Utrecht University

Preventing the Meltdown of Chocolate -

Climate Change Adaptation and the Cocoa Sector

Implications in the Implementation of the National Climate Change Policy on Cocoa Farmers in the Juaboso District of Western Region, Ghana

Author: Anne Christine Dorst (4183592)
a.c.dorst@students.uu.nl
MSc Sustainable Development – International Development (SD-ID)
Utrecht University

Supervisor: Dr. K. Otsuki
Human Geography and Planning – Social Urban Transitions
Geosciences Faculty
Utrecht University

Second Reader: Dr. ir. J. Liebrand
Human Geography and Planning – Social Urban Transitions
Geosciences Faculty
Utrecht University

31st July 2019

Acknowledgements

After having had the opportunity to complete my study at Utrecht University and conducting fieldwork in Ghana, I am truly grateful to present my masters' thesis. At the end of this 6-month process, I would like to thank a number of people. Thank you, Dr K. Otsuki for all your structured feedback which has greatly helped guide me during the writing of this thesis. Thank you, Eli Amemo for being resourceful and incredibly patient with me while conducting interviews in the Juaboso district. Thank you to all the key informants and cocoa farmers who took time out of their days to share their perspectives with me on the matter. Thanks to my parents, brother and friends who helped keeping me motivated during the final stages of the writing process. Without all of your input and encouragement, this thesis would not have been possible. This thesis has been a great opportunity to learn an array of aspects on climate governance in Ghana at district level, of which I hope you, dear reader, will equally learn from.

LIST OF ABBREVIATIONS

ACCRA	Africa Climate Change Resilience Alliance
ADB	African Development Bank
Cocobod	Ghana Cocoa Board
CEC	Community Executive Chief
CED	Cocobod Extension Division
CIF	Climate Investment Fund
CREMA	Community Resource Management Areas
CSO	Civil Society Organisation
FC	Forestry Commission
FSD	Forestry Services Division
GBM	Green Belt Movement
GDP	Gross Domestic Product
GHG	Greenhouse gases
GNI	Gross National Income
HDI	Human Development Index
HFZ	High Forest Zone
IDH	Iniatief Duurzame Handel
IPCC	Intergovernmental Panel on Climate Change
INDC	Intended Nationally Determined Contributions
LAC	Local Adaptive Capacity framework
LBC	Licensed Buying Company
MESTI	Ministry of Environment, Science, Technology and Innovation
MOFA	Ministry of Food and Agriculture
NCCC	National Climate Change Council/Committee
NCCP	National Climate Change Policy
NCRC	Nature Conservation Resource Centre
NDC	Nationally Determined Contributors
NGO	Non-governmental Organisation
RECA	Rural Environmental Care Association
SYND	Strategic Youth Network for Development
TRF	The Resource Foundation
UNFCCC	United Nations Framework Convention on Climate Change
WBO	World Bank Organization

LIST OF FIGURES & TABLES

EXECUTIVE SUMMARY

The importance of climate governance has grown as nations over the globe are experiencing both physical and theoretical implications of climate change. Due to the multi-faceted nature of climate change, many nations have taken a top-down approach to climate governance by establishing appropriate adaptation strategies to be implemented at an international or national scale. The objectives of a national climate agenda must move from a national level down to a ground level, where the last government implementing body involve district institutions.

Districts play an integral role in implementing the top-down objectives of national policy, whilst simultaneously dealing with the bottom-up processes operating at a ground level. Yet, knowledge of district-level operations is surprisingly scarce. This prevents an accurate understanding of how national policies are practically carried out on the ground. This thesis aims to analyse the implementation of a national climate policy at district level.

The implementation of the agroforestry action plan of National Climate Change Policy (NCCP) in the cocoa sector in the Juaboso district of the Western Region in Ghana was taken as a case study. The cocoa sector in Ghana provided a unique case study. As a government-controlled sector but concurrently vulnerable to climate change, the cocoa sector is adopting the nationally imposed agroforestry adaptation strategy. Through a mixed-methods approach, data was collected from key informants and cocoa farmers from the Juaboso district.

Results showed that the climate targets of the NCCP were mechanized through the existing Ghana Forest Investment Program (FIP) in Juaboso. District institutions of Cocobod and Forestry Commission (FC) were deeply involved in the implementation. Cocoa farmers gained access to agronomic tree seedlings, training services and some agrochemicals to implement the strategy. Overall, the main findings illustrate that insufficient finances and resource constraints faced by district institutions are hindering cocoa farmers' ability to access to resources needed to implement the adaptation strategy.

The findings have practical and theoretical value. Practically, the identification of district implications deepened an understanding of the challenges cocoa farmers have in implementing a national adaptation strategy. Theoretically, the results illustrated the shortcomings of a top-down climate governance system at the district level. The work concludes that the top-down system needs to embrace non-governmental players to execute the multi-faceted nature of climate governance. This would allow a better distribution and accessibility of resources at a ground level.

Keywords: Climate change impacts, adaptive capacity, vulnerability, adaptation strategy, top-down governance approach, cocoa sector, district level.

TABLE OF CONTENTS

1. INTRODUCTION

Climate change as defined by the United Nations Framework Convention on Climate Change (UNFCCC) is the observed change in global climate over comparable time periods indirectly and directly attributed to human activities (Codjoe et al., 2013). Climate change impacts and its theoretical implications on nations have stimulated countries to establish appropriate mitigation and adaptation policies. Developing countries[1], in particular, require appropriate policies due to their precarious position of being both highly vulnerable to harsh climatic effects due to their geographical positioning and having a low adaptive capacity to adapt due to their limited access to financial resources (Gyampoh et al., 2009). As nonindustrialized or partially industrialized nations, developing countries are more dependent on the production of natural resources, such as agricultural and timber production, for their socio-economic development. These natural resources are vulnerable to climatic impacts, which puts a strain on the economic development of developing countries. Ghana is a prime example of this.

Ghana's agricultural sector accounts for 20% of the country's GDP (World Bank), but its predominantly rain-fed agricultural production is significantly vulnerable to climatic variability. Agricultural production includes the cocoa sector, which accounts for 30% of the country's export earnings (Norman et al., 2016) and 70-100% of the incomes of cocoa farmers (Asante & Amuakwa-Mensah, 2014; Läderach et al., 2013). The changing climate, in addition to deforestation rates and excessive chemical use, has negatively impacted cocoa yields and thus harmed cocoa-based livelihoods. With these prospects, ensuring that cocoa farmers can adequately adapt to climate change not only for their own livelihoods but also for the cocoa sector at large, is therefore of utmost concern for Ghana.

With the cocoa sector entirely managed by the sub-governmental body Ghana Cocoa Board (Cocobod) (Norman et al., 2016), the government of Ghana is at liberty to impose adaptive climate practices onto the nation's cocoa sector. The 2015-2020 National Climate Change Policy (NCCP) Master Plan is one such policy which aims to mainstream adaptive strategies across each sector nation-wide. Within the cocoa sector, the NCCP promotes the use of agroforestry programs which is the intercropping of timber trees alongside cocoa trees. This should generate a degree of shade and create a more favourable microclimate for cocoa production despite the dry, hot weather conditions occurring in Ghana because of climate change.

Though the objectives of the Master Plan sound promising on paper, it begs the question of whether these objectives are practically carried out at a ground level. The NCCP was established by the

[1] Definitions for developing countries has references to low Gross Domestic Product (GDP) per capita, low Human Development Index (HDI) or low levels of Gross National Income (GRI) per capita (Nielsen, 2011). The United Nations (U.N), however, does not have an official definition for a developing nation, despite persistently using the term for 159 nations. The World Bank Organisation (WBO) also does not distinguish between 'developing' and 'developed' nations, as the term does not capture the diversity of development stages across countries. For the purposes of this paper, a developing country is defined as a country with little industrial or economic activity and generally low incomes.

government of Ghana, which expects its actions to be carried out by the ministerial, regional and then, lastly, district institutions. At a ground level, district municipalities represent a core institutional unit that is the final implementing body before reaching the community. They are the government body closest to community action and thus where the majority of development actions are practically processed (Measham et al., 2011). For this reason, district institutions play a critical role in climate adaptation and implementation (Measham et al., 2011). It is thus imperative that implementation at a district level is carried out effectively to ensure that actions established at the top trickle down to the public.

There is little academic literature which evaluates how national policies are implemented at district level. Consequently, there is relatively little understanding of what potential challenges occur during implementation at district level. The focus of this thesis is thus to investigate the implications of implementation of a national climate agenda at a district level, taking the cocoa sector in the Juaboso district of Ghana as a case study. As a crucial cocoa production site and district with numerous institutions working within the cocoa sector, Juaboso is a relevant research site to understand how the adaptation strategy of the NCCP is being implemented at its district level. Data was collected from cocoa farmers and key informants within the district to understand how the NCCP aims to address climate change in the cocoa sector and improve the adaptive capacity of cocoa farmers. The focus of the study thus centralizes on the following research question: *how is the climate change adaptation policy being implemented on the cocoa sector of Ghana at a district level?*

As a means to explore this question, the thesis evaluates concepts of adaptation in the context of top-down and bottom-up governance approaches in a theoretical framework. This was done because a district embodies a level of governance where the top-down system of the national government meets the bottom-up processes of a public community. The theoretical concepts were employed in analyzing identified knowledge gaps using a conceptual model, followed by an introduction of the research objectives of this thesis. The research objectives were then contextualized within the regional framework before relating it to the methodology. Results were structured based on the sub-questions of each of the two research questions, before drawing up final conclusions and recommendations in the discussion.

2. THEORETICAL FRAMEWORK

2.1. Concepts of Adaptation

Adaptation is an inherently abstract term related to the system that seeks to adapt. A system can be defined as a community, district, nation or even an ecological zone that responds and adapts to external stimuli (Adger et al., 2005). For the purposes of this study, a system is defined as a district which aims to adapt to the external climatic stimuli of climate change.

To understand the extent to which the district level system can adapt to climate change, the interrelated concepts of adaptation, vulnerability and adaptive capacity are explored in this chapter. In order to understand possible similarities and differences, these concepts are then tied into the operations of bottom-up and top-down approaches of climate governance later in the chapter.

2.1.1. Adaptation

Adaptation in the context of climate change refers to "an adjustment in ecological, social or economic systems" (Adger et al., 2005, p.78), according to the Intergovernmental Panel on Climate Change (IPCC). For a system to be able to adapt, it requires an "ability to respond and adjust to actual or potential impacts of changing climate conditions in ways that cause moderate harm or take advantage of any positive opportunities that the climate may afford" (Codjoe et al., 2013, p.20). This is then different from mitigation, which aims to lessen the climatic impact, such as reducing greenhouse gases (GHG). How a system adapts depends on the external factors affecting it and its internal characteristics.

Internal characteristics relate to the normative standards and capabilities of a system, such as its geography and socio-economic situation (Engle, 2011; Lim et al., 2005; Smit & Wandel, 2006). If a system has more favourable characteristics, such as decent infrastructure, finances and skilled labour, then the likelihood of adaptation is higher as the system has a greater capacity to adapt. Internal characteristics can also include social capital, such as cultural norms and interpersonal relationships that either hinder or facilitate adaptation.

External factors include the climatic impact(s) disturbing the system, which is context-specific. For example, climate impacts in the northern districts of Ghana may include severe droughts, whilst climatic impacts in the coastal districts of Ghana may include flooding. It is difficult to accurately estimate the severity and propensity of external stimuli due to the complex nature of the climate. This makes it difficult to determine an appropriate response. Yet, it is possible to estimate how vulnerable a district may be by estimating how exposed the district is to climatic stimuli and their effects on the district.

Overall, the internal and external factors indicate the adaptive capacity and vulnerability of a system, respectively. These two terms are key concepts that determine the course of adaptation within a system.

2.1.2. Vulnerability

Vulnerability of a system in the context of climate change is the relationship between short or long-term exposure to anticipated hazards and a system's response to those hazards (Brooks, Adger & Kelly, 2005). It is based on the level of exposure, defined as the degree to which a system is in contact with climatic stimuli, and sensitivity, defined as how much a system is modified or affected by the stimuli (Reeds et al., 2013). The more a system is exposed and sensitive to a climate stimulus, the lower the likelihood of adequate adaptation (Smit & Wandel, 2006).

Exposure and sensitivity are interdependent properties of a system's vulnerability reliant on both climatic stimuli and the broader social, economic, environmental and political characteristics of the system. An example is a poorer socioeconomic district situated in an arid climate being affected by prolonged drought. The district has a high level of exposure to the climatic stimuli due to the prolonged nature of the drought (exposure) and is consequently experiencing water shortage due to the lack of irrigation systems present and its already arid climate (sensitivity). Hence, the degree of vulnerability of a system experiencing a climate stimulus is dependent on the system's characteristics (Smit & Wandel, 2006; Engle, 2011), which in turn determines how a system could feasibly adapt.

2.1.3. Adaptative Capacity

Adaptive capacity is the ability of a system to prepare, adjust or respond to the effects of external stresses in advance, through its ability to mobilize resources in anticipation or response to those stresses (Adger et al., 2007; Engle, 2011). Adaptive capacity is related to resilience, defined as the capacity of a system to accommodate stresses or disturbances, from which it learns to maintain or improve essential basic structures through the mobilization of its available resources (Speranza et al., 2014; Folks et al., 2002). If a system has a higher adaptive capacity, it has a greater likelihood of effective adaptation.

Akin to vulnerability, adaptive capacity is shaped by social, political and economic processes at multiple scales (Engle, 2011; Smit & Wandel, 2006). Influences include, for example, access to financial, technological and information resources, social capital and political influence (Adger, 2003; Smit & Wandel, 2006). When taking the previous example of the drought-ridden district, the adaptive capacity is relatively low due to the absence of adequate infrastructural and financial resources available as the district has a lower socioeconomic standing. Hence, identifying what builds as well as limits the adaptive capacity of a system is important to recognize what form of adaptation can be undertaken.

2.1.4. Combining all three

As illustrated by the interrelated definitions of adaptation, vulnerability and adaptive capacity previously discussed, the three concepts are interlinked. The adaptive capacity of a system affects vulnerability by modulating exposure and sensitivity (Adger et al., 2007), which in turn affects the degree of adaptation. This interrelated hierarchy model is indicated in Figure 1. The interaction between local and broad-scale social and environmental determinants influence vulnerability and the adaptive capacity in their own respective means, but the overlaps recognize that the processes can be interdependent (Smit & Wandel, 2006). The overlap between all factors indicates adaptations that cover all aspects of the problem (Figure 1). However, a system may choose to focus only on particular determinants depending on its intended objectives. A national climate policy focuses on climate adaptation at broader national scale determinants, which are translated into more specific local level scale determinants, for example.

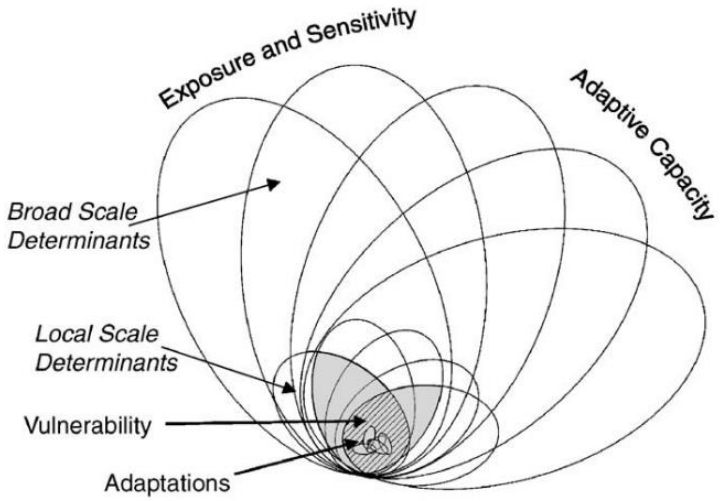

Figure 1. Nested Hierarchy Model of Vulnerability, Adaptive Capacity and Adaptation (Source: Smit & Wandel, 2006)

A question that then surfaces is what determines a successful form of adaptation when it is relative to the determinants observed. Successful adaptation relates to "the capacity of an adaptation action to achieve its expressed objectives, either through the achievement in reducing impacts or risks" (Adger et al., 2005, p.81). If a system, defined as a district for the purposes of this study, aims to reduce sensitivity it can do so by, for example, promoting the planting of alternative crops. A district may alternatively aim to reduce exposure to a climate stimulus by investing in preparations to hazardous events. It could also increase resilience by cumulating access to resources to recover from losses by increasing its reservoir storage capacity (Adger et al., 2005). Ultimately, adaptation is dependent on the normative definition and intended objectives of the system.

2.2. Climate Change Adaptation Governance

Once a system has assessed its framework of vulnerability, adaptive capacity and normative objectives to determine an appropriate adaptation strategy, it is then necessary to determine how that strategy should be integrated within the system. Implementing any form of adaptation within a system requires authoritative effort to ensure that the necessary changes are realised. This concerns governance, which consists of a series of purposive acts that exercise control and allocate resources with authority aimed to steer a system (Andonova, Betsill & Bulkeley, 2009). Climate governance, specifically, includes mechanisms and measures that steer social systems towards mitigating or adapting to climate change risks. Any form of governance involves a variety of stakeholders, including traditional leaders, governments or international organizations, depending on the system involved (ibid; Jagers & Stipple, 2003).

The approach to climate governance inherently depends on the system involved. Climate governance at an international level, such as the UNFCC, illustrates a top-down approach to climate governance by operating with a multitude of stakeholders and prioritizing the global goal of reducing greenhouse gas (GHG) emissions. On the other hand, climate governance at a community level represents a bottom-up approach by prioritizing the impacts felt within a community, such as the Green Belt movement[2] in Kenya. Whereas these two examples illustrate a clear top-down and bottom-up approach, respectively, the two approaches can intermingle. A district implementing national climate action is prescribed specific adaptation strategies from its national government but simultaneously interacts with the bottom-up processes of its district communities. Each approach is assessed individually in the following chapter to understand their theoretical characteristics, before connecting the two in the context of a district.

2.2.1. Bottom-up approach

A bottom-up approach considers participatory techniques and relies on stakeholder expertise (Dessai & van der Sluijs, 2007; Lemieux et al., 2014). It involves the collaboration between community members and additional stakeholders to solve an issue particularly felt at a community level. This collaborative action gradually mobilizes the participation of bodies higher in the institutional hierarchy to establish necessary changes across impacted communities. An example includes the Green Belt Movement, where community women mobilized resources to encourage collaborative community afforestation to combat the issues of food insecurity, drier climates and insufficient firewood (SOURCE).

[2] The Green Belt Movement (GBM) was founded in response to food insecurity and drier communities at a community level in Kenya. The GBM encourage community women to collaboratively grow seedlings and plant trees to store rainwater, provide firewood and restore the initial climate (The Green Belt Movement, 2019).

The mobilization of resources at a local level is thus key to implement bottom-up adaptive actions, highlighting the importance of adaptive capacity at a ground level. A valuable framework in assessing adaptive capacity at a local level is the Local Adaptive Capacity (LAC) framework (World Vision, 2011), developed by the Africa Climate Change Resilience Alliance (ACCRA), which holds the underlying assumption that the increase of five characteristics positively enhance a local systems' overall adaptive capacity (Figure 2). The five key characteristics include the following.

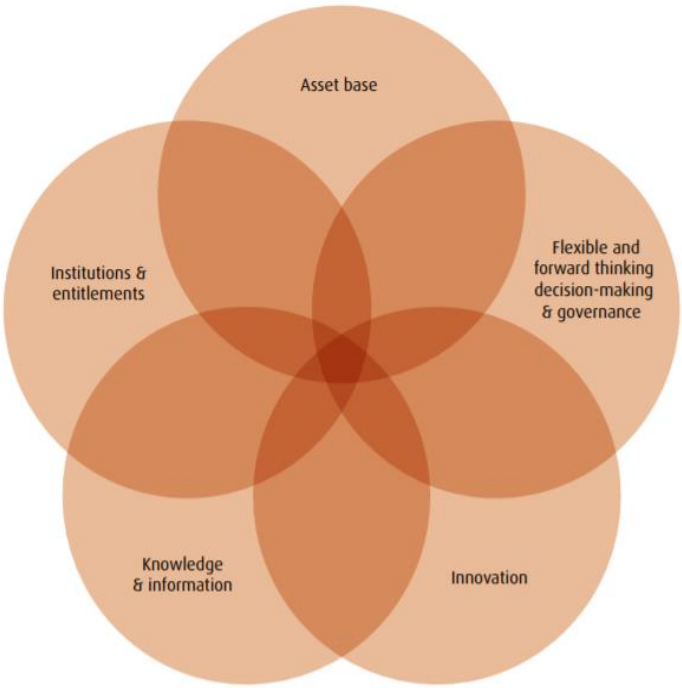

Figure 2. Local Adaptive Capacity Framework (Source: World Vision, 2011).

First, "Asset base" contains five assets required for a system to respond, namely natural capital (i.e. quantity of natural resources); human capital (i.e. amount of knowledge and labour available), financial capital (i.e. inflows of money and savings), physical capital (i.e. access to infrastructure, tools and equipment) and, lastly, social capital (i.e. networks and social relationships for cooperation, support and mutual trust) (Reed et al., 2013). A community that has a greater degree of access to some or all five assets, has a higher capacity for adaptation.

Second, "Institutions & Entitlements" relate to the ability of a system to ensure equitable access and entitlement to assets. 'Entitlements' refer to integrated characteristics that determine an individual's access to assets, such as education, ethnicity, gender and religion. 'Institutions' refers to the institutional environment that allows equitable opportunities to all groups (World Vision, 2011).

Thirdly, "Knowledge & Information" relates to the degree of awareness and accessibility to information on key resources, such as estimations of external (climate) stimuli and adaptation options which together determine the degree to which a system can adapt.

Fourthly, “Innovation” highlights the technical large-scale or autonomous small-scale strategies and initiatives used by people in order to adapt to external stimuli, such as climate change. Finally, “Flexible and forward-thinking decision-making & governance”, or “Governance” for short, refers to the extent to which there is transparency and participation of people and local organizations in decision-making processes aimed to increase adaptive capacity.

In an ideal scenario, a community would be equipped with all five characteristics in equal amounts. This would be represented as equally sized and overlapping characteristics in Figure 2. In reality, there frequently is unproportionate access to all characteristics, illustrating a more unsymmetrical framework instead. The LAC framework is meant to be used to analyse local adaptive capacity which can be used for research purposes or policy implementation (World Vision, 2011). Identifying which characteristic may be lacking in accessibility can highlight areas of improvement.

Although the five characteristics are employed at a ground level to establish initial local changes, it is interesting to note that all five characteristics are either indirectly or directly related to the present top-down governance system. For example, the provision of information about climate change to district communities may be mediated by media sources or extension officers from institutions, which are established through top-down approaches. The same could be argued for “Institution” in terms of how accessible adaptation strategies are to community residents and how those strategies are distributed within the district. A top-down political system which is equitable, transparent and resourceful would potentially increase accessibility to all five characteristics. Hence, it is relevant to note that alongside the existing local characteristics that determine local adaptive capacity, top-down approaches also determine the adaptive capacity of a local system.

2.2.2. Top-down approach

A top-down approach considers technical and scenario-driven knowledge to develop appropriate adaptation strategies (Dessai & van der Sluijs, 2007; Lemieux et al., 2014), where institutions impose international, national or regional action(s). In contrast to a bottom-up approach which specifically focuses on a local issue, the aim of a top-down approach is to invoke large-scale action on behalf of society, addressing extensive issues such as climate change impacts. An example includes the UNFCCC, which collaborates with various national governments and research institutions to establish collaborative global climate action in curbing greenhouse gas emissions (GHG).

There is a certain degree of messiness to the top-down approach due to its multi-actor and multi-sectoral nature. When following a top-down approach, a dynamic process of social learning and self-organization ensues as various normative convictions and empirical data are gradually translated into collective actions (Leach et al., 2010; Wise et al., 2014). During these dynamic discussions, a consensus

of action needs to be reached which all involved actors can abide by, both in terms of it being within their capacity and within their interests (Ford et al., 2013).

Alongside these complex negotiations, the actors involved also have to deal with an already complex issue, namely climate change. Consequently, akin to any other top-down governance structure, climate governance generally focuses on coherent outcomes as a more comprehensible unit of measurement. This unit of measurement is often a physical vulnerability (Figure 3) hat all involved actors can understand, such as sequestering units of atmospheric carbon dioxide. It is a simplified unit of measurement that is relevant at both a global and national level, as all nations are experiencing elevated carbon levels. It is also in conjunction with rational economic thinking, whereby climate change adaptation outcomes are measured in avoided costs and improved efficiencies (Adger et al., 2005). A reduction in GHG levels indicates a measurable indication of progress.

However, this simplification generates two major shortcomings. First, it captures only the short-term effectiveness and risks inferring causality that a particular adaptation action resulted in a certain outcome without considering external forces (ibid; Wise et al., 2014). Secondly, an outcome-based approach overshadows socioeconomically constraints that undermine the outcome of the implemented climate action. It does not capture the local, social vulnerabilities (Figure 3). Social vulnerabilities are also not apprehended due to the fact top-down adaptation policies are often established without much dialogue with the ground-level public, despite the multitude of actors involved. Consequently, local constraints in the adoption of adaptation strategies are frequently overlooked (Reeds et al., 2013; Wise et al., 2014). This is one of the major limitations of a top-down approach; at the top, policymakers theorize appropriate strategies to be implemented without regularly checking at a ground level whether the theory can be practically carried out. A gap thus ensues between the top-down and bottom-up approaches, where there is relatively little interaction between the two.

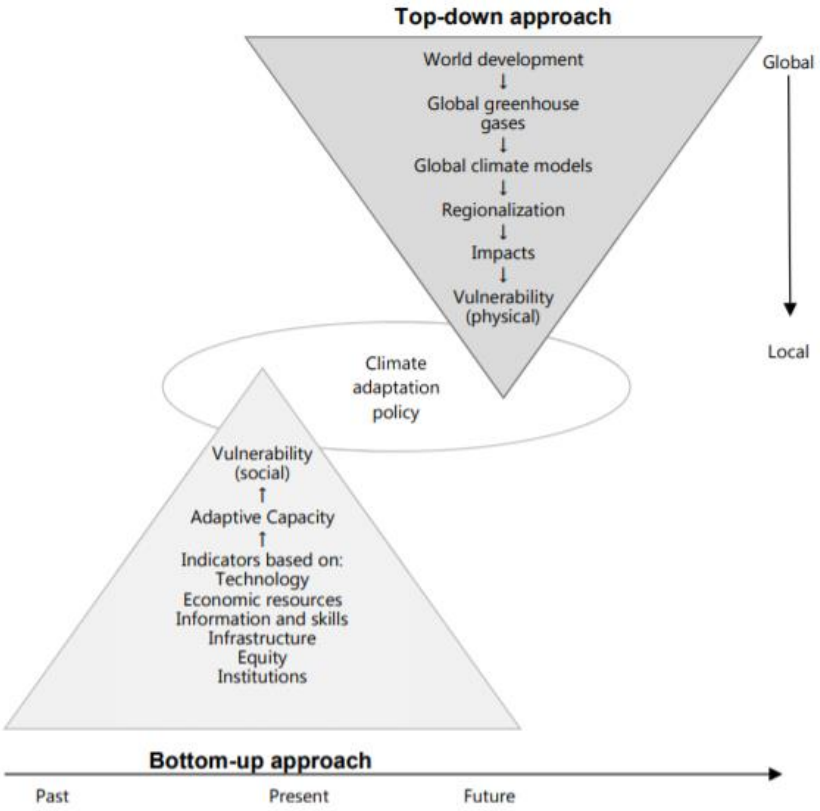

Figure 3. Top-down and Bottom-up Approaches to Climate Change Adaptation (Source: Deasia & van der Sluijs, 2007)

The gap between the two approaches is represented by the two separate triangular structures in Figure 3. The climate adaptation policy operates within this open space. Essentially, the top-down approach has gradually specified the climate change issue into a viable climate adaptation policy using an outcome-based approach that can be implemented at a local level. The climate adaptation policy is then disseminated into the open space and interacts with the social vulnerabilities and adaptive capacity of the bottom-up processes, influencing how the climate adaptation policy is adopted. This translation from a top-down to bottom-up approach thus occurs within the climate adaptation policy space, where ground-level institutions operate, such as districts.

The district, as a representative of the government, is the main contact point and implementor of action at a ground level. District officials interact with the public as they implement the nationally established strategies, thereby being a prime area of study of observing climate change adaptation policy implementation. According to Agrawal & Perrin (2009), district institutions shape the "acquisition and distribution of [government] interventions in fundamental ways, thereby affecting the degree of success of such interventions" (p.4). This is due to the fact that district institutions affect the emergence of an

intervention into the community. They mediate external interventions such as knowledge, skills training and technological support into local contexts, and articulate between local and social political processes through which adaptation efforts unfold (Agrawal & Perrin, 2009).

This is the case of Ghana's cocoa sector, where the district is the final implementing body of the government. Ghana has an authoritative top-down government system, where the sector is entirely managed by the government of Ghana through the Ghana Cocoa Board (Cocobod), which is a government-controlled institution with five ministerial bodies[3] and district-level extension divisions that carry out the government strategies on the ground (Norman et al., 2016). At the same time, the district-level extension services allow residents to communicate regularly with extension officers, thereby creating a space where the top-down and bottom-up approaches interact. Districts involved with the cocoa sectors are thus a prime space where this disparity and interaction between a top-down and a bottom-up approach can be observed.

Recently, the government of Ghana established a National Climate Change Policy (NCCP) to adapt to climate change effects within the cocoa sector, focusing particularly on the adaptation strategy of agroforestry (MESTI, 2015). Agroforestry is a land-use management system where trees are grown alongside crops, with the intent of increasing carbon stock and creating a more cooler and humid microclimate for cocoa production. The policy adheres to both international and national protocols with the intention to increase carbon stock and agricultural productivity, but was established with meagre participation from the cocoa farmers. Nevertheless, districts have been deploying extension services to allow cocoa farmers to use the agroforestry adaptation strategy. How exactly this is being done and what the reactions are from the cocoa farmers is unclear.

3. CONCEPTUAL MODEL

3.1. Knowledge gap

National adaptation policies are well-stated on paper, yet the understanding of how such policies are implemented on the ground is relatively understudied. The cocoa sector in Ghana is a unique area of study because it presents the dichotomous relationship between top-down and bottom-up governance approaches. On the one hand, it has a decentralized district extension division where its services closely interact with the community. On the other hand, it maintains an authoritative governance system with Cocobod acting as the state-owned marketing board to coordinate the production and marketing of cocoa (Kolavalli & Vigneri, 2011). Furthermore, with the recent implementation of the National Climate Change Policy (NCCP), districts in Ghana operate within this interactive space of a climate

[3] (1) Cocoa Research Institute of Ghana (CRIG); (2) Seed Production Division (SPD); (3) Cocoa Health and Extension Division (CHED); (4) Quality Control Company (QCC); (5) Cocoa Marketing Company (CMC)

adaptation policy previously discussed with Figure 3. A unique situation can thus be studied at this district level in Ghana.

However, little literature is available as to how these two processes interact with one another. The national adaptation policy has been implemented for the benefit of the country, yet there is relatively little understanding as to whether and how such policy is exercised at a district level when trying to reach the public. According to Pelling et al. (2008), there is a lack of academic research on institutional constraints to building local adaptive capacity and may pose other barriers to the progress of adaptation. This makes it is unclear whether districts have the capacity to carry out the strategies. In fact, Reeds et al. (2013) determined that the little involvement of local stakeholders in top-down approaches neglects existing constraints or vulnerabilities (Reeds et al., 2013). This includes constraints not only at a district level but also those who are supposed to adopt the adaptation strategy. This highlights a knowledge gap of possible implications of how policies are practically implemented. Policies are not effective at a large-scale without the collaboration of those on the ground, which begs the question of how policies are accessible, understood and exercised by the targeted groups, cocoa farmers in this case. All in all, understanding how a national climate agenda hits the ground is imperative for the improvement of future-policy making, and opens a door to possible practical and theoretical recommendations for climate governance.

3.2. Conceptual Model

In answering the identified knowledge gaps, the conceptual model (Figure 4) of this study provides an operationalization in observing how the top-down process of Ghana's adaptation strategy of the National Climate Change Policy (NCCP) reaches cocoa farmers on the ground at district level. The model is based on the theoretical frameworks and concepts discussed in the previous chapter.

There are two main objectives to adequately examine this area of focus. The first includes understanding the gradual transition of the global climate agenda to the national agenda where information about climate change is gradually narrowed to the context-specific NCCP of Ghana. This encapsulates the translation of climate governance at an international level down to a national level (Figure 4). The objective is to sketches an understanding of how the NCCP attempts to aid the cocoa sector of Ghana in terms of its targets and strategies, and how those targets originated from international demands.

The second objective examines how the established national climate agenda is implemented at a district level, as indicated by the open space in Figure 4. This examines how cocoa farmers gain access to the adaptation strategy provided by the district. To measure this, three of the five characteristics of the LAC framework are used, namely (1) Institutions, (2) Information and (3) Innovation. As previously discussed in Chapter 2.2.1., these three LAC characteristics are related to their interaction with top-down operating institutions, the district in this case. These indicators thus measure whether cocoa

farmers have access to training and resources necessary to use the agroforestry adaptation strategy (Institutions), whether they gain access to information regarding climate change and the adaptation strategy (Information) and finally, whether they are actually using the adaptation strategy (Innovation). Ideally, all three indicators are represented so that cocoa farmers have equal access to all three characteristics, thereby increasing their adaptive capacity.

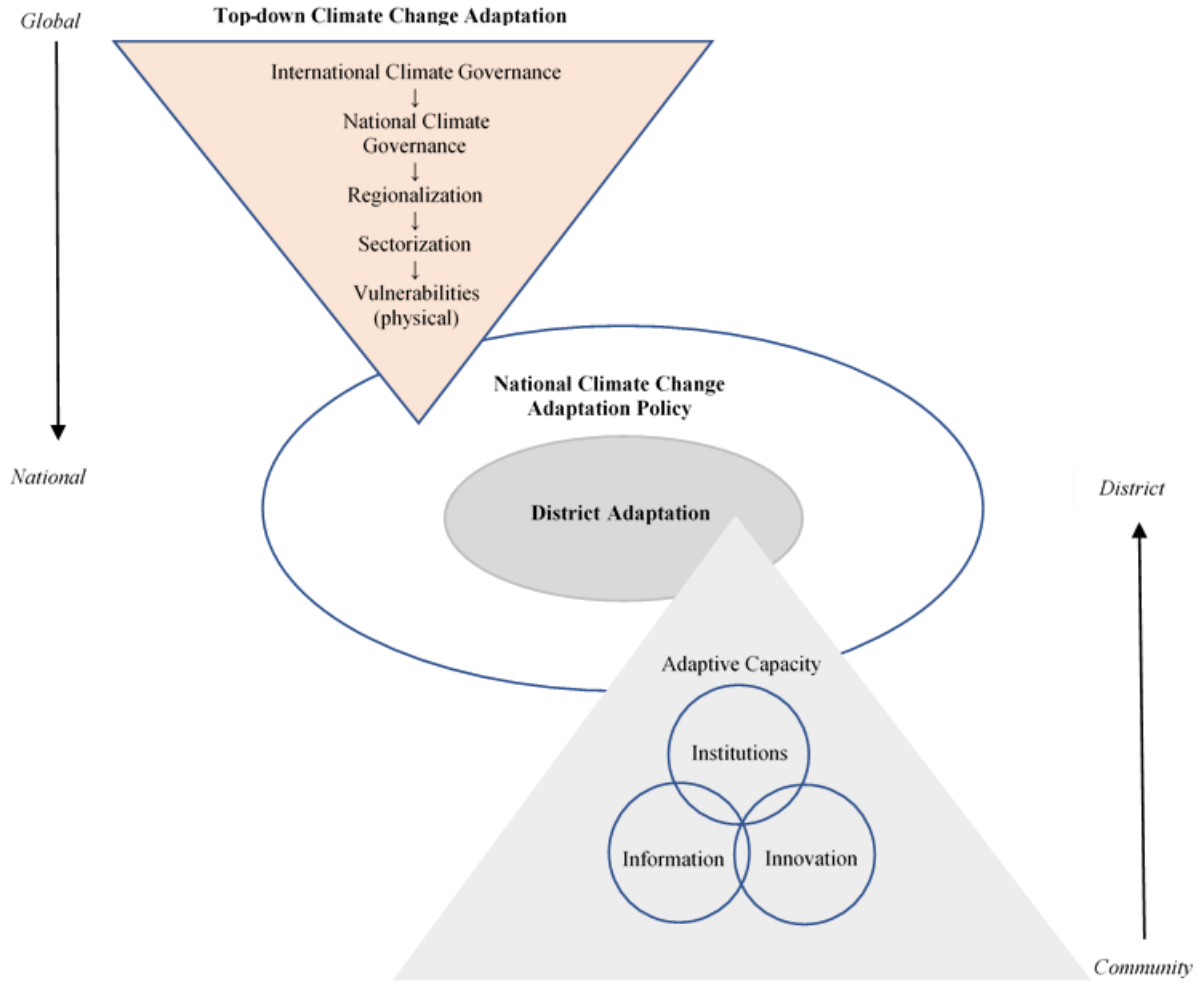

Figure 4. Conceptual Model
(Source: Author's own, based on Figure 3 of Deasia & van der Sluijs, 2007).

The remaining two characteristics from the LAC framework were omitted as indicators in this study because they are concerned with specifically bottom-up approach processes. First, the "Asset Base" characteristic measures accessibility to capitals necessary for livelihood outcomes and strategies. This then poses a question specifically on livelihood strategies and livelihood adaptation, which is not within the scope of this study. Second, the "Governance" characteristic measures the degree of transparency and participation in a decision-making process. The degree to which cocoa farmers were involved in the decision-making process of the NCCP focuses specifically on a bottom-up approach, which is also beyond the scope of this study.

4. RESEARCH DESIGN

4.1. Research Objective

This study aims to address the identified knowledge gaps by examining how the adaptation strategy of the National Climate Change Policy (NCCP) of Ghana is implemented in the cocoa sector at a district level.

The first objective is of an evaluative nature and examines the top-down process of Ghana's climate change adaptation policy by looking at how the global agenda is translated into the national agenda at a district level. The aim is to understand what objectives and targets were taken in the NCCP of Ghana, and how the district attempts to implement the policy on the ground.

The second objective is of an explorative nature and investigates how the adaptation strategy of the NCCP is adopted by cocoa farmers at a district level. This highlights the interaction between the top-down nature of the district and the bottom-up nature of cocoa farmers on the ground. It includes understanding how cocoa farmers gain access to the adaptation strategy of the NCCP at a district level, whether the adaptation strategy is used by cocoa farmers and possible implications of its implementation at a district level from the perspective of the cocoa farmers.

Data from the two objectives evaluated to understand how the adaptation strategy of Ghana's climate change policy is being implemented on the cocoa sector and how identified challenges may provide theoretical recommendations to further develop the adaptation policymaking of Ghana.

4.2. Research Questions

The central question is:
How is the climate change adaptation policy being implemented on the cocoa sector of Ghana at a district level?

The central research question investigates the topic of climate change governance in the cocoa sector of Ghana at a district level. The research question is sub-divided into two main questions relating to each respective objective. The first addresses the translation of the national climate agenda into its implementation at a district level. The second addresses its implementation onto the cocoa farmers.

RQ.1: How is the national climate change policy of Ghana addressing climate change impacts on the cocoa sector at district level?

a) What international climate change adaptation policies were translated into the national climate change policy of Ghana?

b) How do the targets of the national climate change policy attempt to make a difference in the cocoa sector?
c) How is the national climate change policy implemented in the cocoa sector within Ghana's government plan?

RQ.2: How does the national climate change policy attempt to improve the adaptive capacity of cocoa farmers towards climate change in Ghana at district level?

a) How does the strategy proposed by the national climate change policy differ from local adaptation strategies adopted by cocoa farmers?
b) What are the perspectives of cocoa farmers on climate change and on the adaptation strategy of the national climate change policy?
c) How is the adaptation strategy of the national climate change policy adopted by cocoa farmers?

5. REGIONAL FRAMEWORK

5.1. Cocoa Sector in Ghana

Situated in West Africa, Ghana houses a population of 27.67 million with an annual growth rate of 2.5% and an average national level density of 79 persons/km^2 (Asante & Amuakwa-Mensah, 2014; CountrySTAT, 2019; Laube, Schraven & Awo., 2012). Southern regions, including the Greater Accra, Western, Eastern, Central, Volta and Ashanti regions, are the most developed, housing 75% of the country's population and largely responsible for the country's economic activities (Norman et al., 2016). Cocoa production lies within this southern belt of Ghana, predominantly in the Ashanti, Western and Volta regions.

As the second-largest cocoa exporter and leading exporter in premium quality cocoa (Läderach et al., 2013), the cocoa sector in Ghana contributes to approximately 30% of the country's export and employs approximately 800,000 farming households across six to ten regions in Ghana (Asante & Amuakwa-Mensah, 2014; Ghana Cocoa Board, 2019; Läderach et al., 2013; Norman et al., 2016). As previously mentioned, the Ghanian government body Cocobod controls the production, export market and prices of cocoa. Cocobod determines a fixed buying price for cocoa, which has protected cocoa farmers world market price fluctuations to a certain extent. However, cocoa bean production has gradually been dwindling. In 2019, 900 thousand tons of cocoa beans were produced, 69 thousand tons less than that in 2017 (Statista, 2019). The continuation of unsustainable agricultural practices, land degradation and over excessive use of chemicals (Kolavalli & Vigneri, 2011; Ntiamoah & Afrane, 2008; Franzen & Mulder, 2017; Wessel, 2015) have contributed to the difficulty in maintaining high production rates.

Most recently, climate variability as a result of climate change has also been hampering cocoa yields. Climate change models project an overall decrease in the climatic suitability for cocoa production by 2050, with the southern areas of Brong Ahafo and the Western region indicated as most vulnerable (Asante & Amuakwa-Mensah, 2014; Läderach et al., 2013). These two regions, in particular, are estimated to experience a decrease in the cumulative dry months from 3 to 4 months, and a temperature rise of 1.7-2.1 °C by 2050 (Asante & Amuakwa-Mensah, 2014; Läderach et al., 2013). The rise in temperature will generate higher evapotranspiration rates, generating a drier climate. The northern area of the Western region is currently the most important area for cocoa production due to its high soil fertility and it housing some of the last remaining indigenous forests in the country. However, the region is currently vulnerable to deforestation and climatic variability (Läderach et al., 2013). Figure 5 illustrates the Western region highlighted in bold, where the upper areas in particular have "much less" suitable climate conditions for cocoa conditions by 2050.

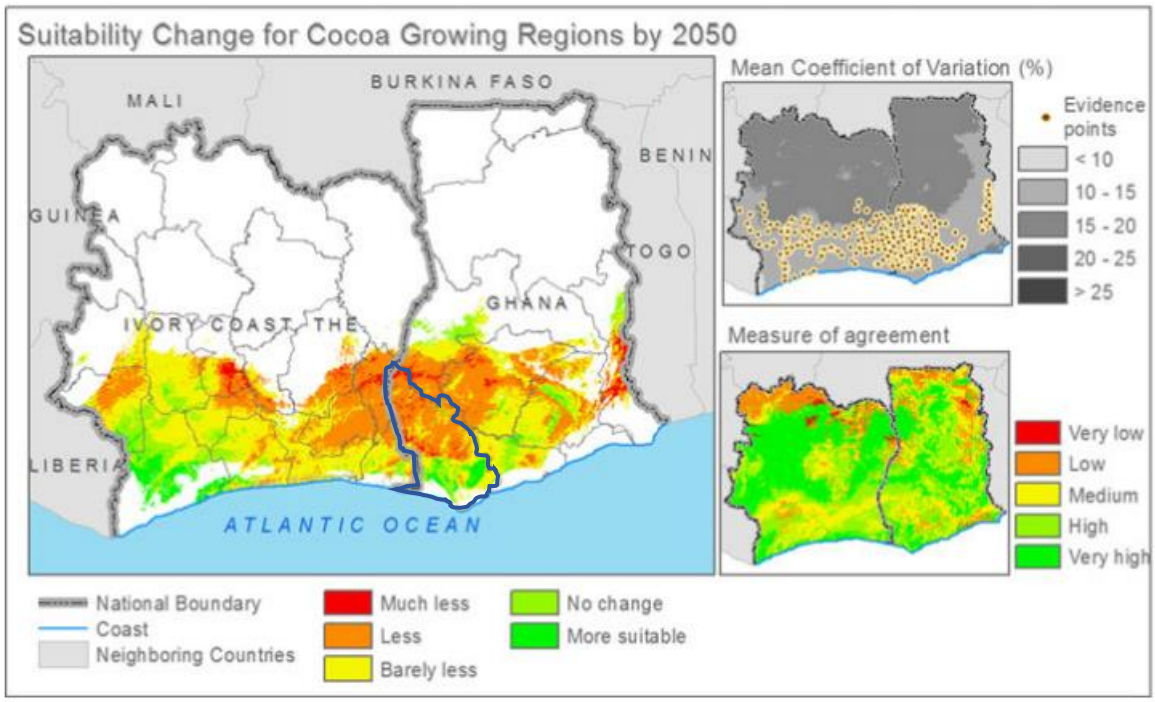

Figure 5. Suitability Change for Cocoa Growing-regions by 2050 in Cote d'Ivoire and Ghana (Source: Läderach et al., 2013)

5.2. Juaboso District

One of the upper areas situated in the Western region is the Juaboso district (Figure 6). Juaboso is one of eighteen districts in the region, but it is a major district in the production of cocoa for Ghana, alongside Bia (Knudsen, 2007; Norman et al., 2016). According to the latest District Analytical Report (Ghana Statistical Service, 2014), Juaboso has a population of 58,435 (50.9% male), constituting 2.46% of the Western region's population as of 2010. The district is sparsely populated, with approximately

90.7% of the population residing in rural localities. On average, 83.1% of the population in Juaboso is economically active (53.2% male), where 97.2% of that 83.1% does crop farming. Although no current statistic is available on cocoa farmers in Juaboso, considering the prevalence of cocoa production in the district and the fact that farmers are engaged in multiple agricultural activities, it can be roughly estimated that crop farmers also include cocoa farmers.

Juaboso's vulnerability to climatic variability negatively affecting cocoa production has promptly resulted in the presence of multiple district institutions, (International) Non-governmental Organisations ((I)NGO) and Civil Society Organisations (CSO), which closely monitoring cocoa production activities in the district. Subsequently, Juaboso district has an established involvement of multiple district level institutions and a higher probability of cocoa farmers having access been to consultation rounds regarding the implementation of the adaptation strategy of Ghana's climate agenda. For these reasons, Juaboso district was established as the research site for this study.

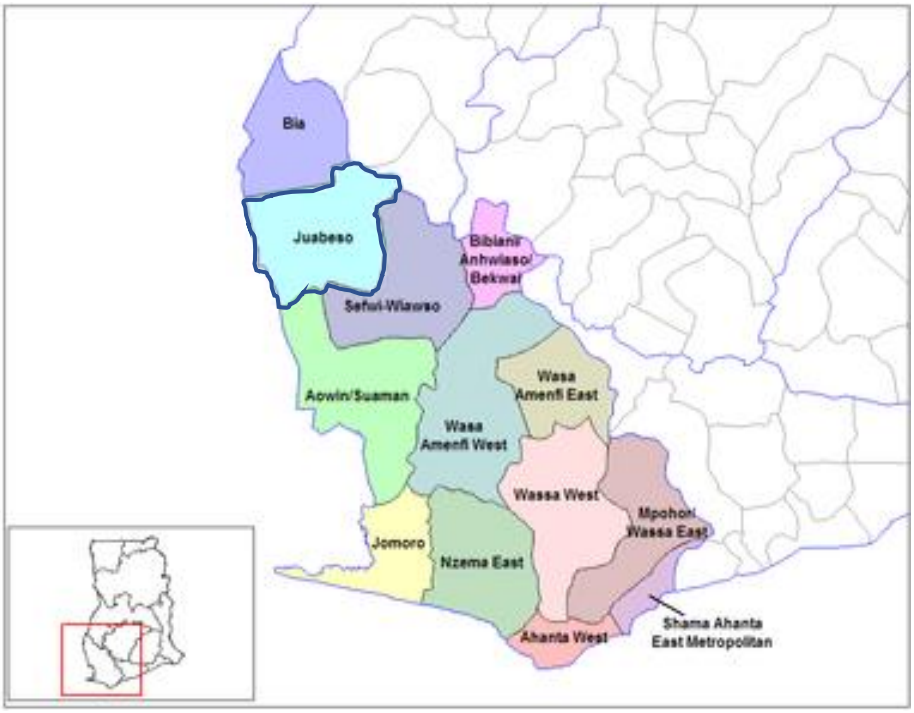

Figure 6. District Map of Western Region, Ghana. (Source: File:Western Ghana districts.png, 2015)

5.3. Adaptation Strategy of the National Climate Change Policy

The most recent nationally established policy addressing climate change is the National Climate Change Policy (NCCP) Master Plan (2015-2020), which was developed under the National Climate Change Committee (NCCC) and officially launched by the government of Ghana in 2014 (Sova et al., 2014; MESTI, 2015). The vision of the NCCP is "to ensure a climate-resilient and climate-compatible

economy while achieving sustainable development through equitable low-carbon economic growth for Ghana" (MESTI, 2013; 2015, p.1). The policy focuses on four thematic areas where changes need to be made: (1) energy and infrastructure, (2) natural resources management, (3) agriculture and food security and (4) disaster preparedness and response. Each thematic area has its respective programmes, which are to run by existing cross-level agencies and mainstreamed into Ghana's existing national development structures to combat climate change.

The cocoa sector is directly involved with Programme 4: 'Increase carbon sinks'. Specifically, Programme 4.5 of the NCCP is of relevance and focuses on the 'Conservation of Trees through Agroforestry and On-farm practices. Programme 4.5. has the following objective: "to conserve and plant trees in farm and fallow lands for carbon stock management and livelihood improvement" (MESTI, 2015, p.104). The justification for this programme is that as cocoa is a natural shade crop, the addition of agronomic trees on cocoa farms will maintain agricultural productivity despite climate variability (MESTI, 2015). This illustrates an adaptation strategy.

Programme 4.5 has two actions[4] over the timeline of 2015-2020. Regarding the implementation of agroforestry practices by cocoa farmers at a district level, the first action (4.5.1) is of relevance to this study. It aims to maximize the opportunity to increase carbon sequestration and improve agricultural productivity through the conservation of trees in association with crops, by measuring the output of increase in yields and the increase percentage cover of trees (MESTI, 2015). The action has four tasks:

> 4.5.1.1 Create awareness of the relevance of agroforestry as a sustainable integrated land-use management tool.
>
> 4.5.1.2 Disseminate agroforestry technologies through intensive extension services at the district level.
>
> 4.5.1.3 Train farmers on sustainable tree management practices to maximize potential benefits.
>
> 4.5.1.4 Develop linkages for market accessibility to enhance income-generating opportunities (MESTI, 2015).

All four actions aim to ensure the implementation of agroforestry practices onto farmers. It focuses on capacity-building to expand the understanding of cocoa farmers on current climatic trends and how to use the agroforestry techniques to adapt to climate change (MESTI, 2015). The use of only timber species for agroforestry is encouraged to act as an income opportunity and means to sequester large amounts of atmospheric carbon, in comparison to smaller food crops.

[4] 4.5.1. Support agroforestry programmes
4.5.2. Provide incentives to and strengthen extension services for farmers and landowners to conserve trees on their farm and fallow lands for economic benefit and enhancement of carbon stocks (MESTI, 2015).

6. METHODS

Research was conducted from February until July 2019. A mixed-methods approach was used. Qualitative data was primarily collected for this study but some quantitative data concerning cocoa farmers were collected to further support some findings.

During data collection, a literature review and fieldwork research were conducted, with the latter done over a ten-week period in the Juaboso district. Logistics concerning the fieldwork were planned in coordination with the Rural Environmental Care Association (RECA), a locally established NGO. An employee from RECA worked closely with the author as a logistics coordinator and translator during the fieldwork period. For the sake of coherency, this colleague is referred to as the translator during the course of this study.

Data collected through both methods were used in answering each research objective. The data collection, data analysis and sample size for each research objective are discussed in the following sub-chapters.

6.1. Research Strategy Objective 1 – Data Collection & Sample Size

The first research objective is concerned with the top-down process of the NCCP policy on the cocoa sector in Juaboso district. In answering this objective, first, desktop research prior to fieldwork was conducted to analyse the adaptation strategy of Action 4.5 of the NCCP. This included understanding its translation from an international to national level as well its targets and strategies and challenges. The research was carried out with the use of annual progress reports, impact reports and academic literature made available by institutions, universities and organizations.

During fieldwork, key informant interviews from state led, CSOs and NGOs involved in sustainable cocoa production and climate change were conducted. Interviews were held at locations in the Juaboso district and Accra city, depending on where the key informants' office was located. Scheduled appointments were arranged for a maximum interview session of one hour. A semi-structured interview guide was used to allow for participants to expand on certain topics and incorporate their own experiences, of which the author could further delve into. Qualitative data was also obtained through the attendance of the Forest Watch General Meeting (GM), the Hotspot Intervention Area (HIA) general meeting, a CREMA[5] meeting and a monthly Mondelēz farmers training.

[5] Community Resources Management Area (CREMA) is a nationally established institutional framework, established specifically by the Wildlife division of the Forestry Commission of Ghana in 2000. It operates as a community-based, natural resources management system. Each CREMA constitutes of approximately 10 community selected individuals representing a particular area, based on traditional territories. The framework is based on existing traditional governance structures, where community are able to govern bylaws regarding natural resource utilization. The concept of CREMA is currently being done in 32 communities in 7 regions, covering over 30 districts (Afari-Dartey, 2016; Key informant, NCRC, Government; Key informant, RECA, NGO)

A snowballing technique was used in contacting the key informants. Contact was established either via email and via the networking efforts of the RECA colleague of this study. A total sample size of 27 key informants was interviewed which included the following: 9 representatives of International Non-Governmental Organisations, 5 of Civil Society Organisations, 4 from governmental bodies, 4 from district level bodies, 3 community-level officials, 2 private sector representatives and 1 other (Appendix A: Table 1).

6.2. Research Strategy Objective 2 – Data Collection & Sample Size

The second research objective concerns the implementation of the adaptation policy onto the cocoa sector in the Juaboso district. In answering this objective, semi-structured interviews were conducted with cocoa farming participants who are residential to the Juaboso district. A semi-structured nature was opted to enable respondents to raise experiences or issues beyond the scope of the conceptual model, thus allowing for further theoretical analysis and the identification of possibly overlooked contributing factors.

As the author has no affinity for any of the Ghanian languages, the author worked closely with the translator from RECA. The translator held a proficiency in *Twi*, the national language of Ghana, which was used to effectively conduct the interviews with the cocoa farmers together with the author. An agreed-upon daily fee was established prior to the start of data collection. The topic of the study was introduced to the translator to allow understanding of the purpose of the study as well as what questions may be appropriate for him to add during the interview sessions.

Interviews were conducted 1-2 times a day and outside the working hours of the cocoa farmers, between 07:00-09:00 and 16:00-18:00. Due to poor infrastructure conditions and no road lighting, the author could not extend interviews past 18:00, when the sun sets. Interviews took place within the community, either at the home of the cocoa farmer or at an outside location. Prior to the start of the interview, the translator would introduce the author and himself, the purpose of the visit and the purpose of the study. Upon their consent, the interviews were audially recorded.

Participant selection was based on the following two criteria points. First, their main livelihood strategy for household income was dependent on agricultural cocoa production. Secondly, they had been involved in consultation rounds concerning the agroforestry adaptation strategy.

Participants were selected through the collaborative effort of RECA as well as with The Resource Foundation (TRF). The TRF is a local CSO based in the Juaboso district and the translator. With the help of TRF, a sample list of potential cocoa farming participants per community within the district was supplied. Prior to arriving at the community, appointments were scheduled with the community's Chief, Chief farmer or one of the CREMA volunteers over the phone. With the help of those mentioned, the potential cocoa farming participants within the community were approached.

Cocoa farmers within the community who joined to listen to ongoing interviews were thereafter invited to participate in their own interview if they were interested and fit(ted) the criteria.

Full-time cocoa farmers (N=108, 31 female) were included in the sample size, with an average age of 53 years (Standard Deviation (SD) = 15.253) and household size of 9.4 members (SD = 6.579). A portion of the participants within the sample was uneducated (27,8%), whilst 29,6% had completed Middle School (Appendix D. Table 1.)

All participants were full-time cocoa farmers and have produced cocoa for an average of 27.69 years (SD = 12.367, Missing = 21). Alongside cocoa farming, 54.6% also participated in alternative employments including growing food crops (34,3%), livestock rearing (5.6%), both (3.7%) or other work (11.1%). For those who could recall it, the mean duration of cocoa employment was 27.69 years (SD = 12.367). The average farm size was 16.58 acres[6] (SD = 14.489) spread across a mean of 2.81 farm locations (SD = 1.912). An average yield of 14.3 bags[7] (SD = 15.555) per year per household was produced, whereby one bag earned 475 GHC[8].

Participants were residents from 11 randomly selected communities (Table 1). A total of 83 (76.9%) participants were indigenous to the community, whilst the remaining moved to Juaboso either to return to their roots (0.9%), to support their family (3.7%), for marriage (2.8%), to begin cocoa farming (13.9%) or other reasons (2%).

[6] 1 acre = 4046.85 m^2
[7] 1 bag = 64 kilograms
[8] 1 euro (EUR) = 5.91 Ghana cedi (GHC)

Table 1.

Frequency of Cocoa Farming Participants per Community in Juaboso District

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Nwkanta	10	9,3	9,3	9,3
	Nyomebekyere	3	2,8	2,8	12,0
	El luibo	5	4,6	4,6	16,7
	Danyame	12	11,1	11,1	27,8
	Adiebra	10	9,3	9,3	37,0
	Antobia	8	7,4	7,4	44,4
	Kofikrom	9	8,3	8,3	52,8
	Tiatone	7	6,5	6,5	59,3
	Prosu	16	14,8	14,8	74,1
	Boizan	16	14,8	14,8	88,9
	Kwabonakrakrom	12	11,1	11,1	100,0
	Total	108	100,0	100,0	

6.3. Data Analysis and Research Ethics

Qualitative data was obtained through semi-structured interviews and field observations during fieldwork. The interviews were audially recorded upon the participant's consent and transcribed thereafter to ensure that conclusions can be drawn. The transcriptions were later coded using the NVivo software program for analytical coherency. All the data was treated with confidentiality and anonymity with no personal identifying information was collected or reported. Audiotapes were deleted after being textually transcribed and numbered, to maintain participant anonymity. The transcripts were coded and analysed using the Nvivo software to enhance analytical coherency. Any quantitative data obtained during the semi-structured interviews with either participant groups were analysed using the IBM SPSS software.

Throughout data collection, reflexive memo writing was used to account for biases that may inductively derive concepts. The author was aware of culturally sensitive topics throughout the research period, such as education and income, and thereby attempted to cause no harm when formulating culturally sensitive questions by allowing the participants to refuse to answer. The author was also aware of her own cultural background and social structure which may have affected the deliverance of questions and interpretation of data. To mitigate this, the author had briefings after the interviews with her translator from RECA to observe any differences in interpretation.

As this study is of an explorative nature, throughout the research period a circular manner was used where case study results and existing literature were continuously compared to one another. All data were analysed to identify new topics for later interviews, and existing literature was analysed to discuss or verify in later interviews.

6.4. Operationalization of the Data

Operationalization of the concepts examined in answering RQ1, and the three LAC indicators used in answering RQ2 are reflected in Table 2.

Table 2. Operationalization of Concepts

Research Question	Concept	Operationalization and definitions	Methods
1	Translation of the global climate change agenda to the national climate change agenda	• Nationally Determined Contributors (NDC) of Ghana as part of the UNFCC 2015 Paris Agreement • Objectives and targets of the NCCP in Ghana	• Desktop research • Key informant interviews
	Translation of the national agenda to a district level	• Objectives stated in the NCCP • Tasks and strategies of Action 4.5. of the NCCP	
2	Implementation of the national climate agenda on the ground	LAC indicator 2: Institutions • Cocoa farmers have access to training services of the 4.5.1.3 in the Juaboso district • Cocoa farmers have access to tree seedlings for agroforestry practices • Cocoa farmers access to agrochemicals and fertilizers LAC indicator 3: Information • Cocoa farmers awareness and understanding of climate change impacts • Cocoa farmers awareness of the provision of training as part of the NCCP's Action 4.5 • Cocoa farmers understanding as to the reasoning behind the provision of training and agroforestry practices as part of Action 4.5. LAC indicator 4: Innovation • Implementation of agroforestry techniques in cocoa farms in Juaboso district as a result of NCCP Action 4.5 • Local adaptation strategies on cocoa farms in Juaboso district undertaken out the initiative of the cocoa farmers	• Key informant interviews • Semi-structured interviews • Focus groups • Field observations

6.5. Methodological Limitations and Recommendations

An important methodological limitation kerbing data collection of this study was its temporal scope. The 10-week timeframe of the fieldwork limited the sample size that feasibly could have been collected. Juaboso district is comprised of 32 communities, of which only 11 communities were included the study. Including more communities in the sample was sacrificed for the importance of gaining higher quality and reinforcing information from multiple cocoa farmers within fewer communities, than vice versa. Regardless, a larger sample size should be included for future research improvements. Juaboso district houses a population of 58,435 (Ghana Statistical Service, 2014), making the sample size of this study not representative to Juaboso district in its entirety. However, for this study, only cocoa farmers consulted with the adaptation strategy had to be included. Acquiring the total sample of consulted cocoa farmers in Juaboso would be an improvement to the representativeness of the data. The sample size of this study provides an initial sample size of consulted cocoa farmers which can be improved upon in later research.

The temporal scope also limited the frequency of follow-up interviews with the key informants. Initial appointments had to be scheduled well in advance with the organizations, hence a second appointment was not always possible within the time frame of the author. This limitation was mitigated to some extent by collecting additional information via telephone or email. Nevertheless, a consequence of this limitation was that some governmental level institutions were also not included in the sample. These included the Environmental Protection Agency (EPA) and the Ministry of Environment, Science and Technical Innovation (MESTI), who could have provided valuable interesting information. Unfortunately, despite frequent attempts in contacting government institutions, these key informants provided no response to the author.

The use of a translator is a frequently mentioned limitation across studies and is also one for this study. The use of a translator carries both pros and cons. On the one hand, the translator was an invaluable source for cultural understanding and cultural etiquette, which the researcher would have been ignorant of during the interview sessions. Furthermore, the translator was highly proficient in conducting the interviews and added relevant questions that the researcher herself had overlooked, thereby contributing to the quality of data collected.

On the other hand, the proficiency of the translator's English was intermediate. Meanings occasionally got lost in translation, which limited the possibility of follow-up questions as either the researcher misunderstood the translations, or the translator did not understand the researcher's question. Despite consultations with the translator on the importance of detailed summaries, the translator also frequently provided compact summaries, which reduced the possibility of follow-up questions and quality of quotations.

7. RESULTS

7.1. Addressing Climate Change in the Cocoa Sector

This chapter presents results relevant to the first research question (RQ.1). This research question examines how the national climate change policy of Ghana is addressing climate change impacts on the cocoa sectors at district level. Each sub-question of the research question is answered in chronological order.

7.1.1. Translation of an International Agreement to a National Climate Policy

In answering the first sub-research question (RQ1.a) of what international climate change adaptation policies were translated into the national climate change policy of Ghana, it was found that the international climate agenda of the UNFCCC was translated into the Nationally Determined Contributions (NDCs) of Ghana. Upon the signing of the 2015 Paris Agreement, Ghana adhered to Article 4 Paragraph 2 which requires that each of the 190 signed Parties prepare and maintain successive NDCs. The NDCs embody the long-term efforts of a nation's actions in reducing national carbon emissions and establishing national adaptations to the impacts of climate change (UNFCCC, 2019). Ghana submitted its preliminary Intended Nationally Determined Contributions (INDC's) to the UNFCCC in September of 2016, whereupon it communicated its NDC to the UNFCCC as of July 2017 (ibid). Interviews with CSOs and NGOs highlighted that it is these NDCs that are the predominant motivator for Ghana's efforts in launching climate action:

> *"conversations started [at an] international level because Ghana is active in the United Nations Program for climate change, so there were discussions at a[n] [international] level and also contributions. So, after the agreement (…) countries develop[ed] programs [and] policies to address climate change at an international level."* (Key informant, SYND, CSO)

However, the NDCs primarily focus on mitigation rather than adaptation. The UNFCCC's primary concern is for the mitigation of atmospheric carbon emissions due to its global pervasiveness. This coherently follows the top-down approach structure of Deasia & van der Sluijs (2007) discussed in Chapter 2.2.2., where the central focus lies on physical vulnerabilities (e.g. greenhouse gases) at a global level down to regional impacts (Figure 3). As the UNFCCC deals with 190 parties with their respective capabilities, the UNFCCC is not at liberty to establish an international set adaptation strategy.

Instead, the concept of agroforestry as an adaptation strategy for the cocoa sector originated from the International Non-Governmental Organisation (INGO) and the private sector, which sought sustainable strategies that would aid cocoa production in the future. An interview with the Climate

Change Unit of the Forestry Commission (FC), responsible for the regulation of forest and wildlife resource utilization, acknowledged this involvement:

> " *[but] not just countries [are involved], even in the production and the private sector at the front, people want to prove that they are sourcing from very environmentally friendly places... Especially the chocolate industry is having a high demand from consumers to see that, okay, we want clean cocoa or chocolate to consume, so we are doing this and that to reduce our impact on the environment. So, it is something that has [an] effect on the business front, the political front, the local level, the international level. (…) as a country we are tackling [climate change] both at a local and global international level, because of the impact felt at all these levels.*"

Public demand for climate action has been at the forefront in motivating the climate movement globally, as it has gradually caught the attention of policymakers, corporations and organisations. Ghana is no exception to this. INGOs, such as the Rainforest Alliance (RA) and previously K-International[9], have been pioneers in implementing climate adaptation strategies and disseminating information regarding agroforestry techniques in Juaboso. These two INGOs introduced the concept of agroforestry in Juaboso when being involved with the REDD+[10] project. A key informant from the Rainforest Alliance in Ghana stated the following:

> *"[Rainforest Alliance was] among the pioneers who came [to Juaboso] to work, apart from K-International. We came here around 2010 with the REDD[+] project, Reduce Emission for Deforestation Degradation, and through that we actually govern the whole project that came out [with] main component[s] (…) which should be beneficial [and] at the same time be on the line with the REDD+ objective."*

Since the establishment of agroforestry techniques introduced by both these two INGOs, other stakeholders took note of its benefits. Consumer demand for sustainable chocolate encouraged chocolate companies to seek out sustainable production strategies. At the same time, as cocoa is a raw commodity in high demand, securing cocoa production is of primary concern for the cocoa private sector. With the availability of agroforestry projects already implemented by INGOs in the district, private sectors followed suit in the agroforestry strategy. Although some private corporates have their privately-run programs that promote agroforestry within their private supply of cocoa, such as Mondelēz, the objectives of the strategies remain the same. This gradual involvement of the private sector was remarked by an informant from EcoCare:

[9] K-International was an INGO from the United Kingdom operating in Juaboso on the field of agroforestry.
[10] Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) is a United Nations collaborative program that fosters sustainable forest management and conservation.

"Private sector has always been interested in productivity, increasing yield and that has always been their focus, and so most of the interventions of [the] private sector within the cocoa landscape has been introducing farmers to fertilizer, pesticide control systems… Now it is beginning to dawn on them that with all the research and studies that have been done (…) point to the direction that within the next 80 years, Ghana and Cote d'Ivoire, who are producing a chunk of cocoa, our climate is changing so drastically that the arable lands that can support the cocoa are diminishing…[So, we need to put] mechanisms and sensitizations to ensure that [there is] land that is left."

Discussions with key informants further revealed that the involvement of the private sector has been beneficial in two regards. First, the private sector has the financial resources to provide the necessary skills and tools to implement the agroforestry strategy. Secondly, the private sector has human capital in the form of labour and trained staff to implement monitoring systems. With these resources at hand, the number of corporations involved in the Juaboso district with regard to the agroforestry strategy has been increasing. Recently, it included Olam, and currently, it includes Touton, Agro Eco and Mondelēz.

The combination of Ghana's obligation to its NDC's and the growing presence of agroforestry programmes established by INGOs and the private sector, had made Ghana take notice of agroforestry as a possible adaptation program. Since its introduction in 2010, data from both INGOs and the private sector was available to Ghana that indicated the benefits of agroforestry. Consequently, rather than implementing a new adaptation strategy, Ghana simply continued current programs. A key-informant from the Climate Change Unit of the Forestry Commission referred to it as a "*win-win situation*" because it simultaneously supports climate change mitigation and adaptation objectives. First, the increase in tree cover would act as a carbon stock, thereby adhering to its NDCs. Second, it could create a more favourable microclimate for cocoa production in the changing climate, thereby meeting the demands for adaptive cocoa production. As a result, the government of Ghana has translated this adaptation strategy into its own National Climate Change Policy (NCCP) by merely supporting the continuation of existing agroforestry programs in the cocoa sector. Hence, at an international level, it was the combination of public demand and international commitments that led to Ghana's enforcement for agroforestry techniques within the cocoa sector at a national level.

7.1.2. Targets of the National Climate Change Policy

The National Climate Change Policy aims to support the continuation of agroforestry programs at a national level, which then begs the question of which agroforestry program is being implemented in

Juaboso. Results showed that the Ghana Forest Investment Program (FIP) is the current mechanism of implementing agroforestry strategies within the district.

The FIP program was implemented in 2015 (MLNR, 2012) and is under the Climate Investment Fund (CIF) of the World Bank (Afari-Dartey, 2016; IDH, 2018). The FIP program is largely financed by the World Bank and the African Development Bank (ADB). The role of the government in the FIP since the implementation of the NCCP is to continue the provision of extension services and provide a small additional funding for the continuation of the FIP. The latter, however, has not yet occurred. This was clearly indicated by one key informant:

> "*[The] government in our part of the world, when there is a law or a policy like this, it takes time for it to get to the ground, so actually, I haven't seen any action on the ground with respect to that, but FIP is also part of it. But no extra funding or resources*" (Key informant, FSD, district level).

It could be hypothesized that the NCCP funding has not yet been evident or has currently been directed to alternative agroforestry programs located in other districts in Ghana. However, this cannot be confidently stated without further research.

The FIP aims to improve forest and tree management practices through the implementation of agroforestry practices by cocoa farmers in Ghana's High Forest Zones (HFZ)[11], which includes Juaboso. Recalling that agroforestry is a land-use management system where trees are integrated with crops on a farm, the intent of the FIP program is educate cocoa farmers on agroforestry practices and convince them to plant trees in their cocoa farm. One of the objectives of the FIP specifically addresses the cocoa sector, where it aims to increase trees in farming systems by promoting sustainable cocoa and agricultural practices. Another objective of FIP specifies the need to develop viable alternative livelihoods for local communities by addressing market incentives, which it does by the introduction of timber species on cocoa farms.

These objectives of the FIP program are in accordance with the four NCCP targets. The four targets of the NCCP aimed to (1) create awareness of the relevance of agroforestry, (2) disseminate agroforestry technologies through extensive services, (3) train farmers on sustainable tree management and (4) develop linkages to the market for income-generating opportunities, as previously explained in Chapter 3.2. The FIP meets each of these four targets, by disseminating information and services on agroforestry to the cocoa farmers at district level. This answers the second sub-research question (RQ 1.b) of how the targets of the national climate change policy attempt to make a difference in the cocoa sector. The overall objective of both the NCCP and the FIP program is to mainstream agroforestry

[11] The High-Forest Zone consists of the large portion of on- and off-reserve forested area in Ghana

techniques into cocoa production by small-scale cocoa farmers and to diversify their income by including timber trees.

7.1.3. Implementation of the National Climate Change Policy at a district level

The third sub-research question (RQ1.c) examines how the national climate change policy is implemented in the cocoa sector within Ghana's government plan. The national climate agenda is mainstreamed into the cocoa sector through the existing agroforestry programs and existing district extension services. In the case of Juaboso, this involves FIP. The FIP is implemented in the cocoa sector of Juaboso through the existing district extension services divisions of Cocobod and Forestry Commission (FC). They are the Cocobod Extension Division (CED) and Forestry Services Division (FSD), respectively. The collaboration between the Cocobod and FC is the focal point of the program, where each institution aids the other in the supply and distribution of tree seedlings across the district:

> *"The program is run by Cocobod and Forestry Services Division. [Cocobod's] involvement is with cocoa. [Ghana] has off-reserve and on-reserve [forested areas]. [Cocobod] deals with off-reserve, that is in the cocoa farm. So, Forestry [Services Division], they raise the seedling for [Cocobod] and [Cocobod] take[s] the seedlings. [Cocobod] measure[s] the farms of the cocoa farms, so based on the acreages [Cocobod] distribute[s] the [tree] seedlings to [cocoa] farmers."* (Key informant, CED, district level).

From the other perspective, the Climate Change Unit of the Forestry Commission remarked on this collaboration as follows:

> *"…as Forestry Commission, our mandate is within the forest and wildlife resources, and Cocobod has the mandate over the cocoa landscapes so [we] will need a partnership to be able to do a program that seeks [to] control both the cocoa and the forest landscape. So the investment from Cocobod side, the extension services also, they carry the weight when they speak about cocoa issues;…they are telling farmers that you need to add this number of trees to your farms, you need to give it this spacing, you have to use all this and others. (…) [Cocobod and Forestry Commission] are looking at how to improve hand pollination, how to bring upon some agronomic practices, the pruning of the cocoa, the weeding and all that, and how to build the farm that can show against the effects of climate change so one you have the shade trees to cover the cocoa trees so that the plants will not wither and also result in [positive] yields. So, it is more about intensifying agriculture but using good agronomic practices that will benefit the farm productivity. So Cocobod is the regulator of the implementation, as we work together,*

even they give out that instruction to the farmers through their extension officers it carries weight and the farmers are willing to accept it."

It should be noted that this relationship between the two institutions is quite unique, as prior to FIP there was little to no collaboration between the two institutions due to conflicting interests. Initially, Cocobod wanted the expansion of cocoa production to boost yields, whereas FC wanted to preserve its already dwindling forest reserves. As agroforestry encapsulates both the interests of boosting tree growth and cocoa production, it is a unique situation of similar interests meeting. Furthermore, it highlights a collaborative effort between two institutions at both a ministerial and district level.

Alongside the partnership between the two governmental bodies, the FIP takes on a slight decentralized approach by involving NGOs and the Community Resources Management Area (CREMA) system. The Resource Foundation (TRF), an NGO based in Juaboso, explained this involvement as follows:

"*The Ghana Forest Investment Program was the program financed by the World Bank and Ghana Ministry of Land and Natural Resources, so they collaborated with Forest Service Division and the Ghana Cocobod and they also collaborate with NGOs, like CSOs. So through [TRF], we also partner [with] them [and use the] CREMA, that is Community Resources Management Area. So, through that, we have a relationship with [Cocobod and Forestry Commission] that we are all working on the same project. (…) Anything at all that we also want to do with the cocoa, we consult them*".

As indicated by this quotation, any actions involving cocoa or forest resources requires the involvement of Cocobod and Forestry Commission, respectively. In this way, both the FSD and CED remain the lead implementors of the FIP program and thereby maintain a top-down approach. Nevertheless, the involvement of CSOs and NGOs allows for a decentralized nature in the form of a wider communication network with the cocoa farmers within the district. This is especially prevalent with the use of the Community Resources Management Area (CREMA) members. The CREMA members, as community-level representatives, act as a contact point between the district level agencies and the communities. Equipped with information from the district level and an inert relationship with the community, CREMA volunteers are simply more effective in reaching the cocoa farmers at a community level than an institutional organization.

When regarding the entire implementation of the NCCP mechanized by the FIP, it can be observed that the climate action of agroforestry gradually trickles down to the cocoa farmer through the involvement of numerous stakeholders (Figure 7). The implementation of the FIP includes a multitude of actors with their respective roles. At the top international and government levels, responsibilities lay in mandating

the theoretical and practical objectives of the program. At the bottom district and community levels, the practical implementation of those targets and objectives are carried out. It is interesting to note that the majority of stakeholders operate at the bottom levels, highlighting the complexity of implementing any policy or program. This is due to the fact that, for the FIP to be implemented on the ground, the entire cocoa farming population in the district needs to adopt the strategies. As this population is relatively large and widely dispersed, the involvement of several stakeholders at the district level is necessary. Furthermore, the cocoa farming population is relatively socioeconomically poor and uneducated, which consequently requires a face-to-face approach for cocoa farmers to understand and accept the program. The number of stakeholders involved would suggest that an abundance of expertise and resources trickle down to the cocoa farmers. Whether this is the case, is explored in the next chapter.

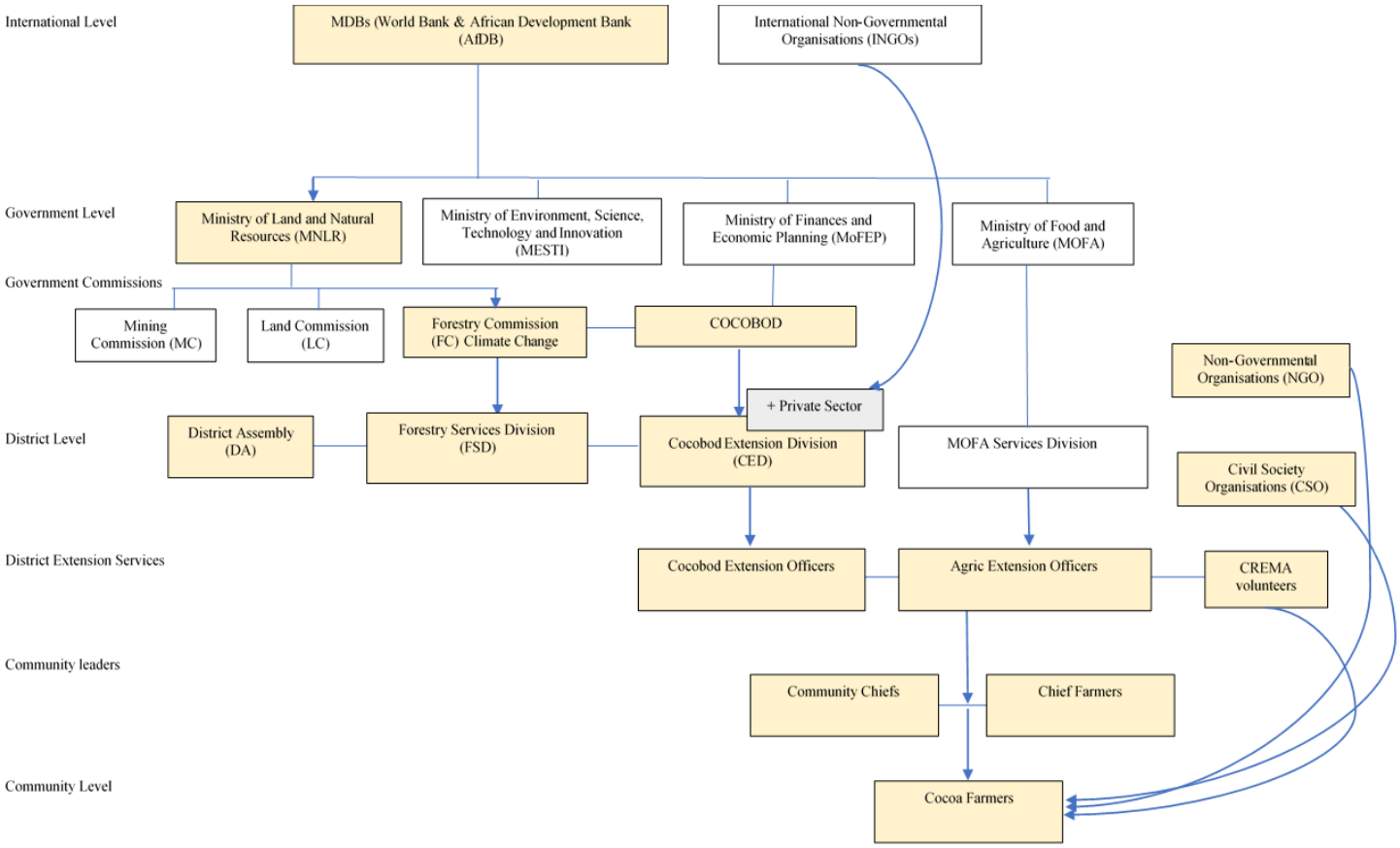

Figure 7. Implementation of FIP through the Institutional Framework as Represented in Yellow (Source: Author's own)

7.2. Agroforestry Strategy on Cocoa Farmers' Adaptive Capacity

This chapter provides the main results relevant to the second research question (RQ.2). This research question evaluates how the national climate change policy attempts to improve the adaptive capacity of cocoa farmers towards climate change at a district level in Ghana. The main results illustrate how the

cocoa farmers' perspective on the agroforestry strategy, their adoption of adaptation strategy and possible challenges they faced. To answer this, the results to each sub-question is chronologically evaluated.

7.2.1. Cocoa Farmers' Perspective on Agroforestry

Although agroforestry as an adaptation strategy provides a win-win situation for the stakeholders at the top of the institutional framework, it was interesting to find that the concept of agroforestry is not novel. No cocoa farming participant indicated that local agroforestry initiatives are ongoing, thus agroforestry strategies are purely an instated adaptation strategy. However, the concept of agroforestry is one well-established in local knowledge within the Juaboso district. In answering the first sub-research question (RQ2.a) of how the nationally established adaptation strategy differs from locally existing adaptation strategies adopted by cocoa farmers, it was found that the current adaptation strategy of agroforestry is not very different from past strategies. Cocoa farmers remarked that when their fathers or forefathers grew cocoa, there were trees on their farms. A key informant from the FC stated it as follows:

> *"[We] used to have trees on their farms and that time it used to protect [our] farms from the winds, it protect[s] [us] when [we work in our] own farm, but [now] the sun it brings is too much*."

Although in the past cocoa farmers maintained some degree of tree canopy in their cocoa farms, in recent years this agricultural practice was omitted for two reasons. First, cocoa farmers were introduced to hybrid cocoa trees which required more sunlight to produce higher yields, thereby omitting the need for much tree canopy. Secondly, approximately five years ago, Cocobod required cocoa farmers to cut down their trees as a means to combat a severe outbreak of black pod disease[12]. As a result, the local initiative of leaving trees on the farm was lost until it was reintroduced through the FIP. Agroforestry is essentially a pre-existing local adaptation strategy reiterated into a government program with additional technical and informational resources.

7.2.2. Cocoa Farmers' Perspective on the National Climate Change Policy

As the adaptation strategy of the NCCP is similar to local farming techniques, it was further investigated how the cocoa farmers perceived the national climate policy itself. This included understanding whether

[12] Black pod disease is a pathogen that infects cocoa pods. A recognizable symptom includes the staining of a brown or black colour on the cocoa pod. Infection can spread and reduce cocoa yields. The current known technique to remove black pod infections is to cut down infected cocoa pods and/or cocoa trees (Key informant, RECA, NGO; Ghana Cocoa Board, 2019).

cocoa farmers experienced any climate effects and consequently whether they regarded the agroforestry adaptation strategy as necessary. In answering the second sub-research question (RQ2.b) of what the perspective of cocoa farmers was on climate change and the NCCP, it was found that cocoa farming participants were highly aware of climate change but not on the NCCP. These two main findings are detailed in the following two sub-chapters, respectively.

i. Cocoa Farmers Understanding on Climate Change

All participants understood that there have been changes in the weather, but not all coined the term of climate change to these changes. Some participants were unaware of the definition of climate change, but did know that the changes in weather were attributed to deforestation:

> "[*We] haven't really had some kind of education o[n] that, but [we] have been observing how things have been happening. [We]'ve realized that because the trees are not [as] much in the system now, that's why all those [weather] things are happening*" (Cocoa farmer, male, 27 years).

Attributing deforestation to the climatic variability indicated that cocoa farmers viewed climate change impacts as a regional problem rather than a global phenomenon. The association to climate change as a global phenomenon was not found within the sample of cocoa farmers. Instead, their understanding of climatic changes stemmed from their own observations and local knowledge, as one participant clearly remarked:

> "*There used to be a lot of full-grown forests but now everything has been cut down and the forest has reduced, and [I] think that's the cause of the change in the climate*" (Cocoa farmer, male, 60 years).

Alongside observing climate change, information on the matter has been supplied using various media forms. All participants have access to the weekly radio broadcasts where information on climate change, agricultural activities and (il)legal forest or mining activities within the region are reported; "*she heard it on the radio by a Cocobod extension officer and the Forestry Division*" (Cocoa farmer, female, 70 years). The radio channels included Rainbow FM and Golden Pot. The FIP program also provides informational extension services to the farmers, either through CREMA volunteers or the extension officers from CED. These staff members have sensitized cocoa farmers in their residential community on the causes and impacts of climate change during consultation rounds. Through the dissemination of these informational services, local observations of climate change have been gradually confirmed with the increasing access to informational services:

"*[I have been] in farming for almost 33 years now. [I] have realized all those [climate] changes and no one would tell [me] that climate change is here (…). Awareness that NGOs and other organization[s] came in [to provide] have just confirmed what [we] were experiencing*" (Cocoa farmer, male, 56 years).

Nevertheless, despite these additional informational services, there was no understanding of climate change in relation to carbon emissions. All causes were attributed to deforestation.

In terms of what type of climate change effects cocoa farmers are experiencing, all cocoa farming participants reported experiencing erratic rainfall, elevated temperatures and the occurrence of pests. Instead of consistent rains over a successive period of months, sporadic rainfall sessions have been occurring according to participants. One participant reported that:

"…the rains, it is not like the [duration has] become shorter, but the time that [we] expect it comes, it doesn't come at that time (…) Probably you expect the rains to start in March [or] April, but it won't rain until maybe May." (Cocoa farmer, male, 30 years).

Elevated temperatures also have generated harsher weather conditions that negatively affect the cocoa yield:

"*It is an increase in temperature, especially in the* harmattan[13] *season [when] the sun blows so much that it is difficult for the cocoa to survive. And at those times the yield really goes down*" (Cocoa farmer, female, 54 years).

Another effect included the presence in pests and diseases, such as swollen shoot, black pod disease, caterpillars, millipedes and ants. Some participants reported an increase of pests and diseases, whilst others remarked that their presence is a natural component of the farm. For this reason, the occurrence of pests and diseases cannot be confidently attributed to either climate change without further research.

Overall, participants stated that the change in weather has negatively affected their cocoa yields. Within the sample, 102 (94.4%) participants experienced a decrease in yield over the years. When solely including those participants, it was found that the average yield of those 101 (1 missing) participants was on average 13.673 bags per year (SD) = 15.439) in comparison to previous yields of 42.019 bags per year (SD = 43.440), indicating an average percentage reduction of 66.49% (SD) = 20.396).

[13] Harmattan is the dry season in the West African subcontinent, occurring from the end of November to the middle of March.

According to the participants, the reduction has been occurring since a mean of 4.51 years (SD = 2.905). Participants attributed the increase in temperatures and erratic rainfall in harming their cocoa yields, and thus urged for necessary steps to protect their cocoa farms.

ii. Cocoa Farmers Understanding on the National Climate Change Policy

Although cocoa farmers were aware of climate change to some extent, it was found that none of the cocoa farming participants were aware of the National Climate Change Policy or the FIP program. Instead, cocoa farming participants were aware that the agroforestry techniques provided were part of a government initiative. This was because of the resources and information distributed by either the Cocoa Extension Division (CED) or the Forestry Services Division (FSD).

The concept that agroforestry is an initiative to aid cocoa production was generally well understood. Cocoa farmers understood that the trees would create shade for the cocoa trees, which would allow the trees to grow healthier. The civil society on the ground similarly stated that the cocoa farming community are aware of the benefits and reasoning behind the agroforestry, as indicated by the following statement:

> *"Almost every organisation is going to these communities with the same message, saying that trees are important for your farms. So, communities are beginning to realize that indeed trees are important for our farms, and they have seen evidence of it (…) [in] 2015 [when] there was that severe [drought] that soared through the country and there was evidence of people who didn't cut trees, their farms being protected and those who did not have trees. (…) When we went [a]round, we were speaking to farmers [and] we realized that their cocoa got burnt, not by fire but by the sun. So, when [we went] to the community (…), a particular farm ha[d] some tree in them [and so] had tree cover. Then [you] ask[ed one cocoa farmer]:'yours got really burnt severely. This [other farm], although it is withered, there is still some life in them. Why do you think they have life in their cocoa farm and yours is totally gone?'.*
>
> *'I don't know, maybe there is some black magic (…) that is why?'*
>
> *'No, no, no. Look at their farm, look at your farm, what is the difference? Ah, they have trees, you don't have trees. If you [as a cocoa farmer] had trees, probably yours wouldn't have been burnt by the sun. So, the community started realizing that by putting trees in their cocoa farms, they are not only protecting the soil but also the are protecting their cocoa trees.*" (Key informant, EcoCare, CSO).

All cocoa farming participants remarked on comparatively better cocoa production with the addition of trees on their farms. Those who had not yet observed the benefits regardless positively perceived agroforestry techniques. The results indicated this was for two reasons. The first includes its basis on indigenous knowledge, as discussed in the previously (Chapter 7.2.1). The second is the general trust cocoa farmers placed on the district institutions. All cocoa farming participants stated they accepted all courses of actions set by the national government because of their belief that the government has the responsibility to ensure the productivity of cocoa agricultural activities:

> "*Cocobod takes care of cocoa, and Cocobod is under the government. Whatever they bring [to Juaboso] is in the interest of cocoa. Whatever they bring and preach is good, [we] accept it is good. So, [we] feel it is good*" (Community chief & cocoa farmer, male, 50 years)

This belief that the government initiative is there to aid cocoa farmers were further enforced with the economic incentive that the FIP provides to cocoa farmers. Participants were aware of the economic aspect of the agroforestry strategy, and regarded it positively as indicated by one of the following participants:

> *"It is a good initiative because [we] can sell it as timber and [we] can also use it as for domestic use*" (Cocoa farmer, female, 54 years).

On the other hand, participants remarked that the incentive was not enough because they would have to wait several years until they could actually harvest the trees. The absence of short-term benefits posed a problem for cocoa farmers to be thoroughly enthusiastic about the adaptation strategy. This is an acknowledged problem also amongst the Forestry Commission:

> "*People do not accept change not that easily and especially for farmers, they see immediate benefit rather than the long-term goal of the whole picture. And I remember sometimes talking to farmers 'okay we want you to plant trees to help protect your farm'. They know that it will really protect their farm, but for how long will they also live to see the tree grow? To benefit from the tree? They want to use it for their current project or to resell the money tree and benefit until he is already 50,60 years how long will this tree take to grow? 20-30 years?"* (Key Informant, FC, Government level)

This suggests that cocoa farmers either require a short-term incentive from the district institutions, or the district has to educate cocoa farmers on short-term economic activities to satisfy their immediate needs while they wait for the timber trees to mature.

The second reason for the positive perception on the agroforestry program was the participants' believe that the government institutions are equipped with modern and technical agricultural knowledge that their local agricultural knowledge does not have. This was clearly explained by the following two participants:

1. *"You know because the [Cocobod] people, they know about cocoa, what they tell them is what [we] do. So, when they said it, [we] accept it because that was a good thing that [we] should do. So, [we] all decided to [do] as [we] were told"* (Cocoa farmer, male, 75 years).

2. "*...[We] don't have any option; [Cocobod] have the technicalities. So, when [CED] come in and tell you [that] you should do this, you have to do it, whether good [or] bad. It is the same way that [CED] came in and told [us] to cut down the trees from [our] farm, and [we] cut down those trees. And now [we] have to plant the trees again*" (Cocoa farmer, male, 58 years).

The overall obedience and trust that participants illustrated for the agroforestry initiative could be another reason why the agroforestry adaptation strategy has been generally accepted by the participants. With the belief that the interests of the government are in line with that of cocoa farmers, the participants saw little reason not to implement the agroforestry strategy. The means to which participants adopted the agroforestry strategy is discussed in the next chapter.

7.2.3. Gaining Access to the Adaptation Strategy

In answering the last sub-research question (RQ2.c) of how the adaptation strategy is adopted by the cocoa farmers, it was found they do so by gaining access to tree seedlings, training services and agrochemicals. The access to these resources was facilitated by both the CED and FSD. The access and challenges of these three resources are presented in the following sub-chapters.

i. Gaining Access to Agronomic Tree Seedlings

The first method of implementing the targets of the FIP was by providing agronomic tree seedlings to the Juaboso district. Both the methods and the challenges of cocoa farmers' gaining access to agronomic are discussed in the following chapter.

Methods in Gaining Access to Agronomic Tree Seedlings

Cocoa farming participants gained access to agronomic tree seedlings through the collaborative efforts of three district-level governmental institutions. The government institutions include MOFA, who is

responsible for all national agricultural activities excluding cocoa production, Forestry Commission (FC), who is responsible for all national forestry activities, and Cocobod, who is responsible for all national cocoa related activities. Each of these three institutions has a district-level extension division located within the district. Forestry Commission was the sole producer of the agronomic tree seedlings, whereby they germinate timber seedlings at their nursery site at the Forestry Services Division (FSD) office in Juaboso. Once the seedlings have grown for approximately 2-3 months, they are considered ready to be distributed amongst communities in the district. Though the FC is the supplier of the tree seedlings, they are not the sole distributors of the seedlings to the communities. This task is shared between all the before mentioned institutions.

Through the extension services of the three mentioned institutions, participants gained access to agronomic tree seedlings for free over the past 3-5 years. According to the community Chiefs, a group of extensions officers would approach Chiefs with the intention of their visit, where thereafter the Chief would make an announcement on the community radio for residents to voluntarily come and collect tree seedlings. Some participants stated that they were also directly approached by extension officers on the immediate availability of tree seedlings. When participants would come for collection, participants stated that their name and the number of seedlings given was registered:

> "*[Cocobod] brings [the tree seedlings] because of the FIP [which] always bring [seedlings] around every community within the district, when the project was implemented. So that they will ask the farmers to come and register, and get [the seedlings]*"
> (Cocoa farmer, male, 59 years).

Alongside gaining access to seedlings at a community level, farmers were also aware that they could collect tree seedlings at the offices in Juaboso. Participants learned about this option either via radio or after having collected tree seedlings once in their communities. These participants learned about this option via radio as well as during the collection of seedlings at the community level. The collaboration between CED and FSD has overall increased accessibility to the cocoa farmers. As CED is part of Cocobod and therefore is responsible for all cocoa related activities, participants frequently approached CED for cocoa matters. With the option of collecting tree seedlings from either CED or FSD, the accessibility to these resources was elevated for cocoa farmers. This was illustrated by the following two participants:

1. *"…[We] all went to [the] office and collected [tree seedlings], and [we] all get it [our]selves"* (Cocoa farmer, male, 69 years).

2. "*It is very easy to get some [tree seedlings] because when it comes to the Cocobod, [I] will get some. And when [I] go to the Forestry too, [I] can also get some from [their] office*" (Cocoa farmer, male, 42 years).

Overall, the different means in collecting the agronomic tree seedlings increased the options for cocoa farmers to gain access to these resources. A limiting factor to this accessibility was a bureaucratic requirement. Prior to collecting the tree seedlings from the offices, it was necessary for the cocoa farms to be inspected by either the National Cocoa Disease and Pest Control (CODAPEC) or Agric extension officers, which are the health extension services of Cocobod and MOFA, respectively. Upon inspection of the farm, the extension officers measured the farm using GPS to calculate the appropriate number of tree seedlings necessary. According to participants, 6 to 8 trees per hectare[14] was recommended. After inspection, the cocoa farmer were provided with a documentation stating the required number. This can be brought to either the CED or FSD offices. This was clearly explained by the following two participants:

1. *"Last year Cocobod (…) got a nursery sight and then they give [us] the seedlings, so those who have experienced drought on their cocoa can have them. (…) You go to the Cocobod place and then they give you a sheet, and then you use it to [collect] the seedlings*" (Cocoa farmer, male, 59 years).

2. "*The Forest Commission ha[s] some tree nursery at their office…So the Forest Commission and the MOFA (…) in some kind of collaboration, the Agric [extension officers] will come and take a measure of your land so they know the [number] of trees that you need in your farm. So, when you take your registration, the Forest Commission will give you the tree seedlings. They have already the nursery, so they provide the seedlings, not the seed. They work on the seeds to get the seedlings before they give it out.*" (Cocoa farmer, male, 53 years).

An issue with this method was that not all participants had yet had the opportunity for their farms to be inspected or were unaware of the necessity of documentation. Cocoa farmers more closely involved with the private sector, such as Mondelēz, or NGO's, such as The Resource Foundation (TRF), experienced this problem less frequently. This was because these organizations directly supplied the seedlings to the cocoa farmers. These organizations handled the bureaucracy for the cocoa farmers, by measuring their cocoa farmers and collaboratively working with the CED and FSD to provide the seedlings to the cocoa farmers. Consequently, these participants had in general more access to the tree seedlings that those participants not involved with such organizations.

[14] 1 hectare (ha) = 10,000 square meters (m^2)

Overall, it was found that the majority of cocoa farmers have gained access to tree seedlings as represented by the fact that 88% of the sample having planted trees on their farms this year. The remaining 12% did not plant trees due to their cocoa farm currently being rehabilitated (n = 3), the farm already has a sufficient amount of naturally occurring trees (n = 9) or the participants not yet having been provided seedlings this year (n = 2). On average, cocoa farmers began planting agronomic trees on their farms 3.81 years (SD = 4.346) since 2019. Those who were supplied tree seedlings (n = 89) received a mean of 40.60 (SD = 25.516) seedlings annually, whilst the remaining 6 supplied their tree seedlings directly from the forest.

Challenges in Gaining Access to Agronomic Tree Seedlings

Timing of the deliverance of the tree seedlings was a major challenge for the participants. Some participants remarked that the seedlings have not always been delivered on time, which negatively affected the probability of the tree saplings growing well until the harvest:

> "*[CED and FSD] don't bring the trees at the right time, so at times the rains ha[ve] stopped before they bring it. So, about 70% of the trees didn't survive. [Instead, they bring the tree seedlings] around August when the rains have gone down*" (Cocoa farmer, male, 32 years).

These concerns have not gone unnoticed by the district level officials. A key informant from the CED remarked on the same issue:

> *"The tree [seedlings] supplied to us, they are not so much. (…) Normally in a year if they give us around 500,000, we can plant [for the whole district], but normally they will supply less than 50,000 or a little above 50,000, which is inadequate [for the whole district]. And then the timing of supply. We should have gotten them by now because we normally depend on the natural rain and now it is the time, but they will wait until July August, that is when they will bring it. So, that also makes survival very difficult".*

According to both CED and FSD, the issue with tree supply and delivery is due to lack of funding and lack of staff. An informant detailed that even when an institution like the FSD gains sufficient funding, procedures are slowed down by bureaucracy:

> *"…Forestry Commission supplies to a lot of farmers, there are some procedures. By the time that the government will release funds for them to do their nursery, it is another thing. So, they have their own challenge. (…) FC is a big body which is supplying [to] the whole country of*

farmers and they have challenges before the money is even released; it will pass through many hands…You have to follow procedures and that will take time" (Key informant, Rainforest Alliance, INGO).

When inquired why the participants did not travel to the CED or FSD offices to collect the tree seedlings themselves, participants stated that they would simply wait until their arrival. Two participants further clarified that it was an issue of transportation costs:

"*If [CED or FSD] bring it too, it will be of help to [us]. Otherwise, [we] will have to go there and transport it here, which is quite (…) a problem for the common farmer here. (…) [We] have to pay transportation [and] if you don't have the money or the motivation to do that, it means you're not going to do it*" (Cocoa farmer, male, 70 years).

Concerned with not having access to the tree seedlings, cocoa farming participants detailed that it would be beneficial to have a community tree nursery to increase accessibility. A Community Chief and Chief Executive Committee (CES) during a focus group discussion stated this point of view, respectively:

1. "*If the government is able to provide [us] with a nursery, to plant the nursery in the community (…) [then] it will be very good if [we] are given that autonomy to plant trees (…) so it will be easier for everyone to come for the tree*".

2. "*If we nurse them ourselves, the farmers c[o]me and take them, will be there for them, that will help. It will increase the survival rate (…) we have been telling them, they have not been listening to us because if you go to take, [for example], 50 [tree seedlings from the FSD office], before you get to [your] farm you are left with maybe 20.*"

Should cocoa farmers have the opportunity to establish their own nursery, this would not only omit the problem of transportation costs and lack of resources on both the cocoa farmers' and district institutional end.

ii. *Gaining Access to training services*

The second method of implementing the targets of the FIP program within Juaboso was through the provision of training services to cocoa farmers. The methods and implications in which cocoa farmers were involved with these training services are discussed, respectively.

Methods in Gaining Access to Training Services

The results showed three methods in which cocoa farmers were involved with the training services from the CED and FSD. All involvement with these methods was purely on a voluntary basis, where cocoa farms could choose whether they wanted to have a training or not.

The first method was the dissemination of information during the time when cocoa farmers collected tree seedlings. During this time, CED extension officers explained the agricultural practices of tree planting such as buffer zones, the benefits of planting and the number of trees required:

> "*We've been trained on the technicalities in planting trees (…) the distance and when you plant the trees on your farm, the number of trees you have to plant on your farm. How to take care of the trees*" (Cocoa farmer, male, 60 years).

The second method included consultation rounds. The FIP establishes bimonthly consultation rounds, which is provided by staff from either CED, FSD or MOFA. Consultation rounds were done at a community level, where cocoa farmers were invited to attend through the community radio speaker. During these rounds' cocoa farmers had the opportunity to be educated on the purpose of agroforestry and its technicalities.

The third method was when the cocoa farmer sought out training of their own initiative. Cocoa farmers are at liberty to obtain more information by approaching extension officers located in communities within the Juaboso district. Both MOFA and CED have extension officers who work closely with the cocoa farmers. They are responsible for monitoring farming activities as well as in providing informational services to community members. Although MOFA is not responsible for cocoa production activities, because cocoa farmers are often also involved in non-cocoa related agricultural activities (54.6% in this sample), MOFA collaborates with CED in the provision of these informational services. Hence, some participants approached extension officers to gain direct access to information or recommendations when experiencing problems.

Challenges in Gaining Access to Training Services

Challenges were found with the last method. All cocoa farming participants complained of the inadequate quantity of extension officers, as stated by the following participant:

> "The *government is doing is okay, but they need to be increasing the number of employees who work on (…) the agroforestry program. (…) What [I] ha[ve] been seeing is when about two or three farmers have agreed to practice agroforestry, the others aren't doing anything [because they have not learned about agroforestry]. So, [I] think that the government should include more staff so that they will carry out the sensitization program every time so that the farmers [have more] understanding and also participate in the programs*" (Cocoa farmer, male, 42 years).

The insufficient amount of staffing was repeatedly stated as an issue also amongst the CED and FSD. One key informant from the CED remarked on the issue as follows:

> "*The extension officers are responsible for any field concerns on cocoa, so the planting to the harvesting. They have every idea to give it to the farmers any time they want. That is why they organize trainings and they have their methods. It is their responsibility too to let the farmers know everything, and sometimes when there are diversifications, we go down to their operation areas and disseminate information there. (…) [But] each extension officer has its own operational area and the farmers are gathered into groups and each community they form their own groups, and each group comprises of 10 farmers, and each extension agent is working with about 500 farmers in a community*."

This ratio of one extension officer to a community of 500 individuals highlights the need for an increase in staffing to more effectively cover more ground. It would also minimize the degree of responsibility on one sole extension officer. Those who were part of the involvement of NGOs or Mondelēz suffered less from this inadequacy as they had the privilege of accessing monthly training rounds, thereby increasing their access to education and training services. The content of the information is similar to that provided by the government institutions, covering topics of good agronomic practices and climate-smart cocoa practices.

iii. *Gaining Access to Agrochemicals*

The third, and final, method of implementation was through the provision of agrochemicals. Out of the three methods, this technique was minimal. The current provision of free agrochemicals to the cocoa farmers has become limited due to the current governing government party urging farmers to acquire most of the chemical themselves. At the moment, two cartons of twelve 1 litre bottles are given free of charge to each Community Chief, who is then required to share it among the entire community. A CREMA volunteer explained it as follows:

"*The whole community used to get about 2 cartons so when you sell it yourself you get maybe 2 fillings, that is not even up to 2 litres. (…) [I] will need about 1 carton (...) I have not received any fertilizer from the government, but if they will be another opportunity, I will need about 30 bags*" (Cocoa farmer, male, 38 years).

Considering that the average farm size of cocoa farmers within the sample was 16.58 acres[15] (SD = 14.489) and a community consists of between 1500-3000 residents according to community Chiefs, the quantity of government-provided agrochemicals is insufficient for all cocoa farmers. The quantity is even more insufficient when learning that it is necessary to spray multiple times a year. This was clearly stated by one cocoa farming participant:

"*Every year [we] used to spray the cocoa farm about 4 times, 6 times a year*" (Cocoa farmer, female, 45 years).

As a result, participants have little access to sufficient amounts of agrochemical. As cocoa farmers are relatively poor, participants remarked that they are simply not yet at liberty to purchase agrochemicals as easily as some stakeholders may believe. Subsequently, without adequate access to government-provided agrochemicals, limited usage will remain a problem in the foreseeable future.

Cocoa farming participants remarked that the usage of agrochemicals is necessary to sustain their cocoa farms, as the quality of their farm has dwindled. This is as a result of ageing cocoa farms, climatic variability, pest outbreaks and land degradation. Agrochemicals in the form of pesticides, weedicides and fertilizers are thus necessary to not only protect the farm but also boost its land quality. This finding was more prevalent when contrasting the current farming situation to the past when the use of agrochemicals was not necessary. One participant who began cocoa farming 40 years ago explained it as follows:

"*…in those times [we didn't] use any chemicals, [we] just plant[ed] the trees, plant the cocoa and make sure that [we] weed around it, and it goes well. So, there was nothing like [the use of chemicals], because at that time the land was good, it was fertile. And [we] weren't experiencing a lot of disease[s] in [our] farms, so then there wasn't anything like that*" (Cocoa farmer, male, 80 years).

[15] 1 acre = 4046.85 m^2

This same participant stated that as a result of continued deforestation and climatic changes, it is now no longer feasible to grow cocoa without the use of chemicals. Cocoa farmers have also experienced the benefits of its application since its introduction. Cocoa yields with agrochemical application yielded comparatively higher than when the chemical application was not available back in the day. The combined effect of changing climatic conditions and a positive association with the chemical application has consequently left the majority of the participants urging for better access to agrochemicals.

8. DISCUSSION

8.1. Mainstreaming Agroforestry as a Cocoa Adaptation Strategy

The central question of this study was to understand how the climate change adaptation policy is being implemented in the cocoa sector of Ghana at district level. The results illustrate that its implementation is predominantly through a top-down approach, where an existing program was used to mainstream agroforestry strategies in the cocoa sector of Juaboso. This program was the Ghana Forest Investment Program (FIP), which is financed by the World Bank and mandated via the partnership between Cocobod and Forestry Commission (FC).

At a district level, on the other hand, the implementation of FIP is through a slightly more decentralized approach. Corporate organisations, CSOs and NGOs operating in the district are engaged in extending their services to spread the concept of agroforestry over the entire district. This was reflected in Figure 7 (Chapter 7.1.3), showing that the majority of stakeholders operate at district and community levels. Yet, the two district level government institutions of Cocobod and Forestry Commission, namely the Cocobod Extension Divison (CED) and Forestry Services Divison (FSD), maintained their authoritative roles by being the primary facilitators. As a result, a top-down governance system was maintained at a district level though it included some elements of decentralization.

It is interesting to note that the concept of agroforestry as a climate adaptation strategy was initially introduced and implemented by INGOs and corporations, before significant government involvement. Even prior to this, agroforestry was a local technique among cocoa farmers in Ghana. Agroforestry is thus nothing new to cocoa farmers. It has instead been reiterated as an adaptation strategy because it, by chance, fits Ghana's climate policy well. It acts not only as an adaptation strategy for cocoa farmers on the ground, but also as a mitigative strategy by sequestering quantities of atmospheric carbon. This is a fortuitous circumstance for Ghana. For the cocoa farmers it is also a beneficial approach, because it omits the resistance against change. Cocoa farmers are already familiar with the concept, thereby making the adaptation strategy easier to accept and implement.

Upon reflection, the continuation of an existing agroforestry program is actually part of the basis of the National Climate Change Policy. The NCCP sought to mainstream climatic action into Ghana's existing national development structures to combat climate change (MESTI, 2015). The aim was thus to align the new climate requirements of Ghana with existing government and private sector efforts that already sought to promote climate beneficial cocoa production (IDH, 2018). This practice is an idea for other nations. Rather than founding a novel adaptation strategy, nations can delve into their existing programs that may already be meeting some climate objectives. Some nations may be unaware of this possibility. Stakeholders at an international level, whether these include INGOs or otherwise, can provide support in highlighting how existing programs could potentially help nations meet their climate targets. Maintaining and supporting such programs could significantly reduce the financial and institutional burdens that nations face when they need to establish national climate adaptation policies.

8.2. Adopting Agroforestry as an Adaptation Strategy

The first set of sub-research questions aimed to investigate how the national climate change policy of Ghana is addressing climate change impacts on the cocoa sector at district level. Ghana is experiencing climatic vulnerability in the form of erratic rainfall and elevated temperatures. With the cocoa sector vulnerable to these effects, the adaptation strategy of agroforestry has been implemented on the cocoa sector at a national scale. The strategy was mainstreamed and promoted through existing agroforestry programs in the country, namely FIP in the Juaboso district.

The aim of agroforestry as an adaptation strategy was to generate a favourable microclimate for cocoa production by creating shade in the increasingly dry climate. At the same time, it provides an economic incentive of timber use for cocoa farmers. These two aims relate to the adaptive measures required to ensure that cocoa production can continue within the current climate conditions. However, the agroforestry strategy also addresses the mitigative requirements of Ghana's Nationally Determined Contributions.

The second set of sub-research questions aimed to investigate how the national climate change policy attempts to improve the adaptive capacity of cocoa farmers towards climate change at district level. The results showed that cocoa farmers can voluntarily gain access to tree seedlings, training services and some agrochemicals, as provided by the district institutions.

Referring to the Local Adaptive Capacity (LAC) indicators, it was observed that cocoa farmers illustrate a higher degree of access to both 'Information' and 'Innovation'. The indicator of 'Information' measured whether cocoa farmers had access to information on climate change and the agroforestry adaptation strategy. This was sufficiently met with the provision of multiple informational services. Information on climate change was sourced to cocoa farmers either through radio

broadcasting, community-level training sessions, during the collection of seedlings or by approaching extension officers. The latter method, however, was limited due to a lack of sufficient staff. This finding was similarly found by a study of Denkyirah et al. (2017), which found that cocoa farmer's access to information on climate change and adaptation innovations through extension contact is a major challenge. Similarly, a study by Tessema, Awake & Endris (2013) showed that extension service was the least effective source of information on climate change to farmers because of its inefficiencies. As a result, the majority of participants attributed climatic changes to deforestation rather than the concept of climate change, which is also supported by existing literature (Denkyirah et al., 2017; Fosu-Mensah et al., 2012; Oyekale & Oladele, 2012; Oluwatusin, 2014). This indicates that the extension services need to be improved upon. Participants remarked that the existence of extension services was beneficial to them because it provided proximate access to information. Hence, investment into the size and quality of extension services is needed to further improve the accessibility to information. As participants had alternative means to gain information regarding climate change and agroforestry, this limitation was somewhat compensated for. The results indicated a general awareness on climatic effects and an understanding of the concept of agroforestry among the participants.

The second indicator of 'Innovation' measured whether cocoa farmers are implementing the adaptation strategy of agroforestry. The findings showed that the majority of participants are currently implementing agroforestry techniques in their cocoa farmers, as represented by the fact that 88% of the sample has planted trees in their cocoa farmers in 2019. The majority of the cocoa farming participants used training services and are currently engaged in agroforestry practices. The general acceptance of the agroforestry strategy was attributed to the participants trust in the government initiative. They believed that the initiative aimed to improve cocoa production and the technical resources the districts were equipped with could be beneficial to the cocoa farmers. This trust provided an advantage, because it ensured that cocoa farmers were willing to consider strategies imposed by the district institutions. The positive relationship between the district institutions and cocoa farmers provided a space where the top-down processes of the district institutions could already interact with the bottom-up processes of the cocoa farming community.

The final indicator of 'Institution' measured whether cocoa farmers had access to the necessary tools to adequately implement the adaptation strategy. The results showed that the adaptive capacity with respect to 'Institution' was comparatively less to that of the previous two indicators. The district institutions did provide tree seedlings, agrochemicals and training services, but cocoa farmers could not always gain access to these resources. This signposts that the adaptive capacity of the institution was a primary challenge for cocoa farmers in Juaboso. This challenge persisted for three reasons. First, gaining access to the tree seedlings was problematic due to delays and transportation issues. Secondly, the insufficient numbers of extension officers limited how accessible training services were to cocoa farmers. Finally, there was a lack of access to government-provided agrochemicals needed to sustain cocoa production. The findings show that although all cocoa farmers are entitled to the resources

provided by the district institutions, how cocoa farmers acquire the necessary tools for implementing the adaptation strategy is greatly undermined by the shortcomings of the district itself. This relates to the findings of Pelling et al. (2008). The district-level institutional capacity has to therefore first be improved before it can improve the institutional local adaptive capacity of cocoa farmers.

8.3. Theoretical Reflections on the Implications of District Level Implementation

Ghana is on the right track in implementing climate action at a national scale, but at a district level, it is limited by the shortcomings that district institutions have to cope with. The findings of this study indicate that the district alone does not yet have the capacity to fully implement the adaptation strategy onto cocoa farmers. The district institutions of the CED and FSD were found to be limited by their lack of resources and finances to carry out the necessary strategies. According to Measham et al. (2011), districts are frequently constrained by their financial capacity, which in part stems from the wide range of activities in which they are engaged. In the case of Juaboso, the CED and FSD are required to not only implement FIP, but also monitor various other programs within their fields. For example, the FSD is required to also monitor timber activities and promote afforestation strategies within Juaboso. Consequently, the two district institutions simply lack the time and resources to adequately address the FIP program.

It is surprising that despite the multiple actors involved in implementing the FIP in Juaboso, resources remain scarce. Recalling that the FIP is financed by the World Bank and governed from the Ministry of Land and Natural Resources (MLNR) ministerial body as illustrated in Figure 7 (p.38), it is surprising that their funding does not provide enough benefits on the ground. It is argued that some of the funding is slowed down by bureaucratic procedures, as was suggested by some key informants from the CED and FSD. At the same time, as the CED and FSD are required to carry out multiple strategies, it is argued that the funding itself is insufficient to cover the expenses of all the activities. This suggests that the government of Ghana requires to supply more funding that actually reaches district institutions. The theoretical actions established during government policymaking cannot be translated into practical implementations without the necessary funding and staff that must be provided by the government to the districts.

This relates back to the outcome-based approach. A government may have established certain targets that need to be implemented, such as the number of tree seedlings delivered in Juaboso district in this study. However, this focus on measurable units failed to consider district constraints that prevent those targets from being met. At a ground level, as revealed in this study, the implementation does not run smoothly enough. If top-down systems fail to consider local level constrains to implementing adaptation strategies (Reed et al., 2013; Amundsen et al., 2010), the execution of any nationally established adaptation strategy will continually fall short.

8.4. Practical Recommendations on District Level Implementation

Districts remain imperative in the implementation of national climate policies as they are the final implementing body to reach communities. Addressing district level shortcomings therefore needs to be addressed should Ghana wish to improve its current implementation procedures at a district level. The lack of sufficient resources suggests that additional sources of funding and more skilled staff is needed to elevate the burden placed on districts. This could be sought in two ways. On the one hand, the government of Ghana can gain more international funding. This, however, does not ensure that the funding actually reaches the cocoa farmers.

On the other hand, the government of Ghana could further embrace the already multi-faceted nature of climate governance by increasing the involvement of stakeholders. Ghana has the potential of adding additional resources by including more involvement from the private sector, NGOs and CSOs in the context of implementing climate adaptation in the cocoa sector. These establishments already have existing institutions operating within the district. With these institutions more involved, cocoa farmers gain better access to the necessary resources and it shifts some of the responsibility away from the district institutions. Considering it is both in the interest of the public and private sector to carry out the agroforestry adaptation strategy in the cocoa sector, it is a viable consideration. The government of Ghana could even extend some autonomy to the cocoa farmers, such as through the establishment of community nurseries. This elevates the adaptive capacity of cocoa farmers because it reduces some their dependency on institutions altogether.

The before mentioned institutions could also stimulate alternative adaptation strategies. Although agroforestry is a viable adaptation strategy, it only addresses one aspect of the vulnerability that cocoa farmers face. Issues such as the lack of income diversifications and food security are unaddressed in the agroforestry strategy. Institutions with sufficient funding could aid in these aspects, thereby further enhancing the adaptive capacity of cocoa farmers in the district. Both the private sector and INGOs are in a unique position of having the capacity to innovate new technologies for adaptation as well as having the financial capacity (Adger et al., 2003; Surminski, 2013). Their financial leverage can play a role in building adaptive capacity by providing funds and expertise that the current government of Ghana may not be able to provide (Agrawala et al., 2011; Surminski, 2013).

This recommendation does go against the climate governance system in Ghana. Ghana favours a top-down approach because a centralized system can address the multifaceted nature of climate change. A centralized system can exert the necessary control over multiple actors and sectors involved, whereas a decentralized system will not have the capacity to coherently address the issue of climate change (Termeer, Dewulf & Breeman, 2013). This is a valid perspective and was observed within the case study of Juaboso. Both CED and FSD maintained control by being closely involved with all operations concerning cocoa and forest resources, respectively. This limited the degree of fragmentation in terms

of scattering priorities amongst a multitude of stakeholders. It also helped focalize the usage of the resources where it can be more easily monitored.

However, it is argued that there is room for leniency in the top-down approach in the context of climate change. Whereas traditionally practitioners viewed multilateral agreements negotiated by national governments as the central mechanism for global environmental governance, governance in the context of climate has gradually favoured a more multifaceted nature (Andonova, Betsill & Bulkeley, 2009). The government of Ghana could gradually transition to a more decentralized governance system where the government of Ghana still oversees all collaborative practical actions on the ground. This involves the gradual diffusion of authority between multiple levels actors. Ghana has the potential of embracing the multifaceted nature of climate change with a multifaceted climate governance system.

9. CONCLUSION

The results of this study illustrate that the top-down climate governance system of Ghana is prevalent even at the district level of Juaboso. The district-level institutions of Cocobod and Forestry Commission were the primary facilitators of implementing the agroforestry adaptation strategy in Juaboso district. This was done through the existing Ghana Forest Investment Program (FIP), which runs in accordance with the targets of the National Climate Change Policy. Overall, the FIP aims to mainstream agroforestry techniques within cocoa production. Information, innovative techniques and resources were sourced by district institutions to cocoa farmers to provide them with the opportunity to use the adaptation practice. However, the minimal institutional capacity of the districts in providing the necessary resources was the primary shortcoming in the implementation of agroforestry strategies at district level.

The findings of this study revealed that the district institutions are actively disseminating information and introducing innovations to cocoa farmers. However, the limitation of lack of funding and resources is jeopardizing the extent to which cocoa farmers can improve their adaptive capacity by implementing the adaptation strategy. The results show that a top-down approach overlooks not only local constraints experienced by cocoa farmers, but also the constraints within district institutions. Considering the fact that cocoa farmers in this study already trust that district institutions operate within their interests, districts like Juaboso have the advantage of positively cooperating with the cocoa farmers. Districts are equipped with technical skills that the cocoa farmers want to obtain, giving districts an advantage in effectively disseminating information and implementing an adaptation strategy to its community. With these advantages, it is now time that the higher governmental bodies who establish adaptation policy, realize the value and role that districts play.

The findings of this study have shown both the strengths and shortcomings of implementing an adaptation strategy in a top-down approach, with a focus on the district level. However, to date, there are only a few studies focusing on this topic. There is a need for more research on the implementation of national policies at district level. It is a relevant area of research because there is a global growing interest in climate governance as climatic effects become more prevalent in several nations. The continuation of research on this subject matter may help identify recurrent shortcomings and strengths, that then later can be considered during national and international policymaking.

This study has provided initial results that highlight two key aspects. The first is the importance of the communicative relationship between the bottom-up processes of communities and the top-down processes of the districts. Trust between the two parties can provide a steppingstone in implementing an adaptation strategy. The second result is the importance of increasing the implementing capacity at a district level. How these two areas could be improved upon provides an additional frame of research to be delved into.

The Juaboso district was chosen as a research site due to its importance within the cocoa sector, its climatic vulnerability and the involvement of numerous stakeholders. The possibility of similarities or differences in implementation among other districts opens up an area of further study. Similarities found in other districts could further validate the findings found in this study, thereby highlighting areas for improvement during policymaking. Possible differences, on the other hand, could add other challenges to be considered. Different institutional constraints may require the need for alternative implementation strategies or even the need for district-specific strategies rather than a one for all national strategy. This knowledge gap presents a valuable area of study in identifying differences between districts, where its results could be used for future climate policymaking for the country of Ghana.

Finally, this thesis discussed the possibility of embracing a more multi-faceted governance system at a district level. Before diving headfirst into such a system, it is relevant to understand how each of these actors work. It is also relevant to understand to what extent they should gain autonomy in implementing the necessary strategies. Thereafter, it can be understood how governance can possibly be shared by different actors in a gradually more decentralized system. The different capacities of actors such as NGOs, CSOs, subnational authorities and the private sector can provide a scope of qualities to the governance system. Investigating this could provide potential improvements that the government of Ghana can take under consideration when establishing national climate adaptation policies.

10. REFERENCES

Adger, W. N., Agrawala, S., Mirza, M. M. Q., Conde, C., o'Brien, K., Pulhin, J., ... & Takahashi, K. (2007). Assessment of adaptation practices, options, constraints and capacity. *Climate change*, *200*.

Adger, W. N., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global environmental change*, *15*(2), 77-86.

Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). Adaptation to climate change in the developing world. *Progress in development studies*, *3*(3), 179-195.

Afari-Dartey, Samuel. *Ghana REDD Strategy: 2016-2035*. Forestry Commission, 2016.

Agrawala, S., Carraro, M., Kingsmill, N., Lanzi, E., Mullan, M., & Prudent-Richard, G. (2011). Private sector engagement in adaptation to climate change: approaches to managing climate risks.

Amundsen, H., Berglund, F., & Westskog, H. (2010). Overcoming barriers to climate change adaptation—a question of multilevel governance?. *Environment and Planning C: Government and Policy*, *28*(2), 276-289.

Andonova, L. B., Betsill, M. M., & Bulkeley, H. (2009). Transnational climate governance. *Global environmental politics*, *9*(2), 52-73.

Asante, F., & Amuakwa-Mensah, F. (2015). Climate change and variability in Ghana: Stocktaking. *Climate*, *3*(1), 78-99.

Brooks, N., Adger, W. N., & Kelly, P. M. (2005). The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global environmental change*, *15*(2), 151-163.

Codjoe, F. N. Y., Ocansey, C. K., Boateng, D. O., & Ofori, J. (2013). Climate change awareness and coping strategies of cocoa farmers in rural Ghana. *Journal of Biology, Agriculture and Healthcare*, *3*(11), 19-30.

CountrySTAT. (2019). Key Indicators - Ghana. Retrieved from http://countrystat.org/home.aspx?c=GHA&p=ke

Denkyirah, E. K., Okoffo, E. D., Adu, D. T., & Bosompem, O. A. (2017). What are the drivers of cocoa farmers' choice of climate change adaptation strategies in Ghana?. *Cogent Food & Agriculture*, *3*(1), 1334296.

Dessai, S., & van der Sluijs, J. P. (2007). *Uncertainty and climate change adaptation: a scoping study* (Vol. 2007). Copernicus Institute for Sustainable Development and Innovation, Department of Science Technology and Society.

Engle, N. L. (2011). Adaptive capacity and its assessment. *Global environmental change*, *21*(2), 647-656.

File:Western Ghana districts.png. (2015, January 7). Wikimedia Commons, the free media repository. Retrieved 10:12, July 30, 2019 from https://commons.wikimedia.org/w/index.php?title=File:Western_Ghana_districts.png&oldid=145594139.

Ford, J., Berrang-Ford, L., Lesnikowski, A., Barrera, M., & Heymann, S. (2013). How to track adaptation to climate change: a typology of approaches for national-level application. *Ecology and Society*, *18*(3).

Fosu-Mensah, B. Y., Vlek, P. L., & MacCarthy, D. S. (2012). Farmers' perception and adaptation to climate change: a case study of Sekyedumase district in Ghana. *Environment, Development and Sustainability*, *14*(4), 495-505.

Franzen, M., & Mulder, M. B. (2007). Ecological, economic and social perspectives on cocoa production worldwide. *Biodiversity and Conservation*, *16*(13), 3835-3849. *GH - INDC: Ghana's intended nationally determined contribution (INDC) and accompanying explanatory note* (2015). Retrieved from https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/GhanFirst/GH_INDC_2392015.pdf

GoG. (2013). Ghana National Climate Change Policy. *Ministry of Environment Science, Technology and Innovation*, 88.

Ghana Cocoa Board. (2019). Retrieved from https://www.cocobod.gh/home_section.php?sec=1

Gyampoh, B. A., Amisah, S., Idinoba, M., & Nkem, J. (2009). Using traditional knowledge to cope with climate change in rural Ghana. *Unasylva*, *60*(281/232), 70-74.

Jagers, S. C., & Stripple, J. (2003). Climate govenance beyond the state. *Global governance*, *9*, 385.
Kolavalli, S., & Vigneri, M. (2011). Cocoa in Ghana: Shaping the success of an economy. *Yes, Africa can: success stories from a dynamic continent*, 201-218.

Läderach, P., Martinez-Valle, A., Schroth, G., & Castro, N. (2013). Predicting the future climatic suitability for cocoa farming of the world's leading producer countries, Ghana and Côte d'Ivoire. *Climatic change*, *119*(3-4), 841-854.

Lemieux, C. J., Gray, P. A., Douglas, A. G., Nielsen, G., & Pearson, D. (2014). From science to policy: The making of a watershed-scale climate change adaptation strategy. *Environmental Science & Policy*, *42*, 123-137.

Lim, B., Spanger-Siegfried, E., Burton, I., Malone, E., & Huq, S. (2005). Adaptation policy frameworks for climate change: developing strategies, policies and measures.

Measham, T. G., Preston, B. L., Smith, T. F., Brooke, C., Gorddard, R., Withycombe, G., & Morrison, C. (2011). Adapting to climate change through local municipal planning: barriers and challenges. *Mitigation and adaptation strategies for global change*, *16*(8), 889-909.

MESTI. (2015). *Ghana National Climate Change Master Plan Action Programmes for Implementation : 2015 – 2020* (pp. 2015–2020).

MLNR. (2012). *Climate Investment Funds Forest Investment Program (FIP)*(pp. 1-127, Rep. No. 3.5). Retrieved from https://www.fcghana.org/assets/file/Programmes/Forest_Investment_Plan_fip/Ghana Draft FIP 3-5 _31_august2012.pdf

Norman, M., Darko, E., Whitley, S., Bawakyillenuo, S., & Nyamedor, F. (2016). Mapping current incentives and investment in Ghana's agriculture sector: Lessons for Private Climate Finance. *London: ODI*.

Ntiamoah, A., & Afrane, G. (2008). Environmental impacts of cocoa production and processing in Ghana: life cycle assessment approach. *Journal of Cleaner Production*, *16*(16), 1735-1740.

Oluwatusin, F. M. (2014). The perception of and adaptation to climate change among cocoa farm households in Ondo State, Nigeria. *Academic Journal of Interdisciplinary Studies*, *3*(1), 147.

Oyekale, A. S. & Oladele, O. I. (2012). Determinants of climate change adaptation among cocoa farmers in southwest Nigeria. ARPN Journal of Science and Technology, 2, 154–168

Pelling, M., O'Brien, K., & Matyas, D. (2015). Adaptation and transformation. *Climatic Change*, *133*(1), 113-127.

Reed, M. S., Podesta, G., Fazey, I., Geeson, N., Hessel, R., Hubacek, K., ... & Ritsema, C. (2013). Combining analytical frameworks to assess livelihood vulnerability to climate change and analyse adaptation options. *Ecological Economics*, *94*, 66-77.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global environmental change*, *16*(3), 282-292.

Sova, C., Chaudhury, A. S., Nelson, W., Nutsukpo, D. K., & Zougmoré, R. B. (2014). Climate change adaptation policy in Ghana: Priorities for the agriculture sector.

Speranza, C. I., Wiesmann, U., & Rist, S. (2014). An indicator framework for assessing livelihood resilience in the context of social–ecological dynamics. *Global Environmental Change*, *28*, 109-119.

Statista. (2019). Cocoa production by country 2017/2018. Retrieved from https://www.statista.com/statistics/263855/cocoa-bean-production-worldwide-by-region/

Surminski, S. (2013). Private-sector adaptation to climate risk. *Nature Climate Change*, *3*(11), 943.

Termeer, C., Dewulf, A., & Breeman, G. (2013). Governance of wicked climate adaptation problems. In *Climate change governance* (pp. 27-39). Springer, Berlin, Heidelberg.

Tessema, Y. A., Aweke, C. S., & Endris, G. S. (2013). Understanding the process of adaptation to climate change by small-holder farmers: the case of east Hararghe Zone, Ethiopia. *Agricultural and Food Economics*, *1*(1), 13.

The Green Belt Movement. (2019). Retrieved from http://www.greenbeltmovement.org/

UNFCCC. (2019). Nationally Determined Contributions (NDCs). Retrieved from https://unfccc.int/focus/indc_portal/items/8766.php

Wise, R. M., Fazey, I., Smith, M. S., Park, S. E., Eakin, H. C., Van Garderen, E. A., & Campbell, B. (2014). Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change*, *28*, 325-336.

World Vision. (2010). The ACCRA Local Adaptive Capacity framework. *Consultation Document, Kampala Uganda* (nd).

APPENDIX

A. Key Informant Contact List

Table 1. Key Informant Participant List

	Scale	Organization	Abstract
1	INGO	IDH – the sustainable trade initiative	IDH assembles companies, Civil Society Organisations and governments in public-private partnerships. (https://www.idhsustainabletrade.com/sectors/cocoa/)
2	INGO	Solidaridad Network	Solidaridad is an international network organization for international cooperation. It focuses on producer support and a sustainable supply chain with various products. (https://www.solidaridad.nl/supply-chains/cacao)
3	INGO	World Cocoa Foundation	World Cocoa Foundation is an international organization that aims to catalyse public-private action for cocoa sustainability. (https://www.worldcocoafoundation.org/)
4	INGO	Agro Eco	Agro Eco is an independent advisory organization which advises the private sector, NGOs, governments and international organizations in the development of niche markets for quality products. (http://agroeco.net/)
5	INGO	Rainforest Alliance	The Rainforest Alliance is an international non-profit organization working to include forests with the agricultural business. (https://www.rainforest-alliance.org/)
6	INGO	Tropenbos International (TBI)	Tropenbos is an international organization that attempts to improve governance and management of tropic forests for sustainable development. (https://www.tropenbos.org)
7	INGO	Touton: Partnership for Productivity Protection and Resilience in Cocoa Landscapes (*3PRCL*) project	Touton is an industrial agro-industrial actor which provides solutions to generate value along cocoa supply-chains (https://touton.com/company/about-us).
8	INGO	SNV Netherlands Development Organisation	SNV is a not-for-profit international development organization focusing on agriculture, energy and WASH (http://www.snv.org).

9	Embassy	Embassy of the Kingdom of the Netherlands in Ghana	The Dutch embassy governs all bilateral relations between the Netherlands and Ghana (https://www.ambaccra.nl/).
10	CSO	EcoCare Ghana	EcoCare is a national non-governmental organization focused on forest and natural resources advocacy in Ghana. (http://www.ecocareghana.org/about.html)
11	CSO	Strategic Youth Network for Development (SYND)	SYND is a youth-oriented non-governmental organization in Ghana focusing on environmental governance. (http://strategicyouthnetwork.org)
12	CSO	KASA Initiative Ghana	KASA is a Natural Resource and Environment (NRE) Civil Society Platform. (https://www.kasaghana.org/)
13	CSO	The Resource Foundation (TRF)	The Resource Foundation is a CSO focusing on promoting sustainable livelihoods to deprived rural communities with a sustainable development change framework (https://trfgh.org/about-the-resource-foundation-ghana/)
14	NGO	Rural Environmental Care Association	RECA is a national non-governmental organisation on rural natural resource use, gender rights and health in Ghana.
15	Government	Climate Change Unit of the Forestry Commission in Ghana (FC)	The Forestry Commission (FC) is a state institution responsible for the regulation of utilization and of forest and wildlife resources, as well as the coordination of related policies in Ghana. The Climate Change Unit is specialized in climate change impact, mitigation and adaptation within the forest sector of Ghana. (http://fcghana.org/)
16	Government	Cocoa Board Research Institute	Cocobod is a state-led marketing board responsible for the production, research, extension, and in/external marketing of cocoa in Ghana. (https://www.cocobod.gh/)
17	Government	Nature Conservation Research Centre (NCRC)	NCRC is a Ghanaian non-profit organization implementing conservation initiatives for natural diversity of Ghana (https://ncrcghana.org/).
18	Government	Forest Watch Ghana	Forest Watch Ghana (FWG) is the national campaign vehicle of Civil Society Organisations and individuals committed to forest resources.
19	District	Ministry of Food and Agriculture District Extension	MOFA is Ghana's government agency responsible for the development and growth of agriculture in the country.

20	District	Juaboso District Assembly	The second-level administrative sub-division of the central government comprised of the district assembly responsible for activities within
21	District	Forestry Commission: Forest Services District Division (FSD)	The district-level division of the Forestry Commission.
22	District	Cocobod district extension division (CED)	The district-level division of Cocobod
23	Community	Community Chiefs	Traditional chief leaders of one community population within the Juaboso district democratically selected by said community.
24	Community	Farming chiefs	Traditional leaders of the farmer population within one community who are democratically elected.
25	Community	CREMA volunteers	The Community Resource and Management Area (CREMA) mechanism is a community level governance structure aimed to monitor natural resources within their communities.
26	Private Sector	Mondelēz	Mondelēz is one of the largest snacks' companies. In Ghana, it is one of the largest licensed purchasing companies of cocoa (https://www.Mondelēzinternational.com/).
27	Private Sector	Olam	Olam is a leading food and agri-business. In Ghana, it is one of the many licensed purchasing companies of cocoa (https://www.olamgroup.com/).

B. Interview Guide for Key Informants

1. How is ___ concerned with climate change in the cocoa sector?
2. What are the main climate effects on the cocoa sector the ___ wants to address?
3. What are the main objectives of ____ to adapt to climate change?
4. What strategies are implemented by the ____ to achieve those objectives?
5. Which objectives have been successful thus far?
6. How does ___ monitor the progress of its objectives?
7. What are some future objectives of ___ to adapt to climate change?
8. What are the national climate change adaptation policies of Ghana and how does __ adhere to these policies?
9. Excluding the involvement of ___, what to your knowledge are some factors that have helped cocoa farmers improve production over the years?
    a. What are the main agricultural practices cocoa farmers currently use (e.g. intercropping, monocropping, agroforestry, etc.)?
    b. Are these agricultural practices that ___ supports, and why (not)?
10. What, to your knowledge, are the main problems that cocoa farmers are still facing in terms of cocoa production?
    a. What do you believe are the causes of these problems?
    b. How does ___ help cocoa farmers tackle these problems?
    c. How does ____ help with providing information to cocoa farmers?

C. Interview Guide for Cocoa Farmers

Demographic Information

Age:
Gender:
Household size:
Household role:

Highest completed level of education:
Employment:
Number of years of employment:
Previous employment:

District:
Number of years of residence:
Time of moving to district:
Reason for moving:

Questions on Household Cocoa Production

1. Could you describe how the cocoa is grown on your farm?
   Probe: full-shade, partial shade, pesticide use, fertilizer use, harvest season, type of cocoa, agricultural practices
2. Who helps on your cocoa farm?
   Probe: full/part-time employment, hired labour, division of work,
3. What is the average size of your cocoa farm in hectares?
   Probe: in/decrease, hectares cultivating cocoa, land ownership
4. What is the average amount of cocoa produced on your farm per harvest?
   Probe: changes, average yield (kg)
5. What is your average income from cocoa production per year?
   Probe: average price per kg, changes
6. Besides cocoa production, do you participate in any other economic activities?
   Probe: part-time work, livestock rearing, food crops

Questions on Climate Change Impacts

1. Are you experiencing any changes in rainfall?
2. Have you noticed a change in the duration of the wet season?
3. Have you noticed a change in the start date or end date of the wet season?
4. Are you experiencing any changes in temperature?
5. Are you experiencing any changes in pests or diseases?
6. Have you experienced changes in soil fertility?
7. Has this region experienced any extreme weather events (e.g. flooding, droughts)
8. Have these changes affected your cocoa production?
9. Do you have any concerns about how these changes will affect your cocoa production in the future?
10. What do you believe are the causes of these changes in the climate?
11. Do you believe that these changes are attributed to climate change?
12. Could you tell me what you know about climate change in general?
13. Do you have access to more information about climate change?

Questions on Adaptation Strategies

1. How are you coping with the changes in the climate?
2. Are there any specific tools or measures you use to deal with the changes?
3. How do these tools/measures work?
4. Are these new measures or based on traditional practices?
5. Are these measures successful?
6. What problems do you need help with?

Questions on National Adaptation Strategies

1. Does the government provide you with tools or services to help you cope with the changes in the climate?
2. How did the government approach you with these services?
   Probe: extension officers, trainers, organizations
3. Are the government services different from the coping measures you were using before?
4. What are some problems with the government in providing you with help?
5. What would you need to help you cope with the changes in the climate?
6. Would you want to learn about new coping strategies that are available?

D. SPSS Output

Table 1.

Highest Obtained Education Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no education	30	27,8	27,8	27,8
	primary school	12	11,1	11,1	38,9
	junior high school	19	17,6	17,6	56,5
	middle school	32	29,6	29,6	86,1
	secondary school	14	13,0	13,0	99,1
	Bachelors	1	,9	,9	100,0
	Total	108	100,0	100,0	

Table 2.

Increase or decrease in cocoa yield

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	decrease	102	94,4	94,4	94,4
	increase	6	5,6	5,6	100,0
	Total	108	100,0	100,0	

Table 3.

Supplier of seedlings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cocobod	32	29,6	29,9	29,9
	Agric	22	20,4	20,6	50,5
	Forestry Commission	10	9,3	9,3	59,8
	Touton	3	2,8	2,8	62,6
	Mondelēz	11	10,2	10,3	72,9
	K-International	7	6,5	6,5	79,4
	CREMA	5	4,6	4,7	84,1
	forest	11	10,2	10,3	94,4
	Resource Foundation	2	1,9	1,9	96,3
	UNDP	1	,9	,9	97,2
	no idea	3	2,8	2,8	100,0
	Total	107	99,1	100,0	
Missing	System	1	,9		
Total		108	100,0		