in national, provincial and local departments. The reason for this is because food security is a multi-sectoral issue.

The NPFNS consist of a national advisory committee comprised of several experts from the climate change and environment division; food security and agriculture organisations; and community members. The national advisory committee is chaired by the Deputy President. Similar structures are required to be established in provincial and local levels (DAFF, 2013).

The Household Food and Nutrition Security strategy is also multi-sectoral in its approach to ensuring food security as depicted in Table 3.1.

Table 3. 1: Departments involved in household food security (Source: Nkwana, 2015; Household Food and Nutrition Strategy, 2013)

National Working Group	Departments involved
Food Fortification	DoH
Improving access and affordability of food	DALRRD (DTI and EDD)
Support for small scale producers and food production	DALRRD
Nutritional needs of the most vulnerable and most food insecure	DSD

The Household Food and Nutrition Security strategy also proposes a ministerial household food security advisory committee be established that will be chaired by the President with assistance from the Minister of Social Development (Household Food and Nutrition Strategy, 2013). The strategy requires the advisory committee to be on provincial level. Furthermore, the strategy calls for a coordination office that will be chaired by the Deputy President.

In reference to the national working group, the DALRRD is the lead regulatory authority responsible for food security while the DoH and DTI are accountable for foodstuffs and accessibility to consumer products respectively (Nkwana, 2015). The Department of Social Development (DSD) and Economic Development Department (EDD) correspondingly, make provision for social relief and economic development as means to ensure food security. Nkwana (2015) states that the DALRRD struggles to evaluate the performance of departments of agriculture and even though the NPFNS and Household Food Security Strategy are enforced by law, the supporting sectoral departments involved in the structures of food security are not accountable to the DALRRD due to its lack of convening power.

Subsequently, the Fetsa Tlala (End Hunger) initiative has several objectives which include: i) increasing food production capacity of subsistence and smallholder producers, ii) increasing availability and access to locally produced fresh food products, iii) creating opportunities for agricultural value chain development at local level, iv) creating opportunities for small, medium and micro enterprise development at local level, and v) creating job opportunities within the agricultural sector (Fetsa Tlala, 2013). The Fetsa Tlala initiative is led by the DALRRD and like the Household Food and Nutrition Security strategy, consists of a multi-sectoral approach where several sector departments (DSD, DTI, DRLDR, DBE) play a crucial role in implementation. Nkwana (2015) states that the Fetsa Tlala initiative also faces challenges of co-ordination and implementation between departments, where line functions of

the respective government departments (i.e., DALRRD) have no clear clarification of their role in ensuring food security. This highlights the disconnection between government departments responsible for food security.

The brief overview of CCA, DRR and food security policies in South Africa provide a standard for integration and (un)successful implementation of CCA and DRR policies and strategies from a food security perspective. To help enhance food security through a CCA-DRR policy perspective, it is further significant to assess practices learned elsewhere as experiences from other regions may offer useful lessons for policy intervention.

3.5 POLICY-BASED EVIDENCE OF CCA AND DRR EFFORTS IN ENHANCING FOOD SECURITY

As part of the analysis, the researcher aimed to illustrate the importance of having a CCA and DRR approach in ensuring food security by cross-examining countries that still struggle in adaptation and risk resilience efforts to achieve food security.

This section is important because agriculture is the single most important economic activity in Africa and climate change continues to exacerbate harsh conditions for those already food insecure and vulnerable (FAO, 2018; UNEP, 2011).

Current efforts and approaches adopted by the international community aims to build resilient households, especially those that are most vulnerable, by ensuring that they have food and nutrition security while reducing disaster risks and adapting to a changing climate. This is similar to the FAO's DRR for food and nutrition security programme that aims to enhance the resilience of the vulnerable households by curbing disasters and risks which pose as threat (FOA, 2013). However, some countries have been slow in implementing such measures, which has led to negative effects such as reduced crop productivity and food prices affecting the most vulnerable (Van Ommen Kloeke, 2014).

3.5.1 Great Horn of Africa (GHA)

Countries that serve as practical examples of why it is important to tackle food insecurity through CCA and DRR reside in the Great Horn of Africa (GHA). This is crucial as over 43% of the population in the GHA are subject to food insecurity as the region still gets drier (UNEP, 2011; FAO, 2018).

Drought, storms and other related climate change hazards have had a significant impact on people's livelihoods within countries in the GHA and this has caused a negative trend in food production because agriculture contributes over 40 percent GDP in countries such as Rwanda, Ethiopia and Kenya (Devereux 2000; FAO, 2017b). Climate change has had a negative knock on the agriculture sector, leading to food insecurity in the region.

The Food Security and Nutrition Working Group (FSNWG), which is a regional platform co-chaired by the FAO, emphasises that the key drivers of the current food and nutrition insecurity crisis in the GHA community include “increased food prices, frequent failed rainfall seasons, economic shocks and slow impacts of resilience investment” (FSNWG, 2017:2). This was further supported by Esthetie *et al.* (2017), who maintained that frequent drought experienced in the GHA has led to increased food costs and malnutrition levels.

There have been climate change response measures by the FAO to curb food insecurity in the GHA, i.e., the National Strategy for Disaster Risk Mitigation and Management and National Action Plan and the National Communication Strategy for climate change adaptation and early warning on extreme weather events in countries such as Djibouti and Burundi (FAO, 2017b). However, one of the factors that affect implementation is limited funds. Countries in the GHA are dependent on external funding. However, to add to the apprehension regarding limited funds, countries in the GHA (i.e., Ethiopia) suffer from weak links between early warning systems and response and institutional arrangements where focus on livelihood security and vulnerability reduction still lacks (Conway & Schipper, 2011; FAO, 2017b). A regional climate change strategy/plan does not exist and DRR and CCA communities working together successfully is also one of the challenges which affects food security (USAID, 2012a).

3.5.2 Kenya

Kenya is a low-income country with approximately 3 million people in rural areas being considered highly food insecure (World Bank, 2009). In some parts of the country, unfavourable weather conditions can lead the country into a maize deficit concern, which may interchangeably affect the most vulnerable communities (Alinovi *et al.*, 2010). The situation in Kenya was argued by Alinovi *et al.* (2010) when they encouraged governments to adopt strong risk reduction policies to strengthen household resilience in the plight to end food insecurity. The United Nations (2014:4) adds that “the lack of a unified and comprehensive disaster

management policy for Kenya has affected the country's food security rate". This draws on the frustrations experienced between policy alignment and execution.

What has been a great issue for Kenya is that its National Policy for DRR has been prepared since 1999 and still has not been enacted, the newly prepared CCA framework does not have a comprehensive implementation plan and CCA-DRR partnership is still not documented. Developmental issues in Kenya in safeguarding food security lie in the lack of coordination and institutional conflicts between overlapping ministries and policy-driven adaptation (Kabara & Kabubo-Mariara, 2018; Ongugo *et al.*, 2014). This has undermined development in the country.

3.5.3 Uganda

Famine has been a recurring challenge for people living in Uganda (Bahiigwa, 1999). As a result, such natural hazards have affected the coping strategies of vulnerable households in Uganda, especially for people living with HIV/AIDS (Helgeson *et al.*, 2012; Tsai *et al.*, 2012). According to UNSCN (2011), Uganda is still considered a malnutrition-burdened country with approximately 30% of the population suffering from undernourishment. Moreover, Uganda's disaster risk profile maintains that, during the period 1933-2012, approximately 9 million people suffered from natural hazards (UNISDR, 2013). Due to these reasons, Rukundo (2014) states that, although Uganda has a constitution and policy that give right to adequate food, the country's disaster preparedness and management are weak. Rukundo (2014:321) further states that "the policy in Uganda is not matched with prudent legislation that appropriates finances and institutional investment to implement related obligations to vulnerable victims of disasters".

Despite Uganda's National Climate Change Policy enactment in 2015 (Republic of Uganda, 2015), implementation and coordination between DRR and CCA policies are still of great concern and women are still marginalised (Aura *et al.*, 2017). Furthermore, USAID (2012b) states that one of the constraints for addressing vulnerability and enhancing resilience lies in the limited expertise in responses to enhancing food security through adaptation and mitigation efforts.

Implementation of food security and disaster risk management policies in Uganda is slow and institutional arrangements for disaster preparedness are still lacking (Rukondo *et al.*, 2014).

The situation in Uganda proves how institutions can fail to alleviate food insecurity for vulnerable households.

3.5.4 Burkina Faso

According to Roncoli *et al.* (2001), over 250 000 people in Burkina Faso faced high levels of food insecurity because of the drought that was experienced in 1997. Inappropriate policy planning to reduce disasters to curb food insecurity has been a noticeable issue in the country (Momoh & Akinyede 2008; Olowu, 2010). Furthermore, persistent rise of food prices, hunger and malnutrition levels have been great challenges in Burkina Faso due to climate change impacts and increases in fuel prices (AERC, 2011; Badolo & Traore, 2015).

More recently, the 2009 flood destroyed crops and 22,220 hectares of farmland and destroyed approximately 420 000 homes (World Bank, 2011). Recuperating from the severe climatic shocks is a challenge in the region due to policy constraints. The ineffective and unstable disaster risk and CCA government parameters on which policy-functioning heavily relies, exacerbate food insecurity and health issues (Barbier *et al.*, 2009). The USAID (2012c) states that, despite the disaster risk and climate change policies in Burkina Faso, the institutional arrangements limit action which purposively reduces food security levels.

As a result, Lutz *et al.* (2000) argue for the need of an effective flexible and decentralised policy to protect farmers and poor vulnerable households from the negative effects of hazards and food insecurity. This role lies heavily on the government. If the government has a weak institution and policy structuring measures, its implementation attempts to fight climate change impacts and food insecurity may be insignificant. Furthermore, USAID (2009) refers to different strategies and programmes to reduce food insecurity in Burkina Faso (For example: National Food Security Strategy); however, they are not integrated and aligned with disaster risk and CCA policies, making it hard to enhance both food security and climate change resilience (Zewdie, 2014). It is therefore imperative to have strong target-based policies that approach food security through a DRR and CCA perspective.

Subsequently, the activities carried out by most families in developing countries are dependent on natural resources (land, water and soil) and failure to protect these natural resources from extreme weather events is a concern for vulnerable households (Trench *et al.*, 2007). An

increase in vulnerability can be caused by lack of access to land ownership, credit, education, agricultural tools and other inputs which help people adapt to changes (Gonzalez *et al.*, 2011). Therefore, a strong food security, DRR and/or CCA policy would endorse and make provision for access to appropriate land, agricultural extension services, training, climate forecasts and other measures suitable for adaptation and resilience. Developing countries continue to suffer from food insecurity due to the mismanagement of disaster preparedness policies, implementation, funding mechanisms and lack of adaptation and resilience inputs (Rukundo *et al.*, 2014).

In conclusion, enhancing food security while adapting to a changing climate should be of great importance in developing countries. Stress should be put on enhancing government and non-governmental institutions in coherently structuring policies and alignment between food security, DRR and CCA field, because failure to do so can result in increased food insecurity rates and disaster impacts simultaneously.

3.6 KEY FINDINGS FROM APPLIED DRR AND FOOD SECURITY APPROACH

This section discusses some of the positive impacts that a strong integrated policy that encompasses food security through a DRR and CCA approach has had. The section further argues that an effectively integrated policy can help alleviate food insecurity and further strengthen the resilience of both households and countries against climate-related hazards.

3.6.1 The context of convergence between DRR and CCA in achieving food security

The area of convergence between CCA and DRR lies through one common aim: increasing the resilience towards extreme weather conditions, particularly among vulnerable communities (Mercer, 2010). With the current upsurge of existing hazards and risk potential within rural-urban areas, it is important to review existing CCA and DRR strategies to develop greater flexibility in responding to changing risk profiles in the aim to enhance resilience (Solecki *et al.*, 2011; Venton & Trobe, 2008). Current CCA and DRR policies need to be revised and improved, taking into account the likelihood of climate-related hazards which pose as threats to people's livelihoods, food security and environmental assets. In so doing, Vermeulen *et al.* (2012) highlight the importance of climate-related policies being in alignment and working in synergy with food security strategies to enhance both resilience and food security in the face of changing risk profiles within the locale. On this basis, it is empirical for the three

communities (CCA, DRR and food security) to collaborate to ensure food security, even through extreme weather conditions.

The global community of CCA, such as the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the 1997 Kyoto Protocol, ensures there are resilience building and vulnerability reduction in systematic-wide risk-reduction approaches to climate change adaptation (Allen *et al.*, 2014). For DRR, the Hyogo Framework for Action (HFA) (2005-2015) in partnership with 168 governments has been a stepping-stone for vulnerability assessments and risk reduction measures (Olowu, 2010). To fight food insecurity, the World Food Agriculture Organization (FAO) and the World Food Programme (WFP) have stepped up efforts to alleviate hunger and malnutrition (FAO, 2018). These three communities enhance the importance of adapting to a changing climate and reduction of disaster risk(s) at all levels - encourage systematic discourse on CCA and DRR on all government levels with greater emphasis on ground-level and, constructively, enhance food security by building resilient agricultural programmes and communities (Parry *et al.*, 2007; Venton & Trobe, 2008; WFP, 2011).

Gaps in understanding and weak links between CCA and DRR communities can hinder effective risk reduction and adaptation policies. As aforementioned, developing countries need to effectively integrate CCA, DRR and food security policies; however, so far, this has been elusive whereas in some countries, integration is either poor or in its infancy (ESCAP, 2017; Rivera, 2014; Vincent *et al.*, 2008). Selby and Venton (2009) state that DRR and CCA currently inhabit separate silos and the disconnect is visible during disasters as food insecurity rises simultaneously with disaster impacts. Results from several studies (Eriksen *et al.*, 2008; Lobell *et al.*, 2008) indicate that Southern Africa is one of the regions that will suffer severe negative impacts if adaptation and risk resilience measures are not effective.

Table 3. 2: Benefits of linking adaptation, DRR and food security (Pettengell, 2011)

Location	Application and Benefits for integration
Bangladesh	WFP has played a pivotal role in enhancing DRR, CCA and response capacities. Since 2000, this has resulted in 30 000 homesteads being raised above

	flood levels and 1.6 million women trained in disaster preparedness and adaptation to help in enhancing their livelihoods and food security.
Ghana	Three communities (Yinduri, Pwalugu and Santeng) in the North East along a riverbank have frequently experienced drought, floods, wildfire and disease. The three communities earn their livelihoods by cultivating along the riverbank which is the only available productive land. In 2009 a flood destroyed farmers' fields which affected food security in the region. The humanitarian aid World Vision's integrated approach (CCA and DRR) helped farmers and the surrounding community to diversify their income sources, enhance crop yields, manage natural resources sustainably and protect their livelihoods from adverse effects. In dealing with flood issues, the farmers found opportunity in the flood water for alternative livelihoods that included the use of residual moisture in the soil where watermelon, yellow melon and beans were planted for income generation.
Yasothorn Province, Thailand	Oxfam implemented a one-year pilot study for 57 out of the 509 organic-farming households where CCA and DRR systems were used to promote agricultural production. The study revealed that all 57 households were more food-secure than they had been before the project started. The project was successful due to the combined top-down and bottom-up activities which included the participation of both communities and government

Table 3.2 above highlights the importance of integrating CCA and DRR practices systematically to protect livelihoods and enhance food security. Given the predicted severe consequences which will affect Southern Africa's food security if adaptation and risk resilience measures are not available and effective, Stringer *et al.* (2009) signify the value of examining CCA and DRR institutional structures and policy instruments in an effort to ensure that policies support the improvement of a resilient environment and community. To achieve and enhance food security, it is therefore essential to maintain coherent and lucid institutional structures and policy mechanisms to effectively implement CCA and DRR measures. Van Aalst *et al.* (2008)

state that successful implementation of adaptation and DRR measures will result in enhanced resilience towards a range of immediate risks and needs.

Likewise, the lack of achieving enhanced food security in a changing climate can be due to a lack of clarity concerning how successful integration between CCA and DRR can be achieved. Similarly, notwithstanding the fact that co-ordination and a joint effort between CCA and DRR is essential for reducing vulnerability and enhancing food security, it is necessary to comprehend *how* this should be done, at *what* level and to *what* extent co-ordination and integration are required, as well as who (or what department) should take the lead (Venton & Trobe, 2008). This has not yet been clearly established and it can affect implementation of set policies that aim to enhance resilience and food security simultaneously (Solecki *et al.*, 2011). Hence, this study sought to identify gaps and understand the systematic policy integration between CCA/DRR and the food security field.

Subsequently, climate change, if not properly mitigated and managed, will lead to a continued growth in disaster risks and affect natural resources and food security and may possibly lead to conflict (FAO, 2014). The adaptive capacity of those vulnerable to food insecurity is undermined when policies fail to enhance resilience. Therefore, policies should aim to reduce disaster risks and protect people's lives and livelihoods. This can be achieved through a strong integration between CCA and DRR communities, which entails the involvement and understanding of policy as polycentric across different levels of government, the private and civil society (Vermeulen *et al.*, 2011). A strong integration should be followed by timed monitoring and evaluation to avoid mal-adaptation and track progress (Fan *et al.*, 2014). A good example is given by Smith and Troni (2004), where poorly maintained flood defences in Bangladesh designed for specific flood levels became counter-productive, leading to prolonged floods and finally resulting in a disturbance in food supply during the 1999 disaster.

Closer collaboration between food security, DRR and CCA departments would increase access to relevant information and effective policy implementation practices and measures (Vincent *et al.*, 2008). An assessment of policy integration between the three fields (food security, DRR and CCA) is necessary to develop and improve a governance system for enhancing resilience and food security. Relevant studies also suggest that good governance and implementation can be constrained by lack of harmonised sectoral planning and inconsistencies between government sectors (Ampaire *et al.*, 2017; Patt & Schroter, 2008; Pramova *et al.*, 2015). To

build on policy strengths of local South African practices and address issues relating to adaptation, resilience and food security, it is imperative to broadly cover the importance of good governance in ensuring food security, CCA and DRR. The main idea of presenting the following section is to describe how the right set of institutional arrays can help enhance food security through resilience and adaptation measures.

3.7 GOOD GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS: ENHANCING IMPLEMENTATION OF FOOD SECURITY THROUGH RESILIENCE AND ADAPTATION

The previous section touched on the importance of including risk resilience and adaptation measures in the value chain continuum. Furthermore, it also touched on the importance of including resilience measures for South Africa's food system. However, as indicated previously in the second chapter of the literature, enhancing food security involves good policy arrangements. This constitutes a structure of good governance and institutional arrangements. This section of the literature provides an overview of what constitutes good governance in DRR and CCA in enhancing overall food security.

Policy application in dealing with CCA and DRR should be decisive and effective in enhancing food security. This requires a more responsive system of *governance* which includes effective institutional arrangements and implementation processes. Governance involves the government's ability to enforce and implement policies at all levels. It encompasses formal and informal mechanisms, civil society and both the public and private sector (Turnball *et al.*, 2013). In achieving enhanced food security, it is important for governance to uphold good standards for development, which involve the course of adaptation to climate change and resilience in the face of disasters. Pelling (2011) and Turnball *et al.* (2013) state that good governance, in reducing vulnerability and achieving adaptation, lies in the government's accountability, capability and capacity to respond and work closely with civil society, the private sector and at-risk populations. In line with protecting households, risk reduction and adaptation governance measures need to be in conformity with food security institutional measures for development gains. Therefore, good co-ordination, transparency, inclusion and participation from all stakeholders and departments need to be upheld.

Good governance upholds the value of providing access to resources (capital, technology, etc.) so people can guard themselves from natural and human-made hazards. Good governance and

resilience are mutually supportive and both DRR and CCA policies need to be integrated adequately for communities to recover from hazards quickly and in the most appropriate way possible. For effective integration and good governance to be upheld, practitioners and policymakers of DRR, CCA and food security need to understand the point of convergence and role between relevant (DRR, CCA and food security) government sectors, communities and at-risk populations to help practitioners plan and implement policies to improve resilience levels (Turnball *et al.*, 2013) and ultimately food security. The process of understanding the area of convergence between government sectors and other key role-players will identify limitations and constraints to help improve policy dialogue from DRR, CCA and food security sectors.

For DRR and CCA, existing governance arrangements in developing countries fail to address the challenges of climate change and disaster risks, particularly focusing on maintaining and enhancing food security (Kotir, 2011). There is growing evidence (Stringer *et al.*, 2009) which suggest that there is a wide gap between policy adoption and implementation on ground-level where climate change and disasters have significant impact. This not only affects people's lives, but also their food security.

Local governance has a crucial task of implementing risk reduction measures on the ground level where climate-related disasters have significant impacts. Good governance involves closing the gap between policy adoption and implementation. Therefore, the effective implementation at ground-level should be augmented by local risk governance where stakeholders and local authorities take part in decision-making, planning, budgeting and partnering in technical and functional tasks. For greater enhancement, local risk governance needs to be supported and heightened on provincial and national levels (Turnball *et al.*, 2013).

In South Africa, effective implementation in enhancing food security needs to address the challenges the country's food system is currently facing (Drimie & McLachlan, 2013). Some of the challenges include water scarcity and climate change (Pereira, 2014), while Ziervogel *et al.* (2016) point out that there is more concern over institutional issues regarding a resilient food system than uncertainties in climate change projections. To date, studies have neglected institutional issues and concerns regarding a resilient food system. These challenges make it difficult to achieve the constitutional right of all South Africans to always have adequate and sufficient food, even under harsh weather conditions (Pereira & Drimie, 2016).

The brief overview of the fisheries and aquaculture value chain mentioned in Chapter 2 and its significant contribution to South Africa's food security are also of critical concern and should not be overlooked. The fisheries and aquaculture sector is an important livelihood strategy and contributes approximately 0.5% to South Africa's Gross Domestic Product (GDP) at the national level (WWF, 2011). Furthermore, it is estimated to have directly employed approximately 27 000 people, whereas 100 000 people are employed in fishery-related enterprises (Pereira, 2014). The fisheries sector in South Africa has a high growth potential as the DALRRD estimates that aquaculture could grow from over R500 million in 2013 to more than R2 billion over the next 10-20 years (Brick & Hasson, 2016). However, at present, natural and human-made hazards still affect the country's fisheries and aquaculture sector.

The researcher maintains that poor and intricate risk reduction and adaptation of institutional arrangements will lead to maladaptation, a vulnerable food system and inadvertently food insecurity in the face of natural and human-made hazards. As a result, Enemark (2010) argues that accountability, transparency, participation and predictability are some of the measures needed to be put in place for good governance (see Figure 3.2). Gupta (2017) further argues that lack of implementing DRR and CCA policies is a result of poor governance and lack of capacity building.



Figure 3. 2: Governance and capacity building for risk reduction (FIG, 2006)

Capacity building is a process by which people, organisations and society systematically improve their capacity (skills, tools, knowledge and other resources); furthermore, it involves a continuous effort to use relevant resources to enable and improve the environment (UNISDR, 2017b).

3.7.1 Key factors in disaster risk reduction governance

Figure 3.2 portrays the elements needed to sustainably reduce disaster risks and it includes a high level of transparency, accountability, responsiveness and participation. These are some of the foundations needed to build a resilient environment. Similarly, Clague (1997) states that a governance structure which fails to reduce risks and enhance resilience is the root cause of underdevelopment. Consequently, this implies that an increase in vulnerability to disasters is due to institutional failure.

For risk reduction to be effective, accountability needs to be upheld amongst governance networks. Blair (2000) notes that accountability means being able to hold those in control for a key function responsible or accountable for their actions. This is an important trait to have in a democratic state where decentralisation is maintained. Together with participation, where citizens are encouraged to play a meaningful role in governance decisions, these two quality traits are what constitute ‘good governance’. Mavhura *et al.* (2013) state that participation is needed from society to enhance risk reduction measures in order to build resilient communities, particularly by means of indigenous knowledge.

Subsequently, transparency and responsiveness in governance are also of crucial importance. Transparency involves being honest and open whereas responsiveness implies reacting to a situation or need swiftly, yet positively (Vigoda, 2002). For governance networks to be open and honest, reliability of information should be made available in a timely manner and this is important for a quick response, especially during a crisis (Ahrens & Rudolph, 2006). Transparency and accountability in governance, as noted by Bertot *et al.* (2010), create a culture of anti-corruption and equality. In this form, Ahrens and Rudolph (2006) argue that good governance measures and the quality of policies lead to positive implementation and have proven to encourage economic development and inevitably risk reduction.

The key factors discussed above comport with capacity building by means of using the necessary tools and skills to improve organisations and society and to maintain sustainable development. Furthermore, the effective handling and use of resources enable and enhance the environment. Capacity building involves the use of educational programs to teach and train organisations and societies in a particular issue. In terms of risk reduction, the sharing of information helps alleviate both societies and organisations from natural and/or man-made

hazards. Both capacity building and good governance lead to sustainable development, food security and disaster risk reduction (UNDP, 2004).

Good governance also encompasses the other factors laid out in Figure 3.2 but not yet discussed. As such, Schipper and Pelling (2006) note that a country's quality of governance illustrates their effectiveness in different governance structures and rule of law. Conversely, one may argue that poor governance structures fail to enforce law which hinders accountability and transparency. If the citizens and institutions are not subjected and accountable to law, governance systems fail, leading to corruption and retrogression (Schipper & Pelling, 2006). Countries with poor governance and high corruption levels suffer from policy paralysis; the inability for policies to make headway and be implemented (Tambulasi, 2011).

As mentioned above, there is a significant gap between policy and application and countries suffering from policy paralysis need to close this gap effectively. Ahrens and Meurers (2002) infer that the quality of disaster risk governance structures is measured by the ability to successfully implement a policy and to effectively enhance resilience. Therefore, for effective risk reduction, an endeavour to enhance the quality and capacity of governance should be a major priority, especially for developing countries.

3.7.2 Key factors in climate change governance

Risk reduction, as discussed above, is enhanced when the quality and capacity of governance structures are heightened. To improve risk resilience, Munaretto *et al.* (2014) add that adaptative proficiency of policy levels needs to also be enhanced. This was further supported by Nieuwaal *et al.* (2009:8) who argued that “dealing with climate adaptation not only demands a rethink of how we arrange our social-ecological or socio-technical systems but also how we govern them”. However, governing CCA can be problematic for several reasons. Dewulf *et al.* (2008) state that adaptive governance can lead to maladaptation due to unpredictability and continuous changes in environmental conditions. Additionally, multi-level systems, cross-scale interactions and networks between organisations, civil society and other sectoral-departments can lead to duplication of tasks and redundancy (Nieuwaal *et al.*, 2009). The interplay of different stakeholders and departments is problematic due to diverse customs, values, interests, power resources and perspectives (Nieuwaal *et al.*, 2009).

Adaptive governance involves creating calculated projections and dealing with uncertainties involved in adaptation and climate change. As discussed in the early stages of the literature, DRR is more concerned with addressing present-current risks while CCA focuses on future risks which may arise. Scholars such as Mickwitz *et al.* (2009) stress that different cultural and political groups can have different opinions on how to deal with climate change and accountability can diminish due to the complex nature of adaptation. Because of the complexities and uncertainties of adaptation, there is no universally accepted way to govern CCA (Brunner *et al.*, 2005). This notion is further supported by Biermann (2007) and Dewulf *et al.* (2008) who argue that despite the different approaches to attain adaptability, it is not quite clear how co-ordination and effective implementation can be achieved and handled. The complexity and problems that exist within adaptation governance creates an atmosphere of redundancy and inactivity if proper network and evaluation measures are not put in place (Feldman & Khademanian, 2007). The complexities and uncertainties of adaptation can hinder implementation, particularly for countries that suffer from institutional and policy paralysis.

Notwithstanding the complexities and uncertainties that lie around climate change and adaptation, the consensus is that a collaborative decision-making, responsive and ultra-modern governance system should be upheld (Emerson *et al.*, 2012; Kalibo & Medley, 2007). Siegel (2009) defines collaborative decision-making as processes put in place where government involves outside stakeholders in the government's decision-making agenda or facilitate efforts that include equal partnership among the aforesaid stakeholders and government sectors. The decision-making processes include: the exchange and improvement of information, an enhanced advisory board between stakeholders and government institutions and lastly, stakeholder involvement where agreements or compromises are made (Siegel, 2009). In support of this, Termeer (2009) makes note of an interactive and inclusive governance which promotes collaboration and partnership with civil society and firms. Put differently, institutions need collaborative decision-making processes that promote efficient, proactive and responsive mechanisms that can acclimatise to a changing climate. Climate adaptation involves cross-scale interactions between the government and outside stakeholders; therefore, it is important to have flexible institutional arrangements where implementation will be evaluated based on set standards i.e., effectiveness, efficiency, equity and legitimacy in adaptation (Adger *et al.*, 2005; Adger, 2001). Jones (2001) states that effective adaptation involves the ability and potential of an adaptation policy to achieve its set objectives. For instance, assessing the evaded impact of

flood-runoff on lowland farmlands. Adger *et al.* (2005) further add that the two pivotal factors for effective adaptation include robustness to uncertainty and the capacity to be flexible enough to adapt to changing conditions.

Efficiency is crucial because adaptation entails costs. Therefore, decision-making requires considerations of the costs and supplies involved in implementation (Adger *et al.*, 2005). This means achieving objectives with minimum wasted effort or expense. In other words, implementing in the most cost-effective yet productive way possible. However, past experiences in developing countries prove that lack of capital or inadequate resources can be the sole cause behind failure to not only implement policies, but to do so successfully (Mertz *et al.*, 2009). Betsill and Bulkeley (2007) state that sufficient capital and adequate resources are crucial for implementing policies. With that being said, it is important to uphold efficiency amid sufficient capital and appropriate resources to minimise waste while performing using the least amount of input. A good example includes a farmer having the necessary inputs for adapting to climate-related hazards (e.g., drought) such as irrigation systems and/or drought-resistant crops. Adger *et al.* (2005) state that it is important for decision-makers to be context-specific and evaluate economically efficient responses to climate change. For instance, a farmer's planting method will be based on the likelihood of drought projections in the next year or two rather than 20 years. However, long-term projections are crucial for capital turn-over when the farmer needs to make cost adjustments to evaluate his/her return of investments to avoid costly planning errors. As such, farmers who intend to invest in irrigation systems focus on long-term climate change projections to assess their net benefits (Adger *et al.*, 2005).

Similarly, it can be argued that successful adaptation also needs equity and legitimacy from governance structures. Equitable adaptation involves assessing the perceptions and consequences of implementation, for example, who wins and losses from adaptation, as well as who is accountable for implementing adaptation measures (Adger *et al.*, 2005). According to Thomas and Twyman (2005), contemporary adaptation policies still strengthen inequalities and do little to alleviate vulnerable groups from disasters. This is the reason equitable adaptation policy objectives should be maintained. Legitimacy on the other hand, relates to the degree an adaptation decision is accepted by both participants and non-participants which will be affected by those decisions (Adger *et al.*, 2005). This reinforces the notion made by Biermann (2007) and Dewulf *et al.* (2008) that there is no universal accepted way to govern CCA because of the different cultural and social perceptions involved in adaptation.

Governance and legitimacy are also tested by the action taken by decision-makers to minimise conflicts from participants and non-participants of vulnerable groups. Furthermore, adaptation decisions and the degree of vulnerability reduction rests on the direction taken by the political sphere to enhance implementation. For example, it is argued that reluctance of implementing adaptation decision by political leaders can disproportionally affect those vulnerable to both disaster risk and climate change (O'Brien & Sygna, 2013).

Briefly, both equity and legitimacy are important in successfully implementing CCA policies. Equity and legitimacy enhance the likelihood of reducing inequalities and enhancing resilience for those who are vulnerable to disasters. There is less chance of successful implementation if equity and legitimacy are excluded (Tomkins & Adger, 2004). In addition, it creates a platform for corrective and preventive action as part of improvements to governance and world-wide development (Ikeme, 2003).

In essence, Adger *et al.* (2005) state that governance structures should put in effort to balance effectiveness, efficiency, equity and legitimacy through decision-making bodies to not only enhance resilience, but to make it beneficial to those who need it most. In refining 'good' adaptation decisions, Pelling (2010) highlights the importance of decision-makers upholding good governance etiquette and constantly conducting post-implementation reviews to evaluate whether there is maladaptation and that the most vulnerable groups are alleviated from disasters risk impacts. Corfee-Morlot *et al.* (2011) indicate that good governance and risk resilience should be sustained across different government levels; therefore, fundamentally, an integration and mainstream of adaptive and disaster risk resilience policies into relevant sustainable plans. Particularly, in the context of this study, this requires an integration and mainstreaming of CCA and DRR policies into *existing* and *new* food security programmes and vice versa.

The concluding section discusses the importance of collaborative efforts from both CCA and DRR policy fields to enhance food security.

3.7.3 Multi-level governance for adaptation and disaster risk resilience in enhancing food security

As previously mentioned, the integration between CCA and DRR has been problematic due to improper planning, institutional incapacity, lack of political will, differences in perceptions and the failure to uphold good governance measures (Birkmann & Von Teichman, 2010). Mitchel and van Aalst (2008) state that the issue in developing countries to ensure food security lies in CCA and DRR governance fields suffering from poor co-ordination, policy design, funding mechanisms, implementation measures and operating from separate silos or a substandard polycentric system. Djalante *et al.* (2011) argue that polycentric multi-layered institutions, participation and a network-governance are needed in enhancing resilience to protect livelihoods and directly ensure food security. Djalante *et al.* (2011) further argue that a polycentric system allows for institutional interactions which improve diversity of responses, reduce uncertainty and enhance collaboration.

In support towards maintaining an effective synergy between CCA and DRR policy arenas, Tomkins (2005) notes that both horizontal and vertical integration is needed between departments and government spheres. Birkmann and Von Teichman (2010) add that CCA and DRR should be integrated in the most effective way possible to enhance food security. National governments act as central key points for adaptation and risk resilience, enhancing capacity for societies to adjust and readjust during current environmental settings and as conditions shift (Dixit *et al.*, 2012). All government levels should be responsive and anticipatory to disaster risks and adaptation efforts. Schipper and Pelling (2006) state that this should be done in a way that enhances food security. Notwithstanding the fact that all government levels are responsive and/or anticipatory, Birkmann and Von Teichmann (2010) argue that national government is responsible for ensuring that all sub-national governments have the necessary resources and knowledge of integrating CCA and DRR in their development plans. In context of the study, development plans relate to measures implemented to enhance food security in the face of climate-related hazards.

Of particular significance in development and implementation of risk resilience and adaptation efforts to enhance food security, the involvement of related government departments (i.e., Department of Agriculture, Land Reform and Rural Development (DALRRD), National, Provincial and Local Disaster Management Centres and South African Agriculture Industry (e.g., AgriSA and farmers' unions) and stakeholders is of crucial importance. In this regard,

national government is expected to facilitate and co-ordinate risk resilience and adaptation efforts to ensure they enhance food security (Howes *et al.*, 2015). Facilitation and co-ordination of efforts should be through all government levels, departments and non-state entities. Djalante *et al.* (2011) state that national government should provide incentives to lower bodies to genuinely engage in joint governance processes.

Multi-level climate-risk governance has a difficult task to maintain in co-ordinating and facilitating involvement between government departments/levels and stakeholders to engage in adaptation and risk resilience measures to enhance food security. At the local level, Thomalla and Larsen (2010) argue that this can hinder implementation of roles and responsibilities are uncertain and validity of participants is questioned. Failure to appropriately assign roles and responsibilities to relevant members can incentivise power struggles and lead to unaccountability and corruption (Lederman *et al.*, 2005). Djalante *et al.* (2011) state that enhanced implementation lies in equipping local level actors with appropriate resources and skills and maintaining co-operation between higher level institutions and lower-level actors. In a multi-level climate-risk governance, this entails co-operation between DRR and CCA governance processes. In enhancing food security, this involves the inclusion of food security departments and stakeholders in the aforementioned climate-risk governance.

Of concern, is that the structural link between food security and climate-risk governance in South Africa is unclear (Pereira & Drimie, 2016). This implies that there is no clear directive for different relevant departments, government spheres and stakeholder involvement in dealing with the issue of vulnerable communities and food insecurity. To this effect, this research is expected to highlight inconsistencies and create an enabling structure around vulnerable communities, relevant governance systems and most importantly, enhanced implementation on the ground level to achieve food security.

This section echoed the importance of realising that successful implementation and enhancing food security involves collaborations of numerous actors across policy domains due to the interconnection and relationship between actors, resilience and food security (Candel & Pereira, 2017). Consequently, given the cross-sectoral nature of climate-disaster-risk impacts and food security, policy integration, coordination and good governance measures are widely accepted to be the best measures to address adaptation, risk reduction and food insecurity altogether (O'Brien *et al.*, 2006). Thus, the results collected from the interviews that were

conducted with relevant key sector officials and stakeholders provided insight on the multi-level risk governance and whether it enhances food security.

3.8 CONCLUSION

Chapter 3 discussed the relevant policies and legislations related to CCA, DRR and food security in South Africa. The NCCR policy and NAS are the two CCA policies that were discussed and evaluated to form an understanding of the lead regulatory and department under which these two policies function. The same was also done for the DRR and food security policies and their governance structures.

The major issue identified within the DRR policy stream lies in the lack of timed implementation and weak consultative processes with other departments (i.e., the food security strategies). There is also a significant gap between theory and practice within the CCA and food security policies. The effectiveness of CCA and food security policies are hindered by bureaucratic challenges which affect co-ordination and clear direction of the policies to function in concurrence. The CCA, DRR and food security policies indicate satisfactory objectives and resolutions which unfortunately are not translated into reality.

The lessons learned from countries across the GHA reveal that despite the region being over 43% insecure food insecure, drought and other climate-related disasters still affect agriculture in a negative way as the region fails to create bridge between policy and practice. The same can be said for Kenya, Uganda and Burkina Faso where CCA and DRR policies are fragmented and are not effectively aligned with food security policies. Until this point, the lessons have highlighted the importance of an effective conjuncture of CCA, DRR and food security policies and strategies. In contrast, countries such as Bangladesh, Ghana and Thailand have shown that an effective integration between CCA, DRR and food security policies/strategies produce positive yields for an area.

The study found that, to enhance food security through CCA and DRR, good governance is an important aspect that leading departments and regulators should prioritise. The rationale behind this is that a right set of institutional arrangements for the three policy fields can enhance food security through resilience and climate-proof measures. Good governance involves government's ability to be accountable and to have the necessary capacity to effectively work with civil society, the private-sector and vulnerable communities. Transparency and

participation from all stakeholders are key in enhancing food security and resilience against climate-related disasters. Failure of CCA and DRR governance measures to optimally function with food security programmes is counterproductive and produces undesirable effects, hence the need for a multi-level governance for adaptation and disaster risk resilience in co-ordination with food security programmes.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter presents the research methodology used to conduct the study. The purpose of this chapter is to give a detailed account of the methods used and procedure taken to collect data concerning the issue surrounding food (in)security and whether CCA and/or DRR policies aid in its enhancement. A qualitative approach (using both primary and secondary data collection methods) was selected and the reason for this is given throughout the discourse of this chapter. In relation to data collection, both primary and secondary data collection methods were utilised. The primary data collection methods included semi-structured interviews with key informants whereas secondary data collection methods involved reviewing relevant documents. The researcher first reviewed relevant existing documents pertaining to DRR, CCA and food security in connection to answering the research objectives. A list of relevant scholars and documents used is also provided.

Subsequently, the researcher provides a detailed account of the sampling methods chosen for the study, being purposive and snowball sampling. The appropriateness behind the choice of the chosen sampling method is also discussed. Following this, the researcher aimed to discuss how the available data attained from the key informants was analysed. The selection of the research participants is discussed and as a result, the reliability and validity of the data attained are also touched on. In connection with the selection of participants, the researcher states the reasons behind the chosen key informants. In conclusion, the researcher states the limitations and ethical considerations taken to protect the participants.

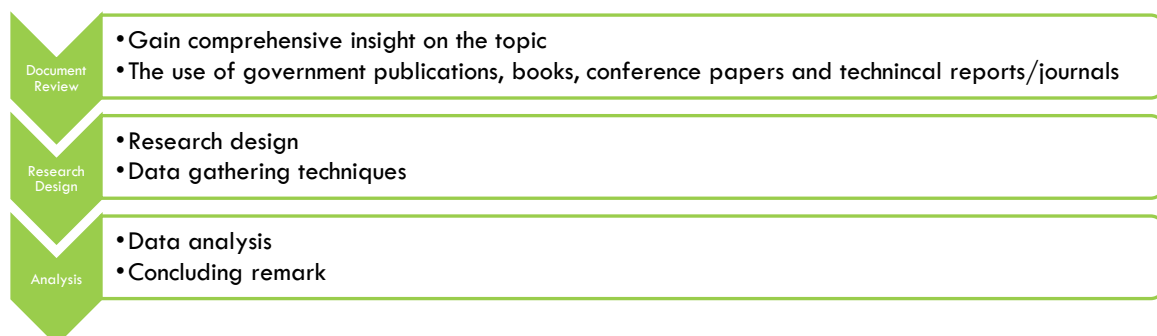


Figure 4. 1: Research methodology process

Figure 4.1 above is an overview of the research methodology process taken. It primarily involved conducting a literature review (as seen from Chapters 2 and 3) to gain a comprehensive insight on the research topic and problem statement. The literature review made use of government publications, books, technical reports and peer-reviewed articles. This was followed by a research design that is qualitative in nature (see 4.2 below). The data gathering techniques was important to get accurate results to answer the research objectives. The process in Figure 4.1 shows that, in conclusion, gathering data was followed by data analysis to interpret and structure the data gathered, to effectively draw a relationship/trends between the research questions and problem statement.

4.2 RESEARCH DESIGN

For a study to adequately answer all research objectives, a coherent and logical research design should be developed and followed. A research design is a plan on how a study is to be conducted and to test a hypothesis in a given context (Bless *et al.*, 2006). McMillan and Schumacher (2001) define it as a strategy that aims to collect data in order to answer the research questions of a study. Maxwell (2012) argues that a good research design promotes well-balanced functioning and a flawed one leads to poor and futile data gathering. This is the reason a research design is considered a very important element in achieving set goals. There are three types of research designs, namely qualitative, quantitative and a mixed method approach (which involves the use of both qualitative and quantitative methods).

To cover the research objectives in-depth, the study used a qualitative design. Qualitative research is both flexible and inductive, as opposed to a quantitative design which follows a strict sequence (Maxwell, 2012). To gather in-depth insight and understanding from a set topic which involves people's perceptions and observations, qualitative research is best suited because it gives researchers an opportunity to build a holistic image and cover data in its natural setting (Creswell, 1996). Therefore, for the purpose of this research, a qualitative design was best fit due to its usefulness in covering participants experience, attitudes and perceptions concerning whether CCA and DRR enhances food security. The researcher reviewed relevant literature which highlighted the research problem and further conducted semi-structured interviews with key informants to answer all the research questions. Recommendations are also provided.

The following sections give more detail pertaining to the research methods applicable to the study.

4.3 QUALITATIVE RESEARCH

The researcher applied a qualitative research approach in this study. Denzin *et al.* (2008) state that qualitative research involves studying phenomena in its natural setting and attempting to interpret and/or make sense of the situation/problem at hand. In contrast to quantitative research which is appropriate for quantifying variation in a phenomenon (Kumar, 2014), qualitative research is most suitable for examining queries related to experience, meaning or perspective, usually from the participants standpoint (Hammarberg *et al.*, 2016). Therefore, from the definitions gathered above, qualitative methods are used to gain better insight and information on a focused topic. Hammarberg *et al.* (2016) argue that qualitative research attempts to understand a condition or problem through in-depth interviews and analysis of textual data. This study therefore aimed to uncover the pattern and relationship involved between DRR and CCA in enhancing food security through exploratory and descriptive analysis.

In contrast to quantitative research which involves structured and inflexible research methods which aims to isolate variables and its categories to frame hypotheses before data collection, qualitative research is exploratory and aims to examine patterns of interrelationships through a broad lens (Brannen, 2017). Qualitative research is best suited for this study due to its flexibility and approach to assessing *how* and *why* a certain phenomenon functions as it does in a given context (Jackson *et al.*, 2007). The flexibility and analysing patterns through a broad lens, usually from gathering sufficient information from relevant stakeholders, allows the researcher to accumulate sufficient information for the research questions to be satisfactorily answered. In addition, the researcher found it fitting for this study to be qualitative in nature in an attempt to gain appropriate information and better insight into the participants experiences and knowledge regarding CCA, DRR and food security in a South African context. Qualitative research creates a setting for technocrats to give their own account of experiences, perceptions, reflections and interpretation of the subject matter (Hammarberg *et al.*, 2016).

In contrast, quantitative research limits the views and observations of participants due to its desire to identify factors ahead of time and not gain in-depth understanding of individual experiences (Merriam, 2002). A qualitative approach is necessary due to its ability to gain in-

depth understanding into the stakeholders' perceptions and experiences of the phenomenon of CCA, DRR and food security in its natural setting.

As aforementioned, qualitative research gives the researcher an opportunity to directly interact with senior officials involved in CCA, DRR and food security departments in South Africa to gather adequate and sufficient information regarding the enhancement of food security through a CCA and DRR lens. Semi-structured interviews and document reviews allows the researcher to explore the problem and dig deeper to uncover trends in a much more flexible manner. The following segment illustrate the methods used for data collection.

4.4 DATA COLLECTION METHODS

For qualitative data collection, different instrumentations were used. 'Instrumentation' or 'data collection methods', as described by Jackson *et al.* (2007) involves tools, techniques and procedures used to collect data for research. Both primary (semi-structured interviews) and secondary (literature review) data collection methods were used.

4.4.1 Literature review

A literature or document review, as elaborated by Webster and Watson (2002) is a secondary source of data collection method which involves a comprehensive synopsis of previous research on a topic a researcher is investigating and is an essential feature of an academic project. Machi and McEvoy (2016:5) further elaborate and state that a literature review is a "written argument that supports a thesis position by building a case from credible evidence obtained from previous research". Therefore, a literature review is a critical analysis of existing research pertinent to a studies research problem. The importance of a literature review lies in the fact that without a critical review of existing research, the researcher will not gain knowledge regarding the research gathered on his/her topic.

Hart (2018:34) mentions that a good literature review does not include everything but is selective by presenting what is relevant to the research problem and the research itself. The literature which was reviewed include: journals, technical reports, policy frameworks/plans/legislation, government census reports and documents relating to CCA, DRR and food security.

The first step taken on the literature review involved reading publications surrounding the prevalence of food (in)security globally and then narrowed the focus to South Africa. The same was done on CCA and DRR. The second phase involved the researcher transcribing the relationship between CCA and DRR with food security and vice versa. This was done to form an understanding and insight regarding the primary relationship between climate change and food (in)security. The third phase involved evaluating literature regarding the link between food systems and CCA/DRR. The fourth and final phase involved evaluating and transcribing all policies, legislation and frameworks relating to the main foci. This was mainly done to identify existing gaps and to resolve conflicts between antithetical studies (Webster & Watson, 2002). The aim of the entire literature review is to give an account of the problem under investigation and most importantly, to situate, within the studies context, the researcher's analysis of relevant CCA and DRR policies/legislation contribution towards food security.

4.4.2 Semi-structured interviews

Jamshed (2014) states that in qualitative research, interviews are the most common form of gathering data. An interview is a dialogue between two or more people aimed to yield retrospective and/or prospective narrative of past, present or future experiences, thoughts or actions (Seale *et al.*, 2004). A social interaction and exchange of information between the interviewer and interviewee is therefore considered an interview. The researcher made use of semi-structured interviews to allow for more flexibility and responsiveness to developing themes (Jackson *et al.*, 2007). A semi-structured interview involves having a small number of pre-determined questions while the rest are unplanned and can be modified during the interview depending on the interviewer's perception of what is important and what is not (Van Teijlingen, 2014). Semi-structured interviews were appropriate for the research because Newton (2012) embraces the idea that they:

- Provide the opportunity to gather rich data;
- Provide the opportunity to gain as much insight into the interviewee's perception and values as possible;
- Create an atmosphere that encourages participants to be honest and open;
- Give the researcher control due to flexibility and being able to adjust questions depending on the direction of the interview; and
- Create an environment of adaptability.

One of the most important elements of semi-structured interviews is that questions and feedback can be simplified and clarified instantly during the course of the interview. It is important to note that other forms of interviews (structured and unstructured) were considered but due to the central focus of the research, were disregarded. The reason behind disregarding the other two types of interviews is that structured interviews limit the researcher from adapting to change and it leaves no room for elaboration. Unstructured interviews on the other hand, are dependent on the participants responses and data gathered can be difficult to interpret and transcribe in a logical manner (Doody & Noonan, 2013).

The researcher conducted one on one semi-structured interviews with open-ended questions in order to gain in-depth experiences, opinions, thoughts and actions from the participants regarding the problem under investigation. The questions of the interview allowed for better exploration and understanding of the participants knowledge and thoughts regarding the topic. The problem under investigation involved policies and legislation, it was therefore important to have technocrats responsible for the particular policy area which the researcher deemed relevant. The relevant technocrats involved senior officials in different departments and industries i.e., the Department of Agriculture, Land Reform and Rural Development (DALRRD), the Department of Environment, Forestry and Fisheries (DEFF), the National Disaster Management Centre (NDMC), the South African Agriculture Industry (e.g. AgriSA and Agricultural Research Council) and academic scholars who have conducted similar research. The respondents were chosen based on their applicability and being well-informed regarding the topic (Marshall & Rossman, 1995).

The open-ended questions were used to gather a full range of possible responses (Singer and Couper, 2017). Five different open-ended questionnaires were tailored for the specific departments/organisations to gather relevant data aligned with the respondent's experience and knowledge (See samples on Annexure B).

The interviews were carried out in a place where the respondents were more comfortable (office, coffee shop etc.). The main reason behind this is that a place of comfort for participants is more likely to produce rich data (Oltmann, 2016). For more convenience, some interviews were conducted telephonically and through skype. Participants were asked questions which fit with the research aim and objectives of the study to coherently investigate the underlying problems faced with enhancing food security through a CCA and DRR perspective and vice

versa. It is important to note that the questions asked by the researcher gave the respondents an opportunity to expand and elaborate more on their statements, furthermore semi-structured methods created a room for follow-up questions to gain more in-depth information (Hammarberg *et al.*, 2016). In order to uphold discretion, the researcher only had individual interviews and included names of the participants upon their approval. The same data collection techniques were applied during telephonic and skype interviews where the researcher explained the study and its significance to the respondents and allowed them an opportunity to ask questions.

4.4.3 Preparing and collecting data from the semi-structured interviews

Fruitful data collection lies in successfully preparing on how to conduct your research (i.e., interviews). The researcher prepared for the interview by drafting questions which were of central importance to the research aim and questions. Doody and Noonan (2013) state that the process should involve beginning with simple questions and phrasing complex ones and the interview guide should first be discussed with the supervisor in order to have a logical flow and not waste time asking irrelevant questions. Instrumentation used to conduct the interview was acquired and pre-tested before the interviews. These include notepads and writing equipment. The procedure followed, as described by MacDougall and Fudge (2001) for the semi-structured interviews is as follows:



Figure 4. 2: Procedure followed for in-depth interviews

It was important for the researcher to first prepare for the interview in order to be able to get relevant and in-depth information from the respondents. Probes such as “can you tell me more about the effects which CCA and DRR have on food security” enabled the researcher to better understand critical points which not only relate to the study’s objectives or the literature review, but also to the personal experiences and opinions of the key technocrats. Generally, regarding the interviews, it was best to first prepare, conduct and then conclude with writing the findings for the researcher to not lose context with the objectives of the study.

4.5 TARGET POLULATION

It is important for a study to have a target population (Creswell, 1996). Lavrakas (2008) defines a target population as a set of participants that takes part in a study and is meant to generalise findings. The target population for the study involved:

- The Department of Agriculture, Land Reform and Rural Development (DALRRD)
- Department of Environment, Forestry and Fisheries (DEFF)
- National Disaster Management Centre (NDMC);
- South African Agriculture Industry and practice i.e., AgriSA and the Agricultural Research Council; and
- Academic scholars.

It is important to mention the reasons and relevance behind the above-mentioned target population. The DALRRD was chosen because it is the central and responsible department for ensuring and supporting food security policies and programmes in South Africa (DEA, 2011). Similarly, DALRRD works with other departments such as CoGTA (i.e., NDMC) and DEFF to try eradicating any disaster risks which can pose as threats to South Africa's food security.

The DEFF was chosen due to its leading role in climate change and developing strategies related to adaptation in South Africa. The DEFF also co-ordinates and oversees CCA functions by providing framework guidance (DEA, 2011a). The DEFF has several directorates under the Climate Change, Air Quality and Sustainable Development branch, which has the following functions (DEA, 2019):

- To identify, gather, sort, collate, store, archive, analyse, synthesise, distribute and popularise complete, accurate and current climate change and climate change response data and information that ensures informed climate change response decision-making.
- To lead and/or support, inform, monitor and report efficient and effective national, provincial and local climate change mitigation responses.
- To lead and/or support, inform, monitor and report efficient and effective national, provincial and local climate change adaptation responses.
- To prepare for, negotiate and inform the implementation of multi-lateral, mini-lateral and bilateral climate change agreements.

- To ensure that reasonable legislative and other measures are developed, implemented and maintained in such a way as to protect and defend the right of all to air and atmospheric quality that is not harmful to health and well-being.

The National Disaster Management Centre was chosen due to its functions as being an establishment which (CoGTA, 2016):

- Specialise in issues concerning disaster risks and disaster management;
- Act as an advisory and consultative board in issues concerning disaster management;
- Promotes the training and participation of volunteers in disaster management; and
- Promotes disaster management education in South Africa.

Generally, it is of great significance to target representatives of the NDMC due to the fact that they are responsible for guiding and developing frameworks for governments disaster risk management policy and legislation (DMA, 2002), making it necessary to highlight personal experiences and thoughts in a more holistic manner.

The South African Agriculture Industries such as AgriSA and Agricultural Research Council is equally important to gain insight from the perspective of farmers/researchers whether CCA and DRR is enhancing food security. This will help highlight any gaps and inconsistencies in CCA, DRR and food security policies. The same can be said for academic scholars who have extensive knowledge in the research problem. Two academic scholars were interviewed not only to highlight gaps and discrepancies but to also evaluate whether the overall interpretation of the findings from previous respondents portray uniformity and consistency.

4.6 SAMPLING

Gentles *et al.* (2015:1775) define sampling as the selection of data sources from which data is gathered to address research objectives. Cohen *et al.* (2000:45) further simplified the definition by stating that sampling involves “choosing informants”. Henceforth, sampling involves a selection of a large population for quantification. It is very important to have a sample that is representative of a population. Gillespie *et al.* (2016:207) further argued that the importance of a sample composition is depended on the research question. The researcher’s sample was based around the research questions to allow for quality data collection and reach valid conclusions.

Sampling was done for several reasons. The first reason is that it is not feasible to collect data from the entire research population. This is because of time and budget constraints. For the researcher's study, because it deals with policies, it was applicable to sample a small population of senior position participants who have a great deal of knowledge and experience of the problem under investigation. Consequently, another reason lies behind the nature of the investigation which is formed around policies in specific departments.

There are two different types of sampling approaches (probability and non-probability). Probability sampling includes simple, stratified, systematic and clustered sampling while the non-probability sampling method includes convenience, judgemental (also known as purposive) and snowball sampling (Elfil & Negida, 2017). It is important to note that probability approaches involve randomly selecting participants whereas non-probability does not (Elfil & Negida, 2017). The researcher applied two non-probability methods, being purposive and snowball sampling. These two methods are explained and the rational given below.

4.6.1 Purpose sampling

Patton (2002) states that purposive sampling is commonly used in qualitative research to obtain information rich cases on limited resources. This mainly involves selecting participants who have knowledge or understanding regarding the researcher's phenomenon of interest (Palinkas *et al.*, 2016). Purpose sampling was therefore appropriate to use in this research because the phenomenon of interest relates to key stakeholders in various government departments. The selection involved senior officials who have the necessary knowledge and information regarding food security, CCA and DRR. The strength of using purpose sampling is that it allowed the researcher to purposively to adopt areas which were suitable with the study's objectives (Chigavazira, 2012).

As previously noted, this is to evaluate whether CCA and DRR enhance food security. In addition, this will highlight the gaps and discrepancies surrounding CCA and DRR in their aim to enhance food security. Table 4.1 classifies the participants occupation/position and the department they function under.

Table 4.1: Interview respondents and the total of all participants

Participant Department	Total
NDMC	3
DALRRD	2
DEFF	2
AgriSA	2
Agricultural Research Council	1
Academic Scholars	2
Total	12

The researcher sampled a total of eight respondents as part of the purposive sample. The purposive sampling was efficient in interviewing key technocrats; however, the researcher also made use of snowball sampling for gathering enough respondents and reaching a level of saturation.

4.6.2 Snowball sampling

Snowballing sampling or chain referral is an act where research respondents introduce the researcher to other relevant participants who have knowledge regarding the research topic and problem under investigation (Brown, 2002). Accordingly, the respondents referred the researcher to other relevant key department officials who had the necessary knowledge to help the researcher fill the gap in literature. The researcher interviewed sufficient participants until the level of saturation was reached. Snowball sampling was necessary because it was difficult for the researcher to identify all relevant key stakeholders who have sufficient knowledge and insight. In total, the researcher sampled four participants as part of the snowball sample. They included technocrats from the NDMC, DEFF and DALRRD.

4.7 DATA ANALYSIS

The researcher followed the five data analysis steps by Creswell (2009:197-201) to unearth useful information, draw conclusions and give practical recommendations. The steps are explained below.

4.7.1 Organising the data

Data acquired from the participants was transcribed, optimally perused and arranged into a logical manner. This is important to determine the relevance of the information as to whether it is applicable to the research objectives and problem.

4.7.2 Categorising the data

This involves sorting data and providing a general sense of what was said by the respondents. The different data types were placed in accordance with their source of domain. For instance, data was classified as food security, CCA and DRR which made it simple to have a logical flow. This also gave the researcher an opportunity to gain overall depth of the data.

4.7.3 Coding the data

Data gathered was coded based on emerging information and this was done separately for all fields e.g. food security, CCA and DRR policy arenas. Data was manually analysed to develop themes/patterns and reduce biasness. The process followed involved:

- Being conversant with the research to identify phrases used frequently. This involved re-reading the data and creating summaries to make sense of the data collected.
- Developing categories as they emerge from the dataset.
- Creating a table on excel that outlines the codes and what they cover.
- Mapping the codes to create key elements/headings, e.g. that cover the respondent's views on CCA, DRR, Food Security, Systems, Integration, Challenges and Progress. Highlighter pens of different colours were used for similarities and differences.

4.7.4 Using the coded data to develop themes and patterns

The coded data was used to develop themes and patterns to highlight gaps and inconsistencies. The gaps and inconsistencies helped resolve conflicts because themes and patterns give the researcher an opportunity to evaluate complex analysis (Thorne, 2000).

4.7.5 Synthesise the data and draw conclusions

Developing themes and creating a logical pattern gave the researcher a clear image on the data acquired and assisted to draw valid conclusions. From asking “what are the lessons learned?” (Creswell, 2009:201) the researcher came up with practical recommendations.

4.8 VALIDITY AND RELIABILITY

The researcher made use of the data triangulation method for the results to be reliable and valid. Triangulation involves the process of cross-verifying data through two or more sources (Carter *et al.*, 2014), meaning cross-verification was through key informant interviews and desk reviews (Government publications, journals, reports and books). Triangulation also helped to ensure that data gathered from different technocrats was rich and comprehensive.

Transcripts were used to uphold credibility and continual discussions between participants and the researcher enhanced the objectivity of the study. By mixing different sources, the researcher reduced biasness that go with using a single source (Patton, 1990).

4.9 ETHICAL ISSUES (ETHICS NUMBER: NWU – 01388 – 20 – A9)

The importance of ethical consideration was maintained throughout the study. McMillan and Schumacher (2001) state that it is important to uphold ethical standards when conducting research. By this, the researcher was cautious by not keeping his self-interests above the respondents. Discretion was exercised and the privacy of the respondents was respected. The respondents were advised to withdraw if they feel their privacy was compromised.

The following guidelines set by Shamano (2010) were followed:

- Respondents were not forced to participate in the research;
- Respondents were not bribed to take part in the study;
- The respondents were assured that their privacy would be upheld; and
- The researcher maintained the confidentiality of the respondents.

Subsequently, the researcher allowed the respondents to raise their concerns before and after the data was collected. None of the respondents were in any particular risk or danger and their names were not mentioned in the study.

4.10 LIMITATIONS

Financial constraints were one of the challenges the researcher faced in the process of conducting data collection. Furthermore, it was a challenge to get hold of relevant technocrats from the NDMC, DEFF and DALRRD dealing specifically with policy issues as the number

of people that understand the integration of CCA, DRR and food security are limited; however, after constant follow-up, the researcher was able to schedule interviews with the respondents.

4.11 CONCLUSION

The motive of this chapter was to expound the research methodology which was used to conduct the study. Primarily, it started by describing the research design that was well-suited to answer the objectives of the study. A qualitative method was used to collect relevant information pertaining to the research questions. Due to the fact that the study heavily relied on people's perceptions and observations, a qualitative method was best suited for the purpose of gathering relevant data from key informants. In relation to qualitative research, the instruments used to collect primary and secondary data were also described with reasons behind disregarding other methods of data collection. Additionally, for the chosen data collection methods to yield the best results, the measures taken to prepare and collect data were also stated.

Subsequent to describing the process taken to prepare and collect data, the target population of the study was illustrated and their relevance mentioned. Therefore, relevant informants for each key area (e.g. DRR, CCA and food security) were referenced. In addition, different sampling methods used in the study, such as the purposive and snowball sampling methods, were explained with reasons why they were suitable for conducting this research. Moreover, the steps taken by the researcher to analyse the data and draw conclusions were provided. This chapter further illustrated the process that the researcher followed by using the triangulation method for the results to be reliable and valid. The triangulation method was used to reduce biasness that often happen in using a single data collection method. The ethical considerations carried throughout the study were discussed as protocol to refrain from transgressing on laws that protect the informants. In conclusion, the limitations and challenges encountered during the course of this research were stated.

CHAPTER 5: DATA ANALYSIS AND INTERPRETATION

5.1 INTRODUCTION

This chapter provides an analysis and interpretation of the results following the data collection process. Analysis was important in order to draw an unbiased inference and consistently establish a setting of stability and validity. The collected data was evaluated and expounded for common understanding. The data is presented comprehensively as to identify trends and relationships in the field of DRR, CCA and food security in South Africa. The connection between the three fields aforementioned and data collected revealed the interactions and constraints between food systems and disaster risks. This is important as it reveals how climate change will impact the local food value chain and how its resilience against extreme climatic events can be formed through CCA and DRR efforts. The data gathered revealed challenges and progress made in policy efforts towards enhancing food security through DRR and CCA. From this, the researcher concluded by giving recommendations supplied by the research participants on how to improve food security through a DRR and CCA policy-perspective, based on the issues and gaps identified.

5.2 THE RELATIONSHIP BETWEEN CLIMATE CHANGE, DRR, CCA AND FOOD SECURITY

The relationship between climate change, DRR, CCA and food security is non-linear in the sense that despite climate-related hazards being inter-connected, the risks and responses will not be the same throughout the socio-ecological system. Figure 5.1 shows the different groups that were interviewed to find their perspective on climate change, DRR, CCA and food security. Each group had a distinct set of questionnaires to assess the connection between climate change, DRR, CCA and food security from their viewpoint.

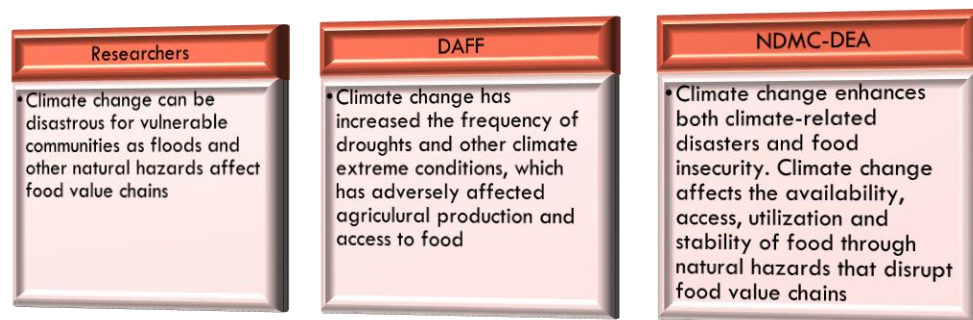


Figure 5. 1: Respondents involved in the study and their view on the relationship between climate change, food security and disaster risks

All the respondents agreed that there is a relationship between climate change, DRR, CCA and food security. The academic researchers who had a considerable amount of experience regarding the research problem stated that climate change aggravates the agricultural disaster risk profile for farmers as it creates changes in rainfall patterns, which has generated frequent flooding and drought spells throughout the Southern African region. One academic research participant stated that climate change affects all four food security pillars (availability, accessibility, utilisation and stability). The respondent further noted that DRR and CCA is important to enhance the resilience of both food security and vulnerable communities against harsh extreme weather conditions. The respondent from AgriSA added that *“it is important to understand the relationship between climate change and the four pillars of food security and not just one, to effectively introduce DRR and other adaptive interventions to enhance the overall food security spectrum under climate change”*.

The two respondents from DALRRD stated that climate change increases rainfall intensity and lengthens dry spells which has increased the prevalence of floods and extreme dry conditions, severely affecting food security, especially for resource dependent farmers and households. One of the respondents noted that *“food security is an outcome and climate change adaption/ disaster risk reduction are outputs. If the outputs are effective, the outcome will be positive; therefore, if we work on climate change adaption and disaster risk reduction, food security will be achieved even under climate uncertainty”*. Despite the understanding of the effects of climate change on food security, one of the respondents from DALRRD alluded that the integration of DRR and CCA is a relatively new concept. This implies that DRR and CCA integration with food security interventions can be a great challenge to overcome, if not properly planned. Both the DALRRD research respondents stated that some non-state

stakeholders and government departments struggle to differentiate between CCA and DRR functions, which has caused ineffective integration between both the disciplines. The DALRRD respondents asserted that the ineffective integration between CCA and DRR has played a major role in the vulnerability of food security against climate change impacts. However, despite this, both the respondents noted that since CCA and DRR are highly interconnected and complimentary, a well-planned approach can enhance food security resiliency.

The respondents from the NDMC maintained that food security is affected by extreme climate conditions, especially in terms of enhancing the vulnerability of those who are already poor and have limited resources. The respondents revealed that small scale and emerging farmers do also understand the relationship between climate change and food security but have limited knowledge of appropriate DRR and CCA interventions, in most cases even lack financial assistance to implement them. One of the research participants from the NDMC state that there is considerable knowledge with reference to the link between climate change and food security; however, there is a lack of implementation efforts due to a variety of reasons such as lack of financial assistance and co-ordination amongst CCA, DRR and food security governance.

The respondents from DEFF noted that climate change is an additional stressor to existing stresses. Therefore, climate hazards such as drought, floods and/or fires can exacerbate food insecurity levels for vulnerable communities. The respondents noted that climate hazards disrupt food chains and increase food prices. The lessons learned in section 3.5 revealed that countries in the GHA have been affected by persistent food price increase and malnutrition due to climate change impacts. One of the respondents from DEFF believed that investing in DRR and CCA can reduce vulnerability against climate hazards and food insecurity. The research revealed that all the respondents believed that climate change and food security is a pressing issue. The general overview/relationship between climate change, DRR, CCA and food security is understood by all the respondents. The findings from the academic researchers from different disciplines, NDMC, DEFF and DALRRD support the setting of the relationship between climate change, DRR, CCA and food security stated in the literature (see section 2.2 and 2.4). This points to the fact that climate change, food security, CCA and DRR are directly connected. Additionally, the findings gathered prove that there is a common understanding between the respondents regarding climate change effects on food security and how interventions such as DRR and CCA can be integrated into policy processes if fully understood.

These insights highlight the importance of adapting to climate change and reducing disaster risks when ensuring food security especially for developing countries which are vulnerable to the effects of a changing climate. In semi-arid countries such as South Africa, understanding the relationship between climate change and food security would make it possible to introduce both DRR and CCA to help deal with the increasing pressure on water resources.

5.3 LEGISLATIONS AND POLICIES THAT ADDRESS FOOD SECURITY, DRR AND CCA

The previous section described the relationship between climate change, food security, DRR and CCA from the perspective of the respondents. It was evident to include it in the evaluation to determine whether the relationship supports what is in the literature review. The aim with this section was to assess the different legislations and policies that address food security, DRR and CCA in South Africa.

5.3.1 Food security legislations and/or policies

The respondents from DALRRD and NDMC were of the view that food security plans are supported by the Constitution (i.e., section 27(1)(b) and 28 (1)(C)) which states that everyone has the right to sufficient food and every child has the right to basic nutrition (South Africa, 1996). This made it possible to endorse food security programmes to ensure South African citizens always have the right to nutritious food.

When asked to describe the food security policies and legislation in South Africa, most of the respondents noted the National Policy on Food and Nutrition Security (NPFNS), the Integrated Food Security Strategy (IFSS), the Fetsa Tlala Initiative and the Household Food and Nutrition Security Strategy. The respondent from the Agricultural Research Council (ARC) noted that the NPFNS which was gazetted in 2014 has strategic objectives such as ‘ensuring food availability and affordability for national and household levels’ but despite the attainability of food security on a national level, the household level still lacks access to affordable nutritious food which has led to high food insecurity levels. Furthermore, the respondent added that the IFSS should be a case in point of how improper institutional arrangements can impede the success of a policy. The respondent was of the opinion that IFSS, which was a strategy approved by Cabinet in 2002, was unsuccessful in its aim to integrate isolated food security

programmes in the hope to achieve food security. *“The IFSS failed to pursue its vision of achieving food security due to the poor alignment and management of government sectors and if the NPFNS does not learn from this, it will also face the same fate”* the ARC informant added. When asked about the challenges that South African food security policies and legislation face, the AgriSA respondent argued that *“there is no sufficient information on the track-record of the NPFNS on attaining its objectives and all the other food security programmes”*. The literature (see section 3.3.4) states that the NPFNS and other food security policies mentioned struggle with co-ordination and implementation due to the misalignment of the functions by different government departments. The respondent from DALRRD noted that the implementation of NPFNS has six strategic objectives where the sixth objective (developing a monitoring and evaluation system of the food and nutrition security) is led by the DALRRD whereas the first strategic objective (establishing a guideline of alignment and overseeing the coordination/implementation of the food and nutrition programmes) falls under the Department of Monitoring and Evaluation (DMPE). The respondent further added that the Department of Social Development (DSD) is tasked with enhancing social protection programmes which involves increasing the amount of children’s access to nutritious food at schools, while the Department of Health (DoH) assists with evaluating malnutrition levels. The respondent from DALRRD noted that it is important to know the difference between government departments involvement in implementing the NPFNS and other food security programmes.

Both the respondents from DALRRD noted that other food security policies that are aimed at enhancing organic farming involve the Conservation of Agricultural Resources Act (CARA) of 1983 (Conservation of Agricultural Resources Act, 1983). The CARA aims to enhance the soil and maintenance of agricultural resources such as water and invader plants. One of the respondents from DALRRD stated that *“the Conservation of Agricultural Resources Act makes provision for water, land-care programmes and looking after soils for enhancing good quality nutritious food”*. The respondents also noted the National Policy on Comprehensive Producer Development Support, which is a draft policy still in its infancy (NPCPDS, 2018). The respondents from DALRRD revealed that the policy aims to assist producers to yield quality food by making provision of support structures that can be accessible through a comprehensive register.

When conducting follow-up questioning, the respondents from the NDMC and the AgriSA stated that they had limited knowledge of the NPCPDS and CARA policies. The academic researchers and the respondent from the ARC had a fair understanding of both the policies in which they stated that successful implementation is still lacking, especially for CARA which has been in effect since the 1980s. One of the respondents from DALRRD declared that there are numerous food security policies that are still in cabinet clusters and have not been made available for public consumption due to financial and technical reasons.

Section 3.3.4 reveals that the Household Food and Nutrition Security Strategy has a multi-sectoral approach in ensuring food security. It is a function of different departments (i.e., DoH, DALRRD, and DSD) and the respondents from DALRRD stated that the intricacy of food (in)security has created challenges of intergovernmental relations in terms of implementation and monitoring of food security initiatives such as the Household Food and Nutrition Security Strategy. The research analysis reveals that coordination between departments remains a challenge due to different directives in the different sectors. One of the academic researchers noted that *“because food security policies such as the household food and nutrition security strategy and the IFSS require involvement from several government levels and sectors, it becomes an issue to give mandates on how to enhance food security as the issue is different based on the perspective of a sector and its underlying motive”*. The respondent from DALRRD added that food security has become political opportunism for parties and not a moral issue that needs to be addressed.

With regard to the Fetsa Tlala Initiative which was a programme approved in 2013 with the NPFNS, the academic researchers and the respondent from the ARC shared similar sentiments in that the policy was too ‘ambitious’ by planning to cultivate a million hectares of land by 2019. The respondent from DALRRD stated that the policy has had some progress by planting over 300 000 hectares of land (see DAFF annual performance plan, 2018). The respondent from DALRRD mentioned that the drought and water restrictions have affected the goal to successfully plant a million hectares of land. This highlights the fact that food security and climate-related hazards are directly connected (see Chapter 1) and the lack to plan thereof are detrimental for the development of food security policies, particularly for a country which has a significant amount of its population vulnerable to climate-related hazards.

5.3.2 Disaster risk reduction (DRR) legislation and/or policies

Governance and legislation/policies that deal with DRR are an integral part of any societies development if correctly structured and executed (Ahrens & Rudolph, 2006). Most of the respondents supported the literature review (see section 2.2) that climate-related hazards are a significant contributor to food insecurity which reduce people's resilience against disasters. This is due to the reason that most food insecure people are located in areas susceptible to natural hazards (WFP, 2011). This then calls for DRR legislation/policies to be properly structured and executed to enhance the resilience of both food security and its beneficiaries. The academic researchers and the respondent from AgriSA noted the Constitution of South Africa (section 24 and 41 (b)) as a consequential tool that states "everyone has the right to an environment that is not harmful and that the spheres of government must secure the wellbeing of its citizens" (South Africa, 1996; 1251). These sections of the Constitution give a directive to the spheres of government to develop systems and policies related to disaster management.

Most of the respondents noted the Disaster Management Act (DMA) of 2002 is the primary legislation which makes provision for strategies that aim to enhance resilience against disasters, mitigation efforts, emergency preparedness plans and post-disaster recovery. The legislation also makes provision for the National, Provincial and Local Disaster (Risk) Management Centres across the country. The respondents from the NDMC, DALRRD and academic researchers also made note of the National Disaster Management Framework (NDMF) of 2005. The DMA of 2002 made provision for the NDMF of 2005 so there can be uniformity for all the different role players assigned to implement the DMA policies and strategies. The different role players include the different spheres of government, private sector, non-governmental organisations (NGOs) and civil society. The list is not exhaustive (Van Niekerk, 2006; Van Niekerk, 2014) as disasters are cross-cutting issues which require the involvement of various sectors and organisations. The cross-cutting issues affecting food security as climate-related hazards have significantly impacted the already vulnerable agricultural sector and have also caused a decline in food accessibility, stability, availability and utilisation in the Southern African region (see section 2.5). The respondents from NDMC noted that despite the importance of enhancing the availability and accessibility of food in South Africa, both the DMA and NDMF fail to mention food security and how to reinforce it. All three of the respondents from the NDMC noted that they however have an advisory forum in place where different sectors of the government meet to discuss disaster-related issues their facing. The

DALRRD attends on a regular basis to discuss the impacts of climate change on food security in South Africa and other issues the sector face.

Both the research participants from DALRRD stated that they have a climate change and disaster management directorate aimed to evaluate and implement strategies that would enhance food security even during extreme weather conditions. The respondents said one of the programmes accelerated by the department involves climate-smart agriculture (CSA) which is an integrated practice to sustainably increase the productivity of agriculture by being climate-resilient. The DALRRD respondents noted that they have developed the CSA strategic framework for the agriculture sector. *“The CSA strategic framework is a tool which addresses the risks posed by climate change on the agriculture sector. The framework entails adaptation, mitigation and food security measures under extreme weather conditions”*, one of the respondents added. The research participant from ARC noted that the food security programmes under the DALRRD run in isolation from the DMA and NDMF as both the legislative policy/framework fail to include integration measures for food security plans. One of the respondents from the NDMC noted that it is important for the DMA and NDMF to mention food security and highlight procedures on how to best incorporate it into the DRR plans. The respondent proclaimed, *“it is crucial for DRR policies to prioritise necessary measures for the inclusion of food security in their objectives because failure to do so undermines the reality of those vulnerable to climate change impacts and food insecurity”*.

The DALRRD respondents noted that despite the inclusion of the climate change and disaster management directorate, there is a gap to fully enhance food security as a directorate under DALRRD is not a priority to other departments unless there is a legislative and policy requirement enacted to ensure the integration of climate-related and food security policies become law.

The data analysis reveals that the DMA of 2002 make provision for disaster risk management plans. The participants from NDMC state that the disaster risk management plans are provision of section 25, 38 and 52 of the DMA where the national, provincial and municipal disaster risk management centres are authorised to prepare disaster risk management plans and all the necessary arrangements for their implementation measures. The NDMC is responsible for developing guidelines in preparation for disaster management plans for the use of organs of state and other role-players in disaster management (DMA, 2002). With that being said, the

respondents from NDMC stated that organs of state can develop disaster management plans in congruent with food security strategies. A good example is the Agricultural Disaster Management Policy of Limpopo (Limpopo Provincial Government, 2011) which aims to enhance the resilience of small scale, emerging and commercial farmers against the effects of climate change. The ARC research participant state that because different government departments compete for resources and funding, sometimes food security is not a priority and therefore, the disaster management plans are not consistent with including food provision in their strategies. This then requires the adoption of a law to integrate disaster management policies with food security strategies (and vice versa) for consistency and uniformity. The academic researchers state that enacting a law for the integration between climate-related disasters and food security policies prioritises the enhancement of food security against climate-related disasters. The respondents from the NDMC also mentioned the National Environmental Management Act No. 107 of 1997 and the Water Services Act No. 108 of 1997 as one of the policies from other sectors that play a pivotal role in developing protective measures to enhance DRR strategies as climate-resilience is a multi-sectoral concern.

5.3.3 Climate change adaptation (CCA) legislation and/or policies

The data analysis revealed several different CCA policies. Most of the respondents mentioned the National Climate Change Response (NCCR) White Paper and the Draft National Adaptation Strategy (NAS). As previously mentioned, (see section 3.2.1) the NCCR is a policy which was approved and gazetted in 2011 whereas the NAS was published in 2016. The NCCR strategy will be integrated into the national water, agriculture, disaster management, national biodiversity and department of health strategic plans (DEA, 2011a). The NCCR strategy's integration with disaster management and agriculture strategic plans support the verity that to counter climate change and disaster risks with the aim of ensuring food security (see section 3.2.1), CCA, DRR and food security policies need to mutually interact with one another. The development of the NCCR policy will be spearheaded by parliament through the portfolio committees set up to co-ordinate, review and implement (DEA, 2011a). The discussions with the academic researchers revealed that because climate change is a cross-cutting issue, the NCCR policy is pertinent to a variety of stakeholders i.e., private and civil society.

The literature (see section 3.2.1) revealed that the NAS is a consolidated strategy of different adaptation programmes and acts as a point of reference for CCA efforts in the country. The respondents from DALRRD and AgriSA noted that this is a great initiative to unify various

adaptation strategies to effectively allocate resources and reduce the risk of investing in maladaptive coping strategies. The respondents from ARC warned that although the NAS can be seen as beneficial in unifying isolated programmes, it is a guideline that will remain in its infancy and with no form of implementation for the next decade. *“Adaptation policies such as the NAS are great in theory but translating them into practice is an exasperating task”*, the respondent further added that *“similar to other government policies, the NAS is more likely to remain a draft for quite some time and even after formal approval, successful implementation would take more than a decade, a case in point being the NCCR”*. This was supported by a statement made by one of the DALRRD respondents who proclaimed that there is a Climate Change Act which is currently in cabinet clusters and would only be made public at a later stage. The respondent stated that *“climate policies often take a considerable amount of time due to the process needed for gazetting, this includes consulting with different stakeholders such as research institutions, NGO’s, farmers etc, then consolidate the information for public comment”*.

The respondents from DEFF stated that the NAS responds to the objectives set out in the NCCR policy to effectively manage climate change and reduce greenhouse gas emissions to an acceptable level. With that being said, both the DEFF respondents noted that translating policy into practice is a challenging task for most government departments; however, progress has been made in upholding climate change policy measures. One of the respondents from DEFF alluded that South Africa has a range of reporting requirements internationally and nationally which prove their extent to upholding climate change. The respondent added that *“South Africa has participated in the Paris Agreement by developing Nationally Determined Contributions (NDC’s) which describes efforts made as a country to both mitigate and adapt to climate change”*. South Africa is a party to various international agreements (see section 3.6.1); therefore, the country is obligated to adhere to climate change mitigation and adaptation. The respondent from DEFF added that *“South Africa also has an obligation with the United Nations Convention to Combat Desertification (UNCCD) to report on Land Degradation Neutrality (LDN) to enhance resilience and climate action”*. Both the respondents from DEFF perceived that conforming to international and local climate change reporting standards is proof that adaptation efforts are fully supported and enforced despite an implementation challenge. Subsequently, both the respondents from DEFF noted that the principles set out in the NCCR policy (see section 3.2.1) is upheld as government departments have their own strategic climate

action strategies for which the department will be accountable to. Therefore, it is important for government departments to orient their policies and protocols with the contents set out in the NCCR policy. An example given by the respondents from DEFF is the DALRRD's 2018 Climate Change Adaptation and Mitigation Plan for South Africa (Currently known as the DAFF's 2018 Climate Change Adaptation and Mitigation Plan for South Africa) which has CCA measures such as Conservation Agriculture, CSA and water management techniques.

5.4 THE RESILIENCE OF FOOD SYSTEMS

All the respondents revealed that climate change has various effects on different food system stages (i.e., production, processing, packaging, distribution and consumption) and will therefore be required to adapt to extreme weather conditions. The academic scholars state that the interaction between climate change and food systems is non-linear in the sense that it is a threat multiplier. One of the academic scholars noted that *“shocks of extreme weather events can destroy crops, disrupt supply chains and lead to loss of stored foods. My sense is that each of the pillars of food security: availability, accessibility, utilisation and stability are impacted by climate change, but people have focussed far too much on availability alone”*. The respondent noted that climate change enhances disaster risks by worsening the situation of vulnerable communities and trapping them in a poverty cycle. The data analysis reveals that the respondents strongly believed climate change creates a mistrust amongst communities and forces a large group of vulnerable groups to migrate to places uninhabitable. One of the respondents from DALRRD stated that droughts, floods and other climate-related disasters destroy livelihoods and create conditions where people compete for resources such as food, water and shelter, which ultimately causes civil unrest. The researcher asked a follow-up question which entailed the effectiveness of involving local communities in adaptation-DRR-food security policies and their implementation, to which the respondent replied *“There have been some efforts to support local production in terms of climate adapted production. However, my sense is that new/old crops have been introduced without really understanding the social context or potential markets. Sorghum and millet are simply not popular. But – worse than that, all of the attempts have focussed on production rather than looking at more systemic resilience or thinking about what kinds of infrastructural or planning interventions might increase community resilience in more impactful ways”*.

In terms of enhancing the resilience of food systems against climatic shocks, the respondents from DALRRD stated that as much as climate-resilient food system is important, of great

concern should also be addressing the complexities of adaptation and DRR efforts across the food system spectrum to reduce trade-offs. Focusing on the adaptive capacity of one aspect of the food system is unsustainable (see section 2.7) and might lead to maladaptation. Subsequently, the academic scholars note that adaptation and DRR measures are a primitive tool to enhance the resilience of food systems, but a ‘flawless’ climate-resilient food system is intractable. Therefore, it is important to note that climate-resilient strategies aimed to enhance the adaptive capacity of food systems will have a significant degree of functionality but due to the complexities and challenges of both climate change and food security, resilience measures may miss set-targets and mask multiple risks. One of the respondents from DALRRD noted that it is important for policymakers and implementers to understand the uncertainties of climate change impacts on food systems and the uncertainties should be taken into consideration when preparing for the resilience of food systems. The academic scholars noted that it is a challenge to enhance the resilience of food systems against climate change effects when people’s livelihoods are not governed solely on climate change. The data gathered reveal that vulnerable households tend to compromise their livelihoods in an effort to respond to climate change impacts and the politics thereof.

The data analysis revealed that the South African food system is dichotomous; one branch of the food system involves the formal, commercial sector whereas the other branch comprises the informal food sector such as the poor, small scale farmers. The academic scholars note that it is difficult to map South Africa’s food system as it has not been institutionalised. The literature (see section 2.7.1.6) provides that South Africa’s food system is fragmented as it cuts across different sectors, administrative levels, geographical scales, private-public spheres and policy domains (Pereira & Drimie, 2016). The respondent from AgriSA stated that food systems are more susceptible to climate change effects due to their fragmentation and lack of a governance structure. The respondent further added that efforts to enhance the resilience of South Africa’s food system is limited due to the lack of a holistic policy framework that governs the country’s food systems. The academic scholars note that food systems are unfavourable to poor small-scale farmers as they are a marginalised group in the contribution to the overall food supply, accessibility and utilisation.

The respondents from DEFF and DALRRD mentioned different types of food value chains in South Africa, some of which were mentioned in the literature (see section 2.7.1) such as beef,

potato and maize value chains. One of the respondents from DALRRD noted that climate-resilient strategies are focused largely on the agricultural production than other elements of the value chain. The academic scholars note that there is a lack of a comprehensive climate-resilient national strategy for South Africa's food value chain. They added that climate-resilient value chains are practiced in selected provinces, depending on available resources and the priorities of the province (see section 2.7.1.5).

The DALRRD respondents mentioned Agri-food parks (see section 2.7.1.1) as an initiative which could provide a good foundation for a climate-resilient food system where each component of the CCA-DRR would reduce the vulnerability of the food chain value. At present, the DALRRD respondents noted that the food chain value in South Africa is concentrated and faces different environmental challenges that continue to affect people's health and further environmental degradation. The DALRRD respondents believed that agri-food parks are a great initiative to enhance environmental protection strategies and nutritional food intake. Academic scholars note that the South African Agriculture is one of the largest emitters of greenhouse gas (GHG) emissions, which has also inadvertently contributed to the vulnerability of food systems and to curb this trend would require commitment in the transformation of South Africa's food value chain, the respondents noted that agri-food parks are a great initiative to reduce GHG emissions.

The academic scholars note a huge gap between CCA/DRR policy and food systems. By this, they proclaim that CCA and DRR policies fail to acknowledge food systems and make provisions to systematically incorporate them into their overall objectives. The academic scholars state this neglect adds to the existing climate change stresses the food system is currently facing. One of them noted that *“lines of accountability, co-ordination and decision-making between climate-resilient strategies and food systems are unclear, which proves that climate adaptation and disaster reduction policies are drafted in isolation from food systems and vice versa”*. There is little to no reference of food systems in existing climate-related/DRR legislation and policies. The data analysis reveals that climate adaptation strategies are more focused on agricultural production and neglects the remaining components of the food value chain. Enhancing resilience of food systems to climatic shocks requires an amendment to existing legislation to ensure both environmental hazards and food security dimensions are addressed and institutional arrangements are made to create a holistic approach/alignment between adaptation, DRR and food systems.

5.5 THE PROGRESS OF CONSOLIDATING CLIMATE CHANGE ADAPTATION, DISASTER RISK REDUCTION AND FOOD SECURITY LEGISLATION/POLICIES IN SOUTH AFRICA

Chapter 2 of the literature review stresses on the importance of the unification between CCA, DRR and food security institutional structures. This is largely due to the complex, yet direct effects that climate change has on disaster risks and food security. Climate change affects all aspects of food security and therefore contributes to the vulnerability of food systems. The respondents from DALRRD agreed with the literature in matters pertaining to climate change and its close relationship with reducing the resilience of food security. One of the respondents from DALRRD noted that *“the failure of CCA and DRR policies to fully integrate and be inclusive of food security strategies is detrimental to the improvement and resilience of food security against climate related hazards”*.

When asked whether the integration between CCA-DRR-food security policies and legislation in South Africa is sufficient, a respondent from AgriSA asserted that closer cooperation is needed as both climate change impacts and food insecurity are consequential at local level and that currently, the marginalisation of emerging farmers is proof that collaboration is inadequate. The respondent was of the opinion that policies do not recognise rural areas and emerging farmers and when they do, the translation from policy to practice is ponderous and uncoordinated. The interview revealed that the integration of CCA-DRR and food security policies is not properly co-ordinated and leads to inconsequential results by the time implementation occurs.

One of the respondents from DALRRD stated that there is a great misalignment between CCA, DRR and food security policies in South Africa. The respondent argued that there has been bias towards mitigation rather than adaptation due to economic reasons. For this motive, the interviewee states that adaptation policies are not prioritised and adds to the structural imbalances between CCA, DRR and food security policies/legislation. The literature review (section 2.6) corresponds with the statement by the respondent in that support between DRR, CCA and food security has been insufficient, which has kept disaster risks and food insecurity persistent. The respondent stated that CCA and DRR have the same aim, namely enhancing resilience and risk avoidance. Therefore, when adaptation is enhanced, risk is reduced. The respondent concluded that women and children in South Africa are more vulnerable to the

impacts of climate change and policies have failed to adequately enhance their resilience due to lack of co-ordinated and well-planned implementation.

One of the respondents from DEFF stated that progress has been made in South Africa as the recently amended DMA act of 2015 refers to CCA, the same can be said for Climate Change Policies which make provision for DRR. The DEFF respondent asserted that *“my knowledge in this regard is limited; however, I believe that CCA and DRR legislation and policies have played a significant role in ensuring food security as farmers and other agricultural role-players have been introduced to conservation agriculture and other adaptation options which has enhanced their resilience”*. The respondent stated that despite the internal challenges faced by government departments and their inclusion of relevant stakeholders, there have been substantial improved efforts such as Early Warning Systems (EWS), different climate change units in relevant departments and an increase in risk knowledge across vulnerable communities. The interview with the respondent revealed that there are some shortfalls with regard to the internal governmental structures in their response time during climatic shocks on the agriculture sector. The respondent mentioned that there is a room for improvement with regard to implementation which can help in enhancing food security during extreme weather conditions.

The academic scholars note that enough is not being done to unify CCA-DRR-Food security policies. One of the respondents proclaimed that poor rural-urban emerging farmers are neglected and that all the attempts have focussed on production rather than systemic efforts to enhance resilience across rural-urban food chain links. This was supported by the researcher from ARC who noted that resilience strategies have largely focused on production which has been seen by the rise and persistence of malnutrition during climatic shocks. The researcher from ARC argues that adaptation efforts introduced by CCA policies have helped most commercial farmers rather than emerging and small-scale farmers. The respondent noted that small-scale farmers struggle to raise funds to adequately adapt to a changing climate, a case in point being genetically modified (GM) seeds which a small percentage can only afford. *“The issue to adequately include farmers and vulnerable people from the ground-level lies in systematically enforcing a command-and-control implementation strategy from government down to local level where most implementation occurs. What is needed is to have an adequate and fully inclusive policy that resembles ground-level control and be reflective of community interests”* the respondent noted.

The respondents from NDMC emphasised that it is critical for CCA and DRR policies to be integral of food security to ensure the protection of food supply even during harsh weather conditions. One of the respondents noted that “*there is a disconnect between CCA, DRR and food security policies which has altered implementation*”. All three of the respondent’s stated that the DMA and DMF both make no mentions of food security; however, the NDMC conducts quarterly advisory forums which incorporates DALRRD in efforts to link DRR and food security. However, because food security is not always part of the theme at the advisory forum, it is not always a priority. One of the respondents noted that there is a challenge of implementation at the local level and climate change impacts are most severe on food insecure populations due to the dysfunction and lack of capacity at municipalities. Moreover, the results from the data analysis reveal that the NDMC respondents believed that government and stakeholders often deal with climate change issues separately from food security.

According to the NDMC respondents, the size of government makes it difficult to prioritise CCA-DRR and food security policy integration due to difference of opinion and priority. The respondents believed that certain departments are still sceptical of climate change impacts and therefore results in a lack of adequate policy integration.

5.6 ISSUES AND SHORTCOMINGS OF A SUCCESSFUL COLLABORATION BETWEEN CCA, DRR AND FOOD SECURITY POLICY SPHERES

All the respondents revealed that there is an implementation challenge towards adaptation, DRR and food security policies and programmes. One of the respondents from DEFF revealed that CCA is an unfunded mandate and that it has no ‘climate change fund’. The respondent noted that departments and stakeholders must prioritise what they get, which creates a gap between policy and practice. Additionally, the results from the data analysis reveal that there is a lack of capacity amongst government sectors in dealing with food security in a changing climate. One of the academic researchers note that there is a mismatch between policy and practice largely because of a lack of political will and the framing of food security and climate change policies. The academic researcher is of the opinion that both food security and climate change policies are production orientated and a lack of political will has negated the effects of a climate adaptive food system policy sphere. What is evident from the academic scholars is that the elements of food systems apart from production are totally overlooked and/or disregarded in food security, DRR and climate adaptation policies. The result is that the

resilience of food security against climatic shocks lie across the production division whereas the other modes of the value chain where climate change impacts intersect are poorly understood and therefore neglected.

One of the respondents from NDMC stressed that administration and interdepartmental coherence in CCA, DRR and food security spheres is weak. The respondent further noted that bureaucracy is an issue and the principal challenge of cutting through the red tape to get an effective connection between CCA, DRR and food security policy framework(s) is a daunting task for government spheres. This relates to one of the respondents from DEFF who asserted that government departments are seen as less responsive to climate change and food security due to internal structures that inhibit implementation at the ground level.

The respondent from DEFF stated that climate change is highly scientific and translating it into policy remains a challenge. Implementation is constrained due to misinformation and propaganda from anti-climate change believers in senior positions. The respondent from ARC stated that some communities believe climate change is not real and the complexity regarding chains of authorisations within communities create an imbalance between DRR, CCA and food security. Factors limiting progress between emerging farmers and the scientific community involve the lengthy process of checks and balances between both research institutions and communities. To conduct research in some particular communities, approval of ethical conduct from the aforesaid institutions needs to be granted as well as approval from the community's gatekeepers, which is a lengthy process. The respondent from AgriSA noted that gatekeepers and traditional principles often limit emerging farmers from using modern standards of CCA and DRR. Traditional agriculture involves the traditional way of farming and the AgriSA researcher note that leadership and resistant farmers often wait to see the negative effects of climate change before adapting, which confines the purpose of adaptation and DRR policies.

Adaptation and DRR policies have a great mismatch with food security policies due to insufficient efforts to make CCA-DRR and food security communities operate interdependently. Two of the respondents from NDMC noted that government is a 'big' organisation and there is little evidence regarding the practical integration and implementation of DRR, CCA and food security policies due to efforts and departmental functions being individualised. The respondents alluded that this has created the level of communication and interlinkage between non-state actors, private sector and government departments responsible for CCA, DRR and food security be constrained. The respondent posited that this is one of the

reasons why successful integration and implementation have lagged. This highlights the gap between government and governance. The resilience of food security from climate change and disaster risk impacts lies on sufficient efforts made by different levels of government, non-state actors and private sector. The literature makes provision for (see section 3.7) a multi-level good governance which is a critical tool in enhancing food security through a CCA-DRR perspective. One of the academic researchers note that there is no conventional solution to a good integration between CCA, DRR and food security policies; however, poor governance and the unsuccessful integration of multiple actors within CCA, DRR and food security defeat the purpose of which the function between the three communities serve.

5.7 CONCLUSION

This chapter involved data analysis and interpretation from research data collected aimed to answer the research questions of the study. The research participants involved respondents from the NDMC, DEFF, DALRRD, AGRISA, ARC and two academic scholars. The research started with getting the respondents' perspective of the relationship between climate change, DRR, CCA and food security. All the respondents understood the impacts of climate change on food security and disaster risks.

The data analysis revealed that climate change affects food security by creating unfavourable conditions for vulnerable farmers prone to drought, floods and other extreme weather conditions. Furthermore, climate change affects all food security elements (availability, accessibility, stability and utilisation). The research findings are in alignment with the literature review in that climate change affects both farmers and households who are resource dependent and that food security is affected by extreme weather conditions which enhance the vulnerability of the poor and traps them in a poverty cycle. Subsequently, the research analysis included the evaluation of food security and DRR legislations and/or policies. The respondents from DALRRD had a considerable amount of knowledge with respect to food security policies whereas the NDMC had a fairly limited knowledge. The food security policies mentioned the most were the NPFNS, IFSS, Fetsa Tlala and Household Food Security Strategy. The respondents from DALRRD further mentioned the CARA and the NPCPDS. With regard to DRR, legislations and/or policies referenced numerously involved the DMA, NDMF and disaster management plans. Moreover, one of the respondents from NDMC mentioned the NEMA and Water Services Act.

With regard to climate change policies, the most cited policies included the NCCR white paper and the draft version of the NAS. The findings revealed that NCCR policy resembles the interests of key stakeholders, i.e., civil society. Furthermore, the NAS is a consolidated strategy of different adaptation programmes and acts as a pivotal point for CCA in South Africa. Some respondents were concerned that the NAS will remain in government clusters for a long-period and a consolidated implementation plan is highly unlikely to happen in the near-future.

The resilience of food systems against climate change was evaluated as part of assessing the gaps and correlation between food systems and resilience. All the respondents agreed that climate change has considerable effects on different stages of the food system. The respondents noted that food systems in South Africa remain vulnerable due to the reason that governance has favoured production more than other elements. It was alluded by the respondents that focus has largely been on production, whereas other elements have been excluded in planning processes. What was most concerning regarding resilience of food systems was the exclusion of adaptation and DRR interventions aimed at enhancing resilience and reducing trade-offs.

The concluding section(s) of the data analysis involved assessing issues and progress made regarding successfully enhancing food security through a CCA and DRR perspective. It was discovered that policies are not well co-ordinated due to a variety of reasons such as lack of knowledge, financing, rural-urban food chain connections, chains of authorisation and (in)capacity of government and municipality officials. The respondents alluded that coherent communication channels between government departments and different stakeholders are vital for the success of enhancing food security in a changing climate.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

The literature study highlighted the direct connection between climate change, DRR, CCA and food security. It was important to establish grounding on the effects of climate change on disasters and food (in)security to gain knowledge on measures such as DRR and CCA. The impacts of climate-related disasters have propelled for a closer interaction between CCA, DRR and food security. The literature review discovered that the three communities (CCA, DRR and food security) have operated in isolation and in turn, intensified the exposure of vulnerable communities to natural hazards and food insecurity. The literature study further advocated for a closer cooperation between the three communities for resiliency against climate-related hazards and food insecurity. This research study was centred on enhancing food security through a DRR-CCA legislation and policy context.

As the intensity of climate-related hazards are expected to increase (Thomas & López, 2015), the literature review (see Chapters 1, 2 and 3) highlights the importance of having solid policies and an effective governance structure to coherently implement policies and legislation. As such, this study aims to assess whether DRR and CCA policies and legislation enhance food security in South Africa by also identifying critical areas of concern for successful implementation. By this, the study should contribute towards forming a closer cooperation between DRR, CCA and food security policy fields for positive developmental outcomes.

The purpose of this chapter is to provide conclusions gathered from all the chapters as well as recommendations based on the research findings. The conclusions from the said chapters is a summary of key points whereas the recommendations serve as reference to what is required to enhance food security through a DRR-CCA policy/legislation integration. The summary of the chapters and recommendations is in alignment with the research objectives to ensure that the research questions of the study and problem formulated are addressed.

The section below commences with a summary of the chapters: Chapter 1 – Introduction; Chapters 2 and 3 – Literature Review; Chapter 4 – Research Methodology; Chapter 5 – Findings. The concluding section involves the overall conclusion of the study and recommendations for critical interventions.

6.2 SUMMARY OF PRECEDING CHAPTERS

The chapters in the study are sequential and in alignment with the research problem and objectives. Chapter 1 provided an introduction to the study and gave a brief description of the impacts of climate change on food (in)security, disaster risks and sustainable development. The point of this introduction was to introduce CCA-DRR and its efforts in enhancing food security (and vice versa). Chapter 1 established a setting for CCA, DRR and food security policy fields. The evidence gathered from the introductory chapter is that climate change is expected to negatively impact on disaster risks and food insecurity. CCA and DRR are effective tools to alleviate vulnerable communities from climate-related hazards and food insecurity. Chapter 1 made provision for the problem statement, which is entrenched on the premise that despite a growing call for CCA and DRR communities to work together, minimal gains may be achieved if successful integration between the two is in exclusion with food security commitments. Therefore, an integral part of improving CCA, DRR and food security legislation/policies in South Africa need be unified for implementation.

Chapter 1 included four research objectives and a brief description of the research methodology used to successfully address each of the study objectives. A thorough research methodology is described in Chapter 4. Chapter 1 also included an overview of the literature which was consulted to lay a foundation of a DRR, CCA and food security field and policy/legislation setting.

Chapter 2 was the first section/chapter of the literature review and is comprised of the relationship between CCA, DRR and food security. The literature review argued that, despite efforts to integrate DRR, CCA and food security, the connection is poorly reflected in policy and in practice. As such, Chapter 2 highlighted the lack of coherent implementation between CCA, DRR and food security efforts. Chapter 3 focused on South Africa's DRR, CCA and food security policies and legislation. The reason was to identify gaps and correlation within the aforesaid policies and legislation. The literature review from both Chapters 2 and 3 revealed that DRR, CCA and food security is a relatively new concept and integration still falls behind. The chapters from the literature study emphasised the importance of a solid context specific DRR, CCA and food security policies and legislation nexus. Furthermore, the literature review highlighted the challenges and progress made by regional and local institutions to create an enabling environment for CCA, DRR and food security.

As previously mentioned, Chapter 4 presented a thorough analysis of the research methodology used to address the research objectives. The research methodology was important to establish a data collection process to gather information from relevant technocrats pertaining to the theoretical concepts established in the literature review. Therefore, the research participants shared their perception regarding CCA, DRR and food security policies and legislation in South Africa. Chapter 5 presented the findings of the study which were analysed according to the subject matter and objectives of the study.

6.2 RESEARCH CONCLUSION(S)

The conclusions gathered from the study are in accordance with the research objectives below. The conclusions aim to address the theme of whether CCA and DRR policies and legislation enhance food security. The research objectives identified correlation and gaps between food security and CCA/DRR fields in South Africa.

6.2.1 Describe the policy setting of CCA/DRR and food security in South Africa

The policy setting of CCA policies in South Africa is stated below.

6.2.1.1 *CCA policies in South Africa*

The leading department in climate-related issues in South Africa is the DEFF. With regard to CCA policies, the literature review referred to the NCCR white paper of 2011 which aims to transition South Africa into a climate-resilient economy by reducing its GHG emissions. The policy is reviewed every five years (short-term), every 20 years (medium-term) and extends to the year 2050 (long-term).

The second CCA policy highlighted in the literature is the NAS which is a draft programme published in 2016 aimed to reinforce and consolidate climate-adaptation plans in South Africa. The literature (see section 3.2.1, 3.2.2) reveals that both the climate-related policies are relatively new and part of South Africa's integrated planning. As such, the policies involve different stakeholders, including private sector and civil society. Despite the NAS aiming to be a consolidated strategy to incorporate a variety of CCA policies in South Africa, it is a draft document. Meaning it is still in its planning face and implementation is still a challenge. The

literature highlights that climate change is a cross-cutting issue and therefore, unifying isolated CCA programmes with DRR and food security initiatives is a pressing problem.

The findings revealed that the CCA policies have an obligation with the United Nations Convention to Combat Desertification (UNCDD) to reduce land degradation and the United Nations Framework Convention of Climate Change (UNFCCC) to voluntarily reduce its emissions. The data gathered from the respondents highlights that translating CCA efforts into reality is a difficult task. The respondents stated that there are additional CCA policies/legislation such as the Climate Change Act which is currently in cabinet clusters. The findings highlighted that South Africa falls short of a climate change funding coffer, which can subsidise CCA plans. The respondents proclaimed that funding is not compulsory and it is voluntary. Both the literature review and research respondents (see section 2.4, 5.3.3) agree that CCA should mutually operate with food security and DRR interventions. Therefore, the lack of a solid funding mechanisms adds to the lack of integration between the three communities.

The CCA policies in South Africa coincide with DRR policies in South Africa as they both address climate and geophysical hazards. These include water, infrastructure and livelihood diversification (Lobella *et al.*, 2008; Mercer, 2008).

6.2.1.2 DRR Policies and Legislation in South Africa

There were various developmental strategies that followed post 1994. For government to curb disaster risks, a prominent set of DRR legislation and policies emerged. The literature review (see section 3.3) holds that there was a paradigm shift post 1994 which encouraged disaster risk governance and policies to be more proactive than reactive.

The literature expresses two sets of policy and/or legislation regarding DRR. These include the DMA of 2002 and the NDMF of 2005.

The DMA and the NDMF make provision for preventing and reducing natural hazards by enhancing the resilience of communities against disaster risks. Both the DMA and NDMF aim to address disaster prevention through efforts of civil society, private sector and all government spheres. Besides a comprehensive legislative structure of disaster management policies, efforts to translate policy into practice have been lacking. There has also been slow progress regarding

the inclusion of food security in both the DMA and NDMF which inadvertently puts food security in South Africa in a vulnerable position. The respondents from the NDMC argued that despite this gap, the advisory forum is a tool which organises different governmental departments (i.e., DALRRD) to discuss food security issues and other matters thereof. It was also noted that the advisory forum is not consistent in this regard as different matters are addressed and the agendas are in accordance with what is (or may be) a national concern at the time of the meeting. Subsequently, it is important to note that some developments have been made in local disaster management municipalities by including food security plans in their integrated development plans (IDP's) and disaster management policies (i.e., Agricultural Disaster Management Policy of Limpopo) which address the vulnerability of small-scale and emerging farmers against climate-related hazards.

The NDMF is the legal apparatus, which acts in accordance with the DMA objectives and is responsible for bridging uniformity and consistency between a diversity of role players consigned for addressing the reduction of disaster risks and efforts to enhance resilience. The amendment of the DMA has integrated climate change efforts to reduce the extent of natural hazards from affecting vulnerable communities, while also mitigating the severity of climate related hazards. The reason behind this lies in that climate change is a cross-cutting issue which requires different departments and role players to fully address disaster risks and climate-related hazards. Both the DMA and the NDMF stem from the Constitution of South Africa (see section 24 and 41(b)) which gives a directive to all the spheres of government to make sustainable efforts to protect the environment and its citizens. Because climate change and DMA cannot function in isolation, the respondents also noted that the NEMA and Water provision related policies play a pivotal role in reducing disaster risks and enhancing the resilience against climate-related hazards. The NEMA plays a similar role with the DMA and NDMF by enforcing section 24 of the Constitution; therefore, ensuring people's lives and environment are protected against climate-related hazards. Additionally, the water provision related policies and legislation act as a subset to equitably provide the nation with sufficient water in a sustainable manner while also safeguarding the environment from climate-related hazards such as drought.

6.2.1.3 Food security policies in South Africa

Post 1994 came with a myriad of food security policies enacted to address section 27 and 28 of the Constitution which makes provision for equitable access to supply food for all South Africans. These include the Agriculture White Paper, IFSS, NPFNS, Household Food and Nutrition Security Strategy and the Fetsa Tlala (End Hunger) Initiative (see section 3.3.4). Despite the Agriculture White Paper being adopted in 1995, one of its shortfalls was that it was not sufficient in attaining household food security and lacked a detailed strategy to address food (in)security in South Africa. The IFSS was developed to integrate the isolated food security policies whereas the NPFNS was endorsed as the comprehensive plan for attaining food security in South Africa. Similar aims to achieve food security are gathered from the Household food and Nutrition Security Strategy and Fetsa Tlala initiative in South Africa.

The respondents further mentioned several food security policies/strategies in South Africa, which include the Conservation of Agriculture Resources Act (CARA) and the National Policy on Comprehensive Producer Development Support (NPCPDS) (see section 5.3.1) which both make provision for quality and nutritious food through government support structures.

The respondents alluded that progress has been made with achieving food security on a national level, but household food security is still an issue that needs to be addressed. The respondents believed that climate change has had a negative effect on food security in South Africa. Furthermore, the integration between food security and DRR/CCA policies is still lacking.

The interviews with the respondents revealed that Climate Smart Agriculture (CSA) is an approach/programme used to enhance food production while also being climate resilient. CSA has been widely credited for its efforts towards adaptation, mitigation and enhancing food security through extreme weather conditions, i.e., through crops that are tolerant to drought, flood and heat/cold stresses (Khatri-Chhetri *et al.*, 2017).

6.2.2 Evaluate interactions and constraints between food systems and disaster risk(s)

The literature (see section 2.6.5) revealed that emphasis has focused on food production and rarely concentrated on the entire food value chain. As a result, there is insufficient knowledge regarding food systems and the risk factors thereof.

Food systems comprise of the following activities: food production, processing/packaging, distribution and consumption. Enhancing the resilience of one activity (i.e., production) and not the entire system generates a vulnerable post-production state. Therefore, if focus is only on food production, post-harvest management can prove to be problematic in dealing with disease outbreaks and incline in nutritional status.

As previously mentioned above, it is important to establish a relationship across the entire food value chain and not only on one system. Each node on the food value chain has implications for the other nodes. For example, direct climate change impacts on food production can alter post-production management and increase food prices for end-users. Consequently, this proves that food systems are inter-connected and lack of comprehensive risk reduction effort(s) may have a negative impact on the entire food value chain.

Section 2.6.1 show that climate change has multiple interactions with food systems. From the production perspective, increasing temperatures can affect soil quality whereas lack of water management can enhance crop evapotranspiration. Climate-related hazards such as droughts and floods can negatively impact infrastructure (livestock facilities and fields) and commodities such as maize and finger millet. Climate change can also affect post-production management by creating high volumes of waste and destroying processing facilities. A disruption in infrastructure and transport roads can create an increase in transport and food prices.

6.2.2.1 *Food systems in South Africa*

Food systems in South Africa is poorly reflected in institutional terms; however, several studies (see section 2.7.1.6) assert that South Africa's food system is dichotomous and includes an informal and formal side. This consist of a large group of small-scale farmers and the commercial sector, respectively. The research findings stress that the current food system favours the commercial sector and marginalises the small-scale farmers.

Multiple/several food value chains were analysed in Chapter 2. These include the Agro-food parks, beef, maize, small-scale fisheries and the apple value chain. The agro-food parks were established as a network of agro-production, processing, logistics, marketing, training and extension services. What the data gathered regarding the agro-food system is that Agri-parks

were established to strengthen South Africa's agriculture value chain as well as to improve food security and the livelihoods of its beneficiaries. Moreover, Agri-parks are guided by the principle that they are farmer controlled, must support rural industrialisation and create a bond between the government and private sector. Findings indicate that there is insufficient documented research and support done regarding the network of risk reduction and adaptation efforts across the agro-food chain.

The remaining value chain (i.e., beef, maize, aquaculture and apples) consist of a primary, secondary and tertiary sector. The primary sector includes input suppliers and producers. The secondary sector includes the processing whereas tertiary involve distribution and the end-user (i.e., retail and consumer). The respondents alluded that climate change is a threat to all sectors (primary, secondary and tertiary) which makes adaptation and risk reduction strategies mandatory.

The respondents noted that extreme weather conditions affect all food security pillars (availability, accessibility, utilisation and stability) but too much emphasis has been placed on availability alone.

The DALRRD is the leading department that deals with food security issues and ensuring the food sector is integral with other departments such as the DEFF. Moreover, DALRRD ensures that the small-scale fisheries and aquaculture value chain directly benefits its beneficiaries. The small-scale fisheries sector plays a vital role in ensuring food security and poverty alleviation. Approximately 250 million people worldwide benefit from small-scale fisheries by uplifting livelihoods, employment and income through harvesting, processing and marketing. In South Africa however, there is no formal accurate estimation of how many people currently benefit from the small-scale fisheries value chain.

The DALRRD promulgated the small-scale fisheries policy in 2012 which aimed to enhance food security and reduce poverty. The policy has been criticised (see section 2.7.1.4) for systematically failing to uplift small-scale fishers and protecting them against the impacts of climate-change. Both the DRR and CCA policies fail to make mentions of the small-scale fisheries value chain. In contrast, despite the consistent growth of the aquaculture value chain, the sector also lacks climate change and disaster risk resiliency. Additionally, relatively few adaptation options (such as developing refrigeration infrastructure and capturing abilities) have been noticed in the food value chain, but on a holistic level, the CCA and DRR efforts have

generally helped a few and have been inadequate by only addressing short-term climate change shocks (Van der Lingen & Hampton, 2019). Enhancing food security against climatic shocks requires a full food value chain assessment. The lessons learned on how to improve South Africa's aquaculture/small-scale fisheries value chain against climatic shocks are from Uganda's fisheries sector. The aforesaid sector consists of a vulnerability assessment on the different stages of the value chain and potential outcomes for the fisheries if climate-resilience measures are not integrated.

The apple value chain in South Africa served as a lesson/tool to portray the importance of including climate-resilience measures throughout the food value chain. The apple value chain in South Africa employs over 26 000 people for production and processing while it has over 100 000 dependents. Climate change can affect fruit size, distribution and food loss if not properly addressed in the sector (see section 2.7.1.5). The literature review (see section 2.7.1.5) proclaims that some farmers in the apple value chain (e.g. those in the Western Cape) practice CSA and adapt to the extreme climate conditions through efficient irrigation systems, enhancing refrigeration and managing post-harvest conditions.

The respondents emphasised the lack of consistent adaptation options throughout the food value chain. Moreover, the complexities of adaptation and trade-offs across the food value chain in South Africa is not adequately addressed. A full functional climate-resilient food system is not probable. This is largely due to the complexities and trade-offs inherent within the food system. The respondents noted that due to the aforesaid complexities and challenges of food systems, adaptation and resilience measures often overlook multiple risks and set targets.

Climate change impacts on food systems is not a linear process. The respondents stated that the uncertainty of climate change impacts on food systems should be discerned and timely managed. Moreover, the respondents noted that this can further be a challenge as the food system in South Africa cuts across different sectors, policy fields, administrative levels and geographical scales.

6.2.3 Identify the challenges/progress in implementing DRR and CCA policies, plans and legislation in relation to enhancing food security

Climate change impacts on food security require effective set of policies between DRR, CCA and food security policy fields. The issue noticed regarding the integration between the three policy fields is that translating theory into practice is far from realisation. The reason behind this is that CCA, DRR and food security is multidisciplinary and requires several institutions/sectors and private-public partnerships, which can be difficult due to the perception that people hold different belief systems and values. The UNISDR (2011) argued that a pre-requisite to having a successful DRR involves a combination of top-down and bottom-up approaches that support partnerships between government sectors and local communities. Therefore, the inclusion of policymakers, civil society and various stakeholders across different governmental institutions is mandatory. This is because risk reduction, risk avoidance and mitigation/preparedness involve the use of different government levels and private institutions.

DRR does not operate in isolation and should be integral with CCA efforts to enhance resilience against natural and extreme climatic conditions. Successful integration between the two policy fields is a challenge as a result of institutional, financial and political barriers (see section 2.3). The failure to effectively integrate both DRR and CCA policies and legislation creates obstacles for enhancing resilience against climate change impacts and achieving sustainable development. The lack of integration further creates a gap between DRR and CCA policy fields which affects poor communities who are vulnerable to the effects of climate change impacts and disaster risks.

The integration between CCA, DRR and food security is still lacking in developing countries. This is because integration between the three policy fields is a relatively new concept. Consequently, Edame *et al.* (2011) note that this has resulted in a lack of interdepartmental coordination and comprehensive funding mechanisms to successfully implement CCA, DRR and food security efforts collaboratively. One of the research participants noted that CCA in South Africa is an unfunded directive and has no direct financing. This has created a bridge between policy and practice regarding CCA efforts aimed at enhancing resilience against climatic shocks.

There has been substantive progress made in South Africa's recently amended DMA of 2015 by including CCA in its policy; however, food security is still not discussed or referenced. The

respondents fully agreed that the failure of CCA and DRR policies to fully integrate food security initiatives is unfavourable to enhancing resilience of food security against climate change impacts.

Some of the respondents argued that CSA is a tool which incorporates CCA, DRR and food security, especially for emerging farmers which are prone to climate related hazards. Despite this, there is a level of agreement that implementation of CSA has been lacking. Conversely, the respondents proclaimed that efforts such as Early Warning Systems, climate change units in various departments/sectors and an increase in risk knowledge across climate change vulnerable communities have improved. As such, some respondents argued climate change and risk reduction efforts have developed interdepartmentally post CCA-DRR policies.

The DALRRD, which is the leading regulator in food security policies and plans, has a unit for disaster management which has its own monitoring systems (i.e., Early Warning Systems) and plans that may enhance the resilience of food security against adverse climate change impacts. The literature (see Chapter 2) argued that the inconsistencies between policies and departments creates ineffective institutional processes. Legislation and policies are mandatory for enabling actions needed to be taken to address set objectives. Therefore, it is inconsistent for governmental departments (i.e., climate change units in the DALRRD) to not be supported by legislation or policy.

The findings reveal that CCA-DRR have largely focused on one entity of the food security spectrum, being 'production' rather than the entire food security dimension(s). The same can be said for the small-scale fisheries value chain. The research findings disclose that this has left the post-production food security spectrum vulnerable to climate change impacts. The respondents stressed that this largely affects the rural and emerging farmers the most. This is because rural and emerging farmers rarely afford CCA and DRR tools.

In general, the food security policy field has been negatively impacted by lack of interdepartmental collaboration between the DALRRD, NDMC and DEFF. Furthermore, the lack of capacity and understanding on what entails integration between CCA, DRR and CCA has negatively affected communities that are vulnerable to climate related hazards and food (in)security. The findings suggest that food insecurity and climate change issues are often dealt with as separate entities. One of the reasons given for this is that the size of government makes

it difficult to prioritize CCA-DRR and food security policy integration due to different opinions and political conflict. The size of government, political conflict and climate change critics have blurred the lines of communication and interlinkages between CCA, DRR and food security departments.

CCA is a relatively new concept and respondents stated that some governmental units are sceptical of climate change impacts on the agriculture sector. It is a difficult task for government and non-government entities to integrate CCA into local-development strategies due to its complexities and lack of legislative support. The study highlights the lack of support gained from some communities which believe climate change is an illusion propagated for economic and political reasons. Moreover, some communities and emerging farmers that aim to enhance food security through adaptation and risk reduction methods are often held back by traditional methods of farming that fail to recognise modern tools of CCA and DRR. Subsequently, traditional methods of farming have largely been followed by resistance to integrate CCA-DRR tools. Resistant farmers commonly wait for the adverse effects of climate change to directly affect them before adapting and reducing risks, which goes against the principles of CCA and DRR.

6.2.4 Conclusion of the research

In summary, it is conclusive that CCA and DRR policies can enhance food security if there is proper planning, integration and implementation. There is lack of coherent connection between CCA, DRR and food security policies in South Africa. The widely recognised active CCA policy is the NCCR white paper that notices the impacts of climate change on vulnerable small-scale, subsistence farmers and food (in)secure communities, but lacks a detailed plan on how food security can be achieved through a changing climate. Moreover, climate change in South Africa is an unfunded mandate which questions the legibility of implementing CCA policies. Climate change policies in South Africa are insufficient as one policy is widely recognised whereas the other one is still a draft document. Policies that address water, infrastructure and livelihood diversification are used as alternates for CCA.

The NCCR policy recognises DRR as a tool that coincides with CCA efforts to enhance the resilience of vulnerable communities against adverse climate change impacts. The two mostly recognised policy and legislative structures of DRR include the DMA and the NDMF which develops efforts for preventing and avoiding disaster risk(s). The amended DMA makes

provision for CCA; however, food security is still not referenced. On a national level, the NDMC has an advisory forum which highlights disaster risk impacts on food security issues. Conversely, the study proves this to be inconsistent as food security is not always a priority and the agenda for the day.

There are several food security policies which include the NPFNS, IFSS, Agriculture White Paper, Household Food and Nutrition Security Strategy and the Fetsa Tlala initiative. There is no conclusive evidence of an integration between food security policies and DRR-CCA policies in South Africa. The NDMC respondents acknowledged that this is a gap between the policies whereas DALRRD respondents noted that the relationship is supported by their Disaster Management Unit, despite the lack of reference in the policies. The study has highlighted this as an inconsistent approach with no formal legislative support.

The research findings revealed that there is no established network between the leading DRR, CCA and food security departments. The argument lies that DRR, CCA and food security policies operate in isolation. Successful integration between the three fields is a result of institutional, financial and political barriers.

There is however progress within the DALRRD by including disaster management units to enhance DRR tools, particularly Early Warning Systems, CSA and risk knowledge across vulnerable communities.

The study has highlighted the direct and indirect impacts of climate change on food security and food systems. CCA-DRR has largely focused on one entity of the food system spectrum rather than the entire food value chain. The food system in South Africa is interconnected and therefore requires a CCA-DRR approach across food production and post-production activities. Moreover, South Africa lacks a holistic policy framework that governs the country's food value chain and its resilience against climate change conditions.

The research further highlighted that climate change influences all food security pillars; however, too much emphasis has largely been on food 'availability' which has left the remaining pillars (accessibility, utilisation and stability) vulnerable to adverse climatic shocks.

The mismatch between CCA, DRR and food security policies leads to an ineffective and less responsive implementation. Due to inherent maladministration and lack of interdepartmental

coherence, CCA, DRR and food security spheres are weak. To address this gap, the following recommendations are given to enhance the resilience of food security through a CCA-DRR policy integration.

6.3 RECOMMENDATIONS – OBJECTIVE 4

The study argued that there is a lack of integration between CCA, DRR and food security policies in South Africa. There are weak lines of communication and interlinkages between leading departments responsible for climate change, disaster risk(s) and food (in)security. As such, this has created a gap between policy and implementation. The recommendations to address these challenges are as follows:

Recommendation 1: Collaboration between departments

To have a consistent network between departments, it is important to have a clear channel of communication and interlinkage between the DEFF, NDMC and DALRRD. This creates an integration between CCA, DRR and food security units.

Recommendation 2: Food system resilience

It is recommended for government to have a holistic policy framework that governs the country's food system. It is important for the food system policy framework to consist of CCA-DRR strategies to enhance the resilience of food value chains against adverse climatic shocks.

Recommendation 3: Multi-level governance structure

Food security, CCA and DRR cuts across different sectors and levels and as such, it is recommended for CCA and DRR to make provision for a multi-level governance for adaptation and disaster risk resilience directly aimed at enhancing food security. This will help both government and non-governmental entities to formulate and implement policies on all levels and spheres.

Recommendation 4: Appropriate funding mechanism

An appropriate funding instrument for CCA should be made available. Moreover, it is recommended that the CCA fund should extend towards policies and strategies that enhance both DRR and food security.

Recommendation 5: Capacity development

It is recommended that government and non-government entities to establish plan of actions aimed at enhancing the capacity of government and non-governmental officials responsible for enhancing food security, CCA and DRR. The plan of actions should be inclusive and participatory to evaluate gaps inherent in organisations.

Recommendation 6: Policy success criteria

Generally, policies cannot function in isolation. It is recommended for CCA, DRR and food security policies to contain a holistic implementation plan that specifies the different actors involved and consists of Monitoring and Evaluation (M&E) systems and success criteria of the overall implementation. Furthermore, it is important for the implementation plan to include feedback channels to inform government, non-government entities and stakeholders of the current state and projection(s) of the said policies.

6.3.1 Recommendations for further research

- This study revealed that a sustainable funding mechanism for CCA, DRR and food security is lacking. Therefore, further research should focus on the establishment of a funding model for CCA, DRR and food security policies. This would help allocate funds for a climate resilient food security system.
- Establish a climate resilient food system implementation framework. The reason for this is because the implementation and resilience of food systems, is poorly reflected in institutional terms.
- Research can focus on methods to improve governance structures between climate change, disaster risks and food security policies and legislation.
- Assess the balance between climate change mitigation and adaptation policies on food security pillars. This would help in establishing whether both mitigation and adaptation efforts are integrated and adopted to enhance food security and minimise the possible impacts of climate change.

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Annexure A: Research Ethics Training Certificate

	Zertifikat	Certificado
	Certificat	Certificate
Promouvoir les plus hauts standards éthiques dans la protection des participants à la recherche biomédicale Promoting the highest ethical standards in the protection of biomedical research participants		
	Certificat de formation - Training Certificate	
	Ce document atteste que - this document certifies that	
	Tshepo Nkolanyane	
	a complété avec succès - has successfully completed	
	Introduction to Research Ethics	
	du programme de formation TRREE en évaluation éthique de la recherche of the TRREE training programme in research ethics evaluation	
	Release Date: 2019/03/11 CID : c6GNY3Vw0	 Professeur Dominique Sprumont Coordinateur TRREE Coordinator
	Federatio Pharmaceutica helvetica FPH Programmes de formation continue	Continuing Education Program Programas de formación continua
Ce programme est soutenu par - This program is supported by : European and Developing Countries Clinical Trials Partnership (EDCTP) (www.edctp.org) - Swiss National Science Foundation (www.snf.ch) - Canadian Institutes of Health Research (http://www.cihr-irsc.gc.ca/e/2091.html) - Swiss Academy of Medical Sciences (SAMS/ASMS/AMW) (www.sams.ch) - Commission for Research Partnerships with Developing Countries (www.kfpc.ch)		
[REV : 20170310]		

Annexure B: Questionnaire Samples

1. Department of Environment, Forestry and Fisheries

Introduction

The researcher is a MSc (Geography and Environmental Science) student at the North-West University at the Potchefstroom campus. The research is based on whether climate change adaptation and disaster risk reduction policies in South Africa enhance food security. The motive behind the semi-structured interview questions is to acquire necessary information and experiences regarding food security in a changing climate and the interplay of policies from the three fields (food security, climate change adaptation and disaster risk reduction). It is worth noting that the information acquired is only for research purposes and discretion will be highly exercised.

The following are the semi-structured interview questions for the Department of Environment, Forestry and Fisheries (DEFF)

- 1) What are the policies and/or legislation that address climate change adaptation in South Africa?
 - a. Are they integral with disaster risk reduction and food security policies? If yes, please describe this integration and state whether in your opinion to what extent it enhances (and/or diminish) food security outcomes?
- 2) Do CCA policies address the entire food value chain spectrum?
 - a. If so, to what extent?
 - b. If not, how can this be addressed?
- 3) Can you identify the challenges/gaps resulting from the integration between CCA, food security and DRR policies/legislation? How can the challenges/gaps be addressed?
- 4) In your opinion, do CCA policies successfully (in a collaborative and cross-sectoral approach) enhance food security in SA? Please explain

2. National Disaster Management Centre

Introduction

The researcher is a MSc (Geography and Environmental Science) student at the North-West University at the Potchefstroom campus. The research is based on whether climate change adaptation and disaster risk reduction policies in South Africa enhance food security. The motive behind the semi-structured interview questions is to acquire necessary information and experiences regarding food security in a changing climate and the interplay of policies from the three fields (food security, climate change adaptation and disaster risk reduction). It is worth noting that the information acquired is only for research purposes and discretion will be highly exercised.

The following are the semi-structured interview questions for the National Disaster Management Centre officials.

- 1) What are the policies and legislations that address disaster risk reduction in South Africa?
 - a. Do they complement food security and climate change adaptation policies and legislation (In what way do they complement the aforementioned policies and legislation)?
- 2) What has been achieved and learned so far in terms of aligning disaster risk reduction policies and legislation with climate change adaptation and food security policies/legislation?
- 3) Are there support mechanisms to help enforce the implementation of this integration, especially at local level?
 - a. How do the aforesaid mechanisms ensure there is a logical flow of support from the national, provincial to local level?
- 4) Are there monitoring and evaluation (M&E) mechanisms available to oversee the implementation of the policies and legislation that they align with food security prospects?
 - a. If yes, what are they and their challenges?
 - b. If no, how do you think this impacts food security and how can the lack of the aforesaid mechanisms be addressed?

3. Researchers/Academia

Introduction

The researcher is a MSc (Geography and Environmental Science) student at the North-West University at the Potchefstroom campus. The research is based on whether climate change adaptation and disaster risk reduction policies in South Africa enhance food security. The motive behind the semi-structured interview questions is to acquire necessary information and experiences regarding food security in a changing climate and the interplay of policies from the three fields (food security, climate change adaptation and disaster risk reduction). It is worth noting that the information acquired is only for research purposes and discretion will be highly exercised.

Question for researchers

- 1) Is there a relationship between climate change, disaster risk reduction and food security?
If so, please describe it.
- 2) What are the policies/legislation that govern food security, climate change adaptation and disaster risk reduction in South Africa?
- 3) Do the food security policies mentioned above work in harmony with climate change adaptation and disaster risk reduction policies (and vice versa)?
 - 3.1) If yes, how?
 - 3.2) If not, why?
- 4) How do you think climate change affects food systems?
- 5) Are there systems or mechanisms in place to monitor and evaluate food systems across different levels (national, provincial, local) and to protect value chains from climatic shocks?
 - a. If yes, what are they, what are the challenges facing the systems?
 - b. If no, how do you think this impacts food security and what measures should be takento address the lack of the aforesaid mechanisms/systems?
- 6) In your opinion, do climate change and disaster risk policies and legislation successfully (in a collaborative and cross-sectoral approach) enhance food security in South Africa? Please explain.