

ANNA SMITS

**LOCAL PERCEPTIONS OF CLIMATE
CHANGE, DEGRADATION AND
SUSTAINABLE DEVELOPMENT**

The Case of the Weto Mountain Range, Ghana

COLOPHON

Title

'Local perceptions of climate change, degradation and sustainable development':
The case of the Weto Mountain Range, Ghana

Images title page

Top left: *'Yam festival in Ho'*; Top right: *'View on Weto Mountain Range from Ho'*; Middle left: *'Weto Mountain Range at sundown'*; Middle right: *'View on Weto Mountain Range from Nyagbo Sroe'*; Bottom: *'Children in a village in the Weto Mountain Range'* (own pictures)

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**THE DEVELOPMENT
INSTITUTE**

Empowering People For Sustainable Development

PREFACE

During my stay in Ghana, I wrote a blog for my family and friends back home. It turned out that the most read stories were those about my fieldwork. The introduction ceremonies in villages with traditional Chiefs really appealed to peoples' imagination. They read how plastic chairs function as a status symbol and how I would never leave a village empty handed. Bananas were a very popular gift among my respondents. No less important, my readers were just as fascinated as myself by the answers I received during the interviews. A story about a lady perceiving climate change as the solar eclipse, stories about how Christianity expelled traditional taboos that were protecting the natural resources and varying stories about the peoples' relation with their environment brought us all to see how different perceptions can be. Precisely this interest in views of local people is what brought me to the lovely inhabitants of the Weto Mountain Range in the first place. When hearing and reading reports about environmental and climatic challenges in the area, it hit me that they were mostly focused on accounts of environmental degradation and climate change that have been taking place and on all the bad practises of the inhabitants. Admittedly, there are ways that inhabitants could change, but why would they if survival is at the heart of all decision-making? It was then that the idea arose to ask the local people themselves how they view their situation and equally as important, what they think the way forward should look like. They told me that surely they have experienced changes in climate and environment and showed that they are willing to learn and to make changes, but that other factors have to be taken into account as well.

This adventure has granted me an inexhaustible amount of stories, memories and experiences to draw upon. Spending a lot of time in rural villages and working with a local NGO have both contributed to my personal development and enriched my professional expertise. The least I can do is thank all of those who made my research possible and who supported me in my integration, work and daily life in a complete new culture with its own customs and stigmas. I want to thank Mr. Niek Beunders for introducing me to the Weto Mountain Range and the Development Institute (DI), for his tutoring, and for opening up his home and hearth for me. Not only would I probably have never come to research this topic, his lively and loving family made sure that I never felt alone even though I was far from home. I would also like to thank the rest of the 'DI family' for all they have done for me: Mr. Ken Kinney, Mr. Clemence Kugbey, Mr. George Ampa, Ms. Emefa Paku, Ms. Stella Yagane, Ms. Dzifa Kumaga and in special: Ms. Mabel Agba. Without her morale and ever positive attitude, the many early morning drives and warm days in the field would have been even more challenging and energy consuming. No request has been too much for her and I feel privileged to have been a subject of her prayers.

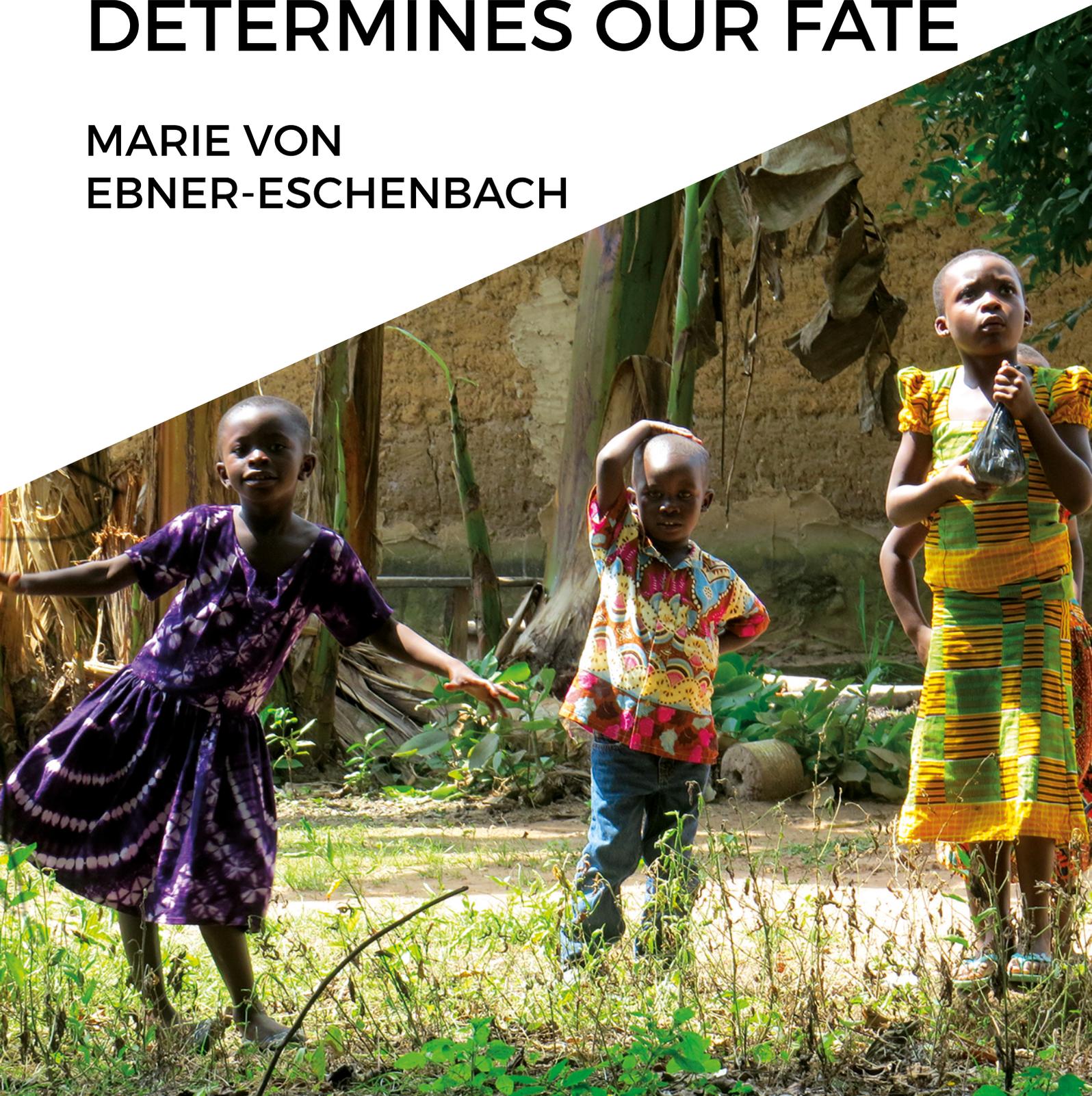
I have also received a great deal of support in the Netherlands. I want to thank my thesis supervisor, Mr. Marcel Rutten for his tutoring, his ideas and for challenging me. He sharing his knowledge and experiences on pastoralists in Kenya made sure that every now and then I took a step back and looked at my research from a different angle. I would also like to thank Lotte and Otto, for investing their time in proofreading my thesis. At last, my thanks go out to my friends with whom I spend so many hours at university, working on our theses and making sure we took enough breaks, and to my family, who have always supported me.

Enjoy the read!

Anna Smits, July, 2015

NOT WHAT WE EXPERIENCE, BUT HOW WE PERCEIVE WHAT WE EXPERIENCE, DETERMINES OUR FATE

MARIE VON
EBNER-ESCHENBACH



SUMMARY

The semi-arid regions of West Africa have experienced a long term reduction in rainfall. In addition, over the past 50 years, the continent has seen an increase in near surface temperature. Temperatures in Africa are projected to rise during the 21st century. The Weto Mountain Range, located in the Volta Region of Ghana, has experienced several consequences of these processes. The droughts and changes in rainfall patterns endanger food security and increase the impact of bushfires. Next to these consequences of climate change, there are environmental threats that stress the local ecosystem such as high levels of deforestation and associated loss of biodiversity, environmental degradation, uncontrolled soil erosion and loss of soil fertility, degradation of water sheds and pollution of water bodies. The local inhabitants contribute to environmental degradation through agricultural expansion, overexploitation, deforestation and poor agricultural and hunting practises. They should be placed, however, next to more major contributors such as mining and sand winning industries. Both locals and larger scale actors, like multinationals, are involved in the number one cause of deforestation in the area: (illegal) chainsaw operations. It are mostly the locals who fell trees and sell them to local markets and carpenters, but also to larger furniture companies and even government projects.

If continued along this line, food security and livelihoods will be endangered increasingly, thereby denying future generations their basic rights. To prevent this from happening, sustainable development is needed, in this thesis defined as *'development that ensures the basic rights of the present without compromising the ability of future generations to meet theirs'*. Intervention is needed to help people adapt to the changing climate and environment in a more sustainable way. At the heart of developing projects and policy that have the goal to tackle the challenges of climate change and environmental degradation, should be locals' perceptions of these challenges and possible adaptation measures. The translation of perception of climate change into agricultural decision-making processes is what determines adaptation in agriculture. Awareness on more sustainable ways of adaptation that have better potential of ensuring current and future food security, must be raised. And thus, the locals' current perceptions need to be challenged. Today, for farmers in the Weto Mountain Range area, sustainable development seems to be an 'imported' phenomenon, something that is imposed upon them by NGOs. What reasons are underlying these processes?

'Local ownership' of sustainable development needs to be created among the local inhabitants, by letting them know of the benefits for them and that they can be empowered enough to make a change. In this thesis, local ownership of sustainable development is defined as *'the extent to which the local community is aware of, believes in, controls, is responsible for and implements sustainable development'*. People see their tradition of subsistence farming becoming less fruitful and need to be convinced to consider other more sustainable livelihood alternatives. For this it is useful to identify influential persons within a community, such as the local chiefs for instance, and local community structures such as farmer and youth groups.

The goal of this research is to contribute to a more complete understanding of locals' perceptions towards climate change, environmental degradation and sustainable development in order to explore options for the creation of local ownership of sustainable development. Have the locals ever heard of these concepts? Do they see their environment changing? Where do they attribute that to? What decision-making is behind the current mostly unsustainable practises? Perception forms an

important starting point for developing interventions that have the goal to move towards more sustainable development. Thereby the focus should be on creating local ownership of sustainable development, because full support and participation of the community is necessary to bring about this transition. The focus of this research is on the rural communities of the Weto Mountain Range, as they are expected to experience the most influence of climate change and environmental degradation in their daily lives, also because a majority is engaged in farming.

The theoretical framework of this thesis builds upon theory about sustainable development, perception and local ownership. Early work on perception explains that one's knowledge of the world was derived from the senses and the stimuli acting upon the senses. Later, the importance of past learning and motivation were added. Perception towards climate change is on one hand structured by activities in terms of the knowledge and intentions actors possess, and on the other hand by parts of the landscape that make sense only in light of the activities. This way the climate is perceived to embody a set of constraints and opportunities for those activities. As perception simply can be explained as knowledge of the world, it can be determined by asking people about their knowledge and keeping in mind that this knowledge is derived from several factors. The importance of past learning and previous experience emphasize the need to examine the history of the subjects that the perception is investigated of. How did people conserve resources in the past? Perception is an important factor in decision-making processes. It must be kept in mind though that decision-making is also influenced by an extensive range of factors such as economic incentives or influential persons within a community. Thereby outcomes of decision-making in turn influence local perception and sustainable development in the form of past learning and motivation. It is not possible to explain a complete situation by only determining local perception. However, it can provide useful insights to why the community is employing the practises the way they do know.

Local ownership is a concept of which the definition does not need much explanation. It is also a concept that is used in different contexts and disciplines, ranging from economy to a peace building process. The use of control in the earlier provided definition, emphasizes that believe in or knowledge of sustainable development is not enough, matters have to be taken in own hands. Next to control, responsibility comes forward as being an important aspect of local ownership. Does the local community know that they are partly responsible for the environmental degradation in the area? Can they be responsible for the sustainable management of natural resources?

In-depth interviews were done in nine villages in the Weto Mountain Range. The main method of analysis for this research is the coding of the interview transcripts with the qualitative programme Atlas.ti. In addition, there is made use of triangulation, which refers to the combination of different methodologies in the study of the same phenomenon. For this research, the qualitative method of coding with Atlas.ti is combined with the quantitative method of scaling, which can be defined as the quantification of qualitative measures. The answers of the respondents are interpreted and each respondent has received scores on a five point (Likert) scale for statements about their perception on climate change, environmental degradation and sustainable development with categories ranging from least to most categories. It can be expected that knowledge influences perception, therefore respondents have also received a score for their knowledge of the different concepts on a three point scale. In addition, the scores are cross tabulated with gender, and correlation tests are done for age, education and the wealth category of a respondent, in order to link characteristics with certain perceptions.

At first sight people mostly did not think there was a relation between them and the environment except for the crops that grow on the land. Thereby, the research showed an unequal knowledge distribution among gender, age and the level of education. Overall, more men had accurate knowledge of the concepts than women. Also, the older a respondent was, the more likely he or she was to have accurate knowledge and the higher a respondent was educated, the more likely he or she was to have accurate knowledge. Nevertheless, in general, the knowledge of the concepts was limited.

The majority of the respondents had seen changes in temperature, rainfall and even in some cases wind (statement 1). Overall, men agreed more strongly than women. The perceptions of what these changes look like, were very far apart. Thereby the changes were also perceived to have quite the impact on the daily lives of people, mostly with regards to farming practises (statement 2). Again, men agreed more strongly than women. The most frequently mentioned cause for the changes in the weather, was the felling of trees, whereas consequences mostly brought us back to farming practises, crops growth in particular. Especially because of accounts of severe consequences and impacts such as spoiling roofs and unpredictable planting periods, the majority of the respondents seemed to perceive climate change as a problem that deserves attention (statement 3). On this statement, of both males and females a majority agreed. Overall, the elderly age group agreed more strongly on all statements. The knowledge score and the three perception scores all show a significant positive correlation with age and the highest level of education but no correlation with wealth categorization. The positive correlation with age can be attributed to the fact that the older a person is, the longer the period is he compares the climate over, which might lead to identifying bigger changes.

With regards to environmental degradation, many respondents have seen changes that have happened in their environment (statement 1). Striking is that the scoring for this first perception statement significantly shows a positive correlation with the wealth categories of the respondents. The higher the wealth category of a respondent, the more likely he or she is to perceive that degradation is happening in their environment. Perceptions of what the changes look like, are closer than for climate change, with the main change being the decreasing density of the forest. This is due to the severe consequences such as roofs blowing away and adaptations such as the replanting of trees. The majority of the respondents was interpreted to view environmental degradation as a problem that deserves attention (statement 2). This statement also showed a significant positive correlation with both age and the wealth categories of the respondents. The majority of the respondents did not seem to perceive themselves as contributing to degradation in the area (statement 3), but those who did, mainly focused on chemical use, burning and over-cultivation. The main perceived influences on the daily lives of the respondents (statement 4), turned out to be the changes in the windbreak, the washing away of crops and the lack of shade. Overall, the elderly age group relatively had the most respondents who agreed strongly on all four statements. Other important causes of environmental degradation were mainly perceived to be the cutting of trees by chainsaw operators, the bushfires of 1983 and sand winning by companies. Erosion and the depletion of local water bodies were perceived as the key consequences.

Many respondents deemed sustainable development to be important (statement 1). Different from the other concepts, the adult age group had the highest relative percentage with respondents who had extensive accurate knowledge on sustainable development. Overall, the elderly age group had the highest relative percentage of respondents who strongly agreed, closely followed by the youth age group. In line with the definition given in this thesis, a common reason

was about the acknowledgement of the children and future generations. A majority perceived themselves as practising sustainable development (statement 2), mostly by planting, not felling and protecting trees, but other examples passed in review as well. The rest acknowledged that they were not (yet) practising sustainable development, for which the most common reason was due to the use of chemicals in farming. Overall, the adult age group had the most respondents who agreed strongly that they are practising sustainable development. There was a positive correlation of practises of sustainable development with age, which could be explained by the fact that most of the examples of sustainable practises were done by farmers and that there is an aged farmer population.

In order to get more insights into the perceptions among the respondents towards sustainable development, it is important to investigate their vision for the future. The most mentioned necessary change for a better personal future, was money. This was followed by development opportunities for entrepreneurship and farming, which were also mentioned for the future of the entire community. In addition, a better future for the community would mean more and better basic facilities and a change in the mindset of people. Sustainability or concerns about environmental degradation were barely mentioned. There are several factors influencing the youngsters' decisions to leave for the urban areas. Perceived absence of job opportunities in the rural areas and perceived benefits of white collar jobs form the most important push and pull factors. The only perceived job in the rural area is farming and that is not something they want to be involved in. In addition, clubs and other facilities attract the youth to the city. With regards to not returning when things do not work out in the city, status loss seems to play an important role.

Events that have taken place in the past can have a major influence on a persons' perception. Past learning experience by the respondents showed in adaptation methods to climate change such as shifting of the planting season, or waiting with planting until it starts raining. With regards to the history of environmental changes, next to the most mentioned change of the density of the forest, the changing of crops production was mentioned. Apart from the moving away of cacao after the bushfires of 1983, there is no general change in crops that can be deduced from the respondents' answers. People have also seen changes in the weeds on their farms and attribute this to the use in chemicals. The drying up of their water bodies, they attribute to the felling of trees, because they saw that in the past when there were more trees, there was more water. Elderly respondents often pointed out that agricultural practises 'in the olden days' were better, because they thought the fertility and quality of the soil was also better back then. The main indicator of past learning in adaptation methods to environmental degradation, was the perceived need for the replanting of trees, in order to get the weather, land and water bodies back to how they used to be in the past.

Next to past learning through experience, insights into how and where people obtained their knowledge of climate change, environmental degradation and sustainable development are important. The most mentioned sources through which respondents obtained their knowledge of the concepts, were school, radio, mouth to mouth, books and awareness and education activities. It is safe to say that there is no lack of opportunities to obtain knowledge in the rural communities. However the research showed an unequal knowledge distribution among gender, age and the level of education. Some answers pointed at causes such as ignorance and a lackadaisical perception by the respondents. Thereby, in some cases the traditional authority seemed to have something do with the unequal knowledge distribution.

Motives also play a big role in decision-making by the respondents. What motivates one to use chemicals on the land? Perceived benefits and consequences were the most important motivators in peoples' decision-making on adaptation to the changing climate and environment. Respondents said to be willing to make changes in order to employ more sustainable development and to learn more about climate change, environmental degradation and sustainable development. Next to these promising answers, it showed that lack of motivation caused ignorance and a lackadaisical perception and thus hampers change. In some cases motivation was so strong that it overruled education for example. Furthermore, preservation and planting of trees represent positive examples of motivators to deal with environmental degradation.

In conclusion, people are very much aware and experiencing influences of the changes in climate and the environment. Not everyone is as conscious about their contribution, but people are willing to change. The current situation is not the best and therefore they will do everything to move out of it. They have seen in the past when the forest was so dense, that water was flowing, the land used to be much more fertile and more animals and products like mushrooms were in the forest for them, they want to get back to that situation. Nevertheless decision-making is still largely based on what is important today, on survival. Despite motivations to invest, it showed that priorities can cause difficulties as well despite an average high enough income to maintain ones livelihood.

With regards to raising awareness and making people believe in order to create local ownership of sustainable development, there are different ways forward. In order to tackle the unequal knowledge distribution, another way of education has to be found next to community gatherings and through the traditional authority. House to house would be preferable, however, it is very costly in time and money. Influential persons within the community are mainly the traditional authority members, priests and representatives of local government entities. Next to the traditional authority's power over knowledge, the confusion of authority between them and other local government entities has to be taken into account. Communal opinion turned out to be important in respondents' decision-making as was propensity to copy others, for example in crops use. People are willing to learn and make changes, but survival is the number one factor in decision-making. Poverty turned out to be the underlying reason for unsustainable practises by the inhabitants. Following this, awareness and believe should be more focused on educating people about the fact that they have more potential to develop than they might think. When educating, alternatives to current livelihood practises have to be offered, instead of urging them to stop felling trees because it is wrong. A promising method to ensure this persuasion, is when information is being brought by persons that the locals can identify themselves with.

Several forms of local governance structures showed that they can be capable of taking control over and responsibility for the sustainable management of natural resources. The youth also showed that they can take matters into own hands, which can also be used for addressing the lack of opportunities for them in the rural areas. On the other hand, there were many examples of less effective local governance structures. This can partly be attributed to the confusion of authority with regards to the management of natural resources.

There are several more options for the implementation of sustainable development in the Weto Mountain Range. Research showed that tackling the misuse of chemicals, the low levels of education of the inhabitants, the overall poor quality of basic services, and the ups and downs of crops

productivity due to rain fed farming, all offer opportunities for more sustainable development. Current development projects in the Weto Mountain Range mainly focus on reforestation, forest friendly livelihood activities such as beekeeping, spices and non timber forest products, sustainable tourism, enabling modernisation of farming practises, and on cacao and tree crops. However, it will be the most important to get the local inhabitants on board by empowering them. This can be achieved by enhancing their knowledge on their own abilities and alternative options, to make them responsible for their own development and to make sure that they have the time to transform and to change their mindset.

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LIST OF ABBREVIATIONS

CDS:	Climate change, environmental degradation and sustainable development
DAC:	Development Assistance Committee
IPCC:	International Panel on Climate Change
IRI:	International Research Institute for Climate and Society
MOFA:	Ministry of Food and Agriculture
OECD:	Organisation for Economic Cooperation and Development
UNWCED:	United Nations World Commission on Environment and Development



1. INTRODUCTION

“HUMANITY HAS THE ABILITY TO MAKE DEVELOPMENT SUSTAINABLE TO ENSURE THAT IT MEETS THE NEEDS OF THE PRESENT WITHOUT COMPROMISING THE ABILITY OF FUTURE GENERATIONS TO MEET THEIR OWN NEEDS.”-

-UNWCED

1. INTRODUCTION

1.1 CLIMATE CHANGE AND ENVIRONMENTAL DEGRADATION IN AFRICA

100 years ago, the climate of Africa was not as warm as it is now. Changes in both temperature and rainfall have been felt across the whole continent (Hulme et al., 2001; IPCC, 2014). Near continent wide droughts in 1983 and 1984, human-induced land cover change, and the oceans have had their impact on both environment and economy (Hulme et al., 2001). There has been a significant long-term reduction in rainfall in the semi-arid regions of West Africa, with extremely dry periods in the 1940s and 1970s (Nicholson, 2001). Thereby West Africa has also seen an increase in its near surface temperature over the past 50 years. This increase will continue, as temperatures in Africa are projected to rise faster than the global average increase during the 21st century, with West Africa's natural small climate variability leading it to be the frontrunner (IPCC, 2014).

Hard to miss on the map in West Africa is Lake Volta (see figure 1), which is located along the southern half of the eastern border of Ghana. Lake Volta is one the largest man-made lakes in the world. The characteristic for the lake and its surroundings is distinctive with inter-annual and inter-decadal variability in precipitation (Kunstmann & Jung, 2005). The adjacent area, the Volta Region (see figure 2), has a semi-arid to sub-humid climate and complies with West Africa's trend of increase in temperature and decrease in rainfall (Kunstmann & Jung, 2005). Nevertheless the Volta Region is predicted to still have more rainfall compared to other areas in Ghana. Also, the droughts and changes in rainfall patterns endanger food security and increase the impact of bushfires in the area (Beunders et al., 2014).



Figure 1: West Africa (mnonline.org, 2015, edited)

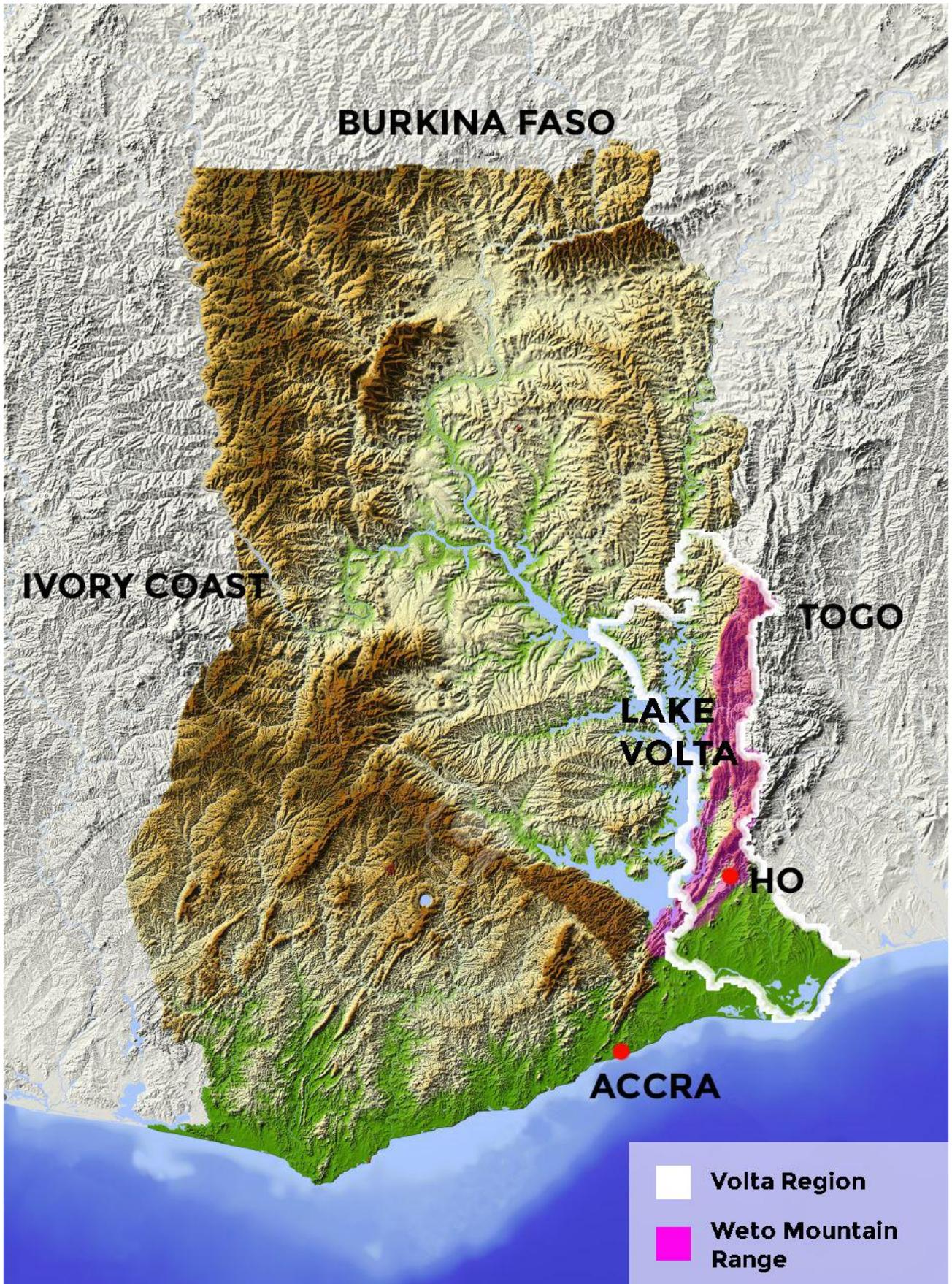


Figure 2: Ghana, Volta Region and Weto Mountain Range (123rf.com, 2015, edited)

The consequences of climate change and high levels of environmental degradation put the Volta Region in a state of environmental crisis. Close to the Togolese border lies the Weto Mountain Range (see figure 2 and photo 1), an area where the inhabitants see their tradition of subsistence farming gradually becoming less fruitful (Paku, 2013). High levels of deforestation and associated loss of biodiversity, environmental degradation, uncontrolled soil erosion and loss of soil fertility, degradation of watersheds and pollution of water bodies stress the Weto Mountain Range ecosystem. The local community has its share of contribution in the degradation of the ecosystem through agricultural expansion (Antwi et al., 2014) overexploitation, deforestation and poor agricultural and hunting practises, contributing to the irreversible depletion of natural resources in the area (Beunders et al, 2014). However, the local inhabitants should be placed next to more major contributors. The mining industry for instance, causes among others land degradation, deforestation and water pollution in the whole of Ghana (Hirons et al., 2014). Another industry with an immense influence on land degradation, is sand winning. Sand winning in Ghana takes mostly place in coastal, river and savannah areas (the Weto mountain Range contains the last two) (Peprah, 2013). A practice in which both local inhabitants and larger scale actors are involved, are chainsaw operations. A ban makes tree felling illegal. Still it makes up for a major part of the supply of lumber for the domestic market. Locals see it as a preferable livelihood activity as compared to agriculture because of the higher income it provides. The lumber is sold at local markets and to carpenters, but also to larger furniture companies and even government projects (Obiri & Damnyag, 2011).



Photo 1: Part of the Weto Mountain Range in Ghana (Wikimedia Commons, 2014)

1.2 THE NEED FOR SUSTAINABLE DEVELOPMENT

If the trends of climate change and environmental degradation continue, food security and the livelihoods of the local inhabitants will further be endangered, thereby denying future generations their basic rights. In order to prevent this from happening, sustainable development is needed. In the well-known 1987 Brundtland report 'Our Common Future', sustainable development is described as follows:

"Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits - not absolute limits but limitations imposed by the present state of technology and social organisation on environmental resources and by the ability of the biosphere to absorb the effects of human activities. But technology and social organisation can be both managed and improved to make way for a new era of economic growth. The Commission believes that widespread poverty is no longer inevitable. Poverty is not only an evil in itself, but sustainable development requires meeting the basic needs of all and extending to all the opportunity to fulfil their aspirations for a better life. A world in which poverty is endemic will always be prone to ecological and other catastrophes." (United Nations World Commission on Environment and Development, 1987, p. 15)

The above implies that if technology and social organisation are managed and improved in the right manner, the meeting of basic needs of all the inhabitants of the Weto Mountain Range can be ensured. Next to the mining, sand winning and chainsaw practises of major actors, local land use and agricultural practises have negative consequences for the environment. Therefore intervention and adaptation is needed. An important factor in developing projects and policy that have the goal to tackle the challenges of climate change and environmental degradation, is locals' perceptions towards these challenges and possible adaptation measures (Fosu-Mensah et al., 2010). Within the debate on climate change and agriculture the focus has shifted from the potential impacts of climate change to actual and potential adaptations of agriculture to climate change and variability (Bryant et al., 2000). The role of human agency is recognized as being essential in the adaptation process. The decision-making of farmers or political actors for instance with regard to climate change, cannot be taken for granted (Bryant et al., 2000). Namely, the translation of perception of climate change into these agricultural decision-making processes is what determines adaptation in agriculture (Bryant et al., 2000). Moreover, there can be other factors influencing decision-making processes such as poverty or health.

How do people get to know about climate change, environmental degradation and sustainable development? Of course one can recognize changes in weather, but does he or she automatically attribute that to the climate (Maddison, 2007)? Or might a person think the weather gods or some other reason punishes him or her? There is also the question whether he or she perceives the changes as something bad (Gbetibouo, 2009). Therefore the locals' perceptions must be examined in order to help determine what changes need to be part of interventions that aim to help locals adapt to climate change and environmental degradation in a more sustainable way (Fosu-Mensah et al., 2010). The Volta Region is predicted to continue experience increasing temperature and decreasing rainfall (Kunstmann & Jung, 2005). Thereby the earlier mentioned practises of mining, sand winning and chainsaw operations will continue to contribute to environmental degradation as those practises will not be stopped or mitigated from one day to another. Therefore, awareness on more sustainable

ways of adaptation to the current changes in climate and environment must be raised. Have they ever heard of sustainable development?

Sustainable development was put on the international agenda when the Brundtland report appeared on the global platform to improve development in 1987. Hereby, the Commission also concluded that one of the problems was a lack of training in the countries of the periphery, and that a process was needed to empower indigenous people and their communities (Castro, 2004) (United Nations World Commission on Environment and Development, 1987). This process represents the introduction to sustainable development in developing countries, also by donors and western companies. Today, for a lot of farmers in the Weto Mountain Range the need for sustainable development seems to be an 'imported phenomenon', something that is imposed upon them by the NGOs that come to the area. Several times after the completion of a project, the locals have returned to their own ways (Beunders, personal communication, 16 March, 2014). What reasons are underlying these processes? Is it because of poverty, or a lack of security that they will succeed? Or will the farmers recognize climate change, but do not know of or believe in sustainable development for example. They are used to spread the risks associated with a changing climate and environment through subsistence farming (Beunders et al., 2014). However, this tradition as carried out now, is slowly becoming less fruitful and is driving people towards the poverty trap (Paku, 2013). Therefore, it is important that they will move towards more sustainable livelihood activities as those have more potential of ensuring current and future food security. This also means that they have to be educated on this and convinced of the importance of the necessary changes.

'Local ownership' of sustainable development needs to be created among the Weto farmers, by letting them know of the benefits for them and that they can be empowered enough to make a change. As everyone is dealing with the changes in climate and environment, this local ownership also accounts for non-farmers in the communities. After all, for a transition to sustainable development, full support of the community and participation of the ordinary people is needed (Strong in Ghai & Vivian, 1992). In a report on the contribution of development co-operation, the Development Assistance Committee (DAC) emphasizes the importance of locally-owned development strategies: *"Sustainable development, based on integrated strategies that incorporate key economic, social, environmental and political elements, must be locally owned"* (DAC, 1996, p. 13). Local ownership of the concept of sustainable development is necessary for these strategies to work. But how do you create local ownership of a phenomenon that is perceived to come from outside? How do you prevent your intervention from being perceived as yet another 'imported phenomenon'?

Next to education, concerning the consequences of climate change, the causes of environmental degradation and sustainable development, people need to be convinced to consider more sustainable livelihood alternatives and the associated benefits and potential. For this to happen, it could be useful to identify influential persons within a community. These could be Chiefs for instance, of which Ghana has a tradition (Ubink, 2008). In addition, community 'governance' structures can be of importance. Government agencies in Ghana often do not have adequate capacity to enforce legislation concerning illegal use of natural resources nor to create an enabling environment for sustainable development (Asscher, 1999; Atta-Mills et al., 2004; Dietz et al., 2014; Yelibora, 2014). A lot of communities form their own groups or committees for regulation, such as farmers groups, youth groups or women's groups for instance. However, the local governance structures have to be examined thoroughly, in order to find out whether these structures include all

members of the community and most importantly, how the structures are influenced by differences in gender, age and wealth for example.

In order to explore options for creating local ownership of sustainable development, the locals' current perceptions towards climate change, environmental degradation and sustainable development must be examined. This raises several questions. Have they ever heard of these concepts? Do they see their environment changing? Where do they attribute that to? As mentioned before, the translation of perception on climate change, environmental degradation and sustainable development into decision-making processes helps determine adaptation strategies. But, how can this adaptation be applied towards more sustainable practises as current (overall subsistent) practises prove to be less fruitful and are driving people towards the poverty trap? What decision-making is behind the current mostly unsustainable practises? Therefore, options for creating local ownership of sustainable development have to be explored. Awareness and knowledge on climate change, environmental degradation and sustainable development are an important part of this local ownership; thus, the perception of these three concepts has to be examined.

1.3 RESEARCH OBJECTIVE

Investigation of locals' perception on climate change, environmental degradation and sustainable development and the exploration of options for creating local ownership of sustainable development can be seen as both theoretical and practical research. It is theoretical because it seeks to contribute to the development of theory on examining local perception for the creation of local ownership. The use of 'creation' directly brings us to why the research is practical as well, as it seeks to contribute to or at least explore options for an intervention in a current situation. Before an intervention can be designed and implemented, the current situation has to be analysed (Verschuuren & Doorewaard, 2007). This also includes scrutinizing carefully the perceptions and other determinants of the locals' behaviour and their other characteristics such as social ties or economical status.

The importance of examining the locals' perceptions for developing projects and policy that have the goal to tackle the challenges of climate change and environmental degradation, has been acknowledged in different studies. Fosu-Mensah et al. (2010) appoint that the locals' perceptions of the challenges of climate change and of possible adaptation measures are an important factor in the development of projects and policy. Bryant et al. (2000) emphasize that the local decision-making process cannot be taken for granted, because the translation of the perceptions of climate change into this process is what determines adaptation (in agriculture). In his study on the perception and adaptation to climate change variability/change by small-scale and commercial farmers, Yaro (2013) argues that local knowledge and perceptions of weather and climate change should not merely be acknowledged by policy makers, but should form the foundation of agricultural policies in a bottom-up approach. The importance of locally-owned development strategies was emphasized by the Development Assistance Committee (1996). Also, farmers often see sustainable development as an 'imported phenomenon' (Beunders, personal communication, 16th of March, 2014), meaning that local ownership of the concept of sustainable development needs to be created in order for the aforementioned mentioned policy and projects to work.

The context of the problem; 'consequences of climate change and environmental degradation in the Weto Mountain Range' can be based on literature and studies on the subject, but also on observations and experiences in the field. In addition, the concepts of perception, sustainable development and local ownership can be examined on the basis of literature and studies on the

subjects. For the local application of the concepts, that literature study can be combined with interviews, observations and experiences in the field.

Following on to the prior elucidation of key issues, the research objective is:

To contribute to a more complete understanding of locals’ perceptions towards climate change, environmental degradation and sustainable development in order to explore options for the creation of local ownership of sustainable development.

The main focus of this research is limited to the investigation of locals’ perceptions, because it forms an important starting point for developing interventions that have the goal to move towards more sustainable development (Fosu-Mensah et al., 2010). Thus, the focus is on creating local ownership of sustainable development, because the full support of the community and participation of the ordinary people is necessary for a transition to sustainable development (Strong in Ghai & Vivian, 1992).

The rural communities experience the most influence of climate change and environmental degradation in their daily lives, because the majority is engaged in farming. Making a comparison between the urban and rural population is not feasible for this research. Therefore there will be a focus on the rural areas of the Weto Mountain range (see photo 2).

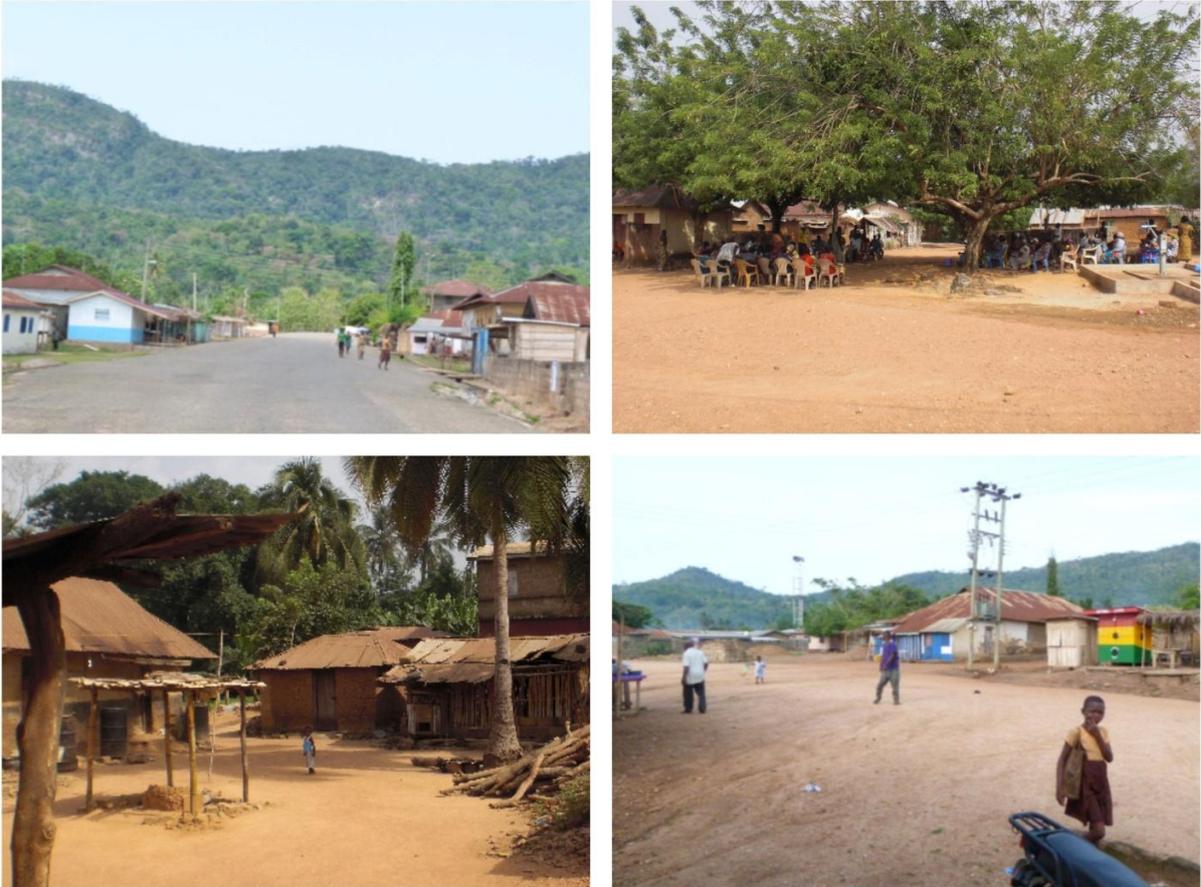


Photo 2: Rural villages in the Weto Mountain Range

1.4 RESEARCH QUESTIONS

The area examined in this research is located in a rural part of the Weto Mountain Range (for more information, see chapter 4). In order to develop further understanding of locals' perceptions towards climate change, environmental degradation and sustainable development and options for the creation of local ownership of sustainable development, it is necessary to capture both perception and possible options for creating local ownership as accurately as possible among the rural inhabitants of the Weto Mountain Range. Based on the gathered information, this will produce descriptive knowledge (Verschuren & Doorewaard, 2007). In addition, exploration of the options for the creation of local ownership will create exploratory knowledge (Verschuren & Doorewaard, 2007). Following the research objective, the main focus is on examining the locals' perceptions, so that with the outcomes, options for local ownership can be explored. Because of this main focus, overall the research is descriptive. This leads to a descriptive central question:

Central question

Which are the perceptions of the rural inhabitants of the Weto Mountain Range towards climate change, environmental degradation and sustainable development?

Sub question 1

Which are the perceptions of the rural inhabitants of the Weto Mountain Range towards climate change (and its causes and consequences)?

Sub question 2

Which are the perceptions of the rural inhabitants of the Weto Mountain Range towards environmental degradation (and its causes and consequences)?

Sub question 3

Which are the perceptions of the rural inhabitants of the Weto Mountain Range towards sustainable development?

Sub question 4

Which options are available for creating local ownership of sustainable development among the rural inhabitants of the Weto Mountain Range?

The research objective contains two main concepts: (1) locals' perception towards climate change, environmental degradation and sustainable development and (2) options for the creation of local ownership of sustainable development. Descriptive sub questions 1 to 3 focus on the locals' perceptions. All three concepts cover a separate sub question in order to ensure that each concept is captured as accurate as possible. Because the research objective is to examine perception in order to explore options for the creation of local ownership, exploratory sub question 4 covers the creation of local ownership. However, the main focus is on locals' perceptions, therefore local ownership is not part of the central research question.

1.5 ACADEMIC & SOCIETAL RELEVANCE

The academic relevance of this research consists of developing further understanding of locals’ perceptions in order to explore options for the creation of local ownership. As mentioned earlier, the importance of both concepts is acknowledged in different studies. In addition, the focus is on climate change, environmental degradation and sustainable development, these are subjects that are high on the international agenda (United Nations World Commission on Environment and Development, 1987; Castro, 2004; Mertz et al, 2008; IPCC, 2014). Also, the Volta Region (and other semi-arid regions in West-Africa) are expected to show increasing temperatures and decreasing rainfall (Hulme et al., 2001; Nicholson, 2001; Kunstmann & Jung, 2005; IPCC, 2014), which emphasizes the relevance of this research for the future. At last, the Volta Region is an area where less research and projects have taken place as compared to other areas of Ghana, like the North, which emphasizes the importance of the focus on the Weto Mountain Range in the Volta Region.

The societal relevance of this study consists of the possible use of outcomes for policymaking and the development of projects with the goal to contribute to addressing the challenges of climate change and environmental degradation and to move towards sustainable development. In addition, outcomes on the relation between perception and the creation of local ownership can possibly also be applied to other concepts than sustainable development.

The focus on the examination of locals’ perceptions and the focus on creating local ownership instead of moving towards sustainable development, contribute to the feasibility of the research. Therein, the focus is on one area in Ghana in order to improve the depth of the research.

1.6 RESEARCH MODEL

In figure 3 the research model is presented. It is developed on the basis of the research objective and research question and sub questions. The research is iterative and thus the model is only guiding for the research process. This means that several steps can take place at the same time.

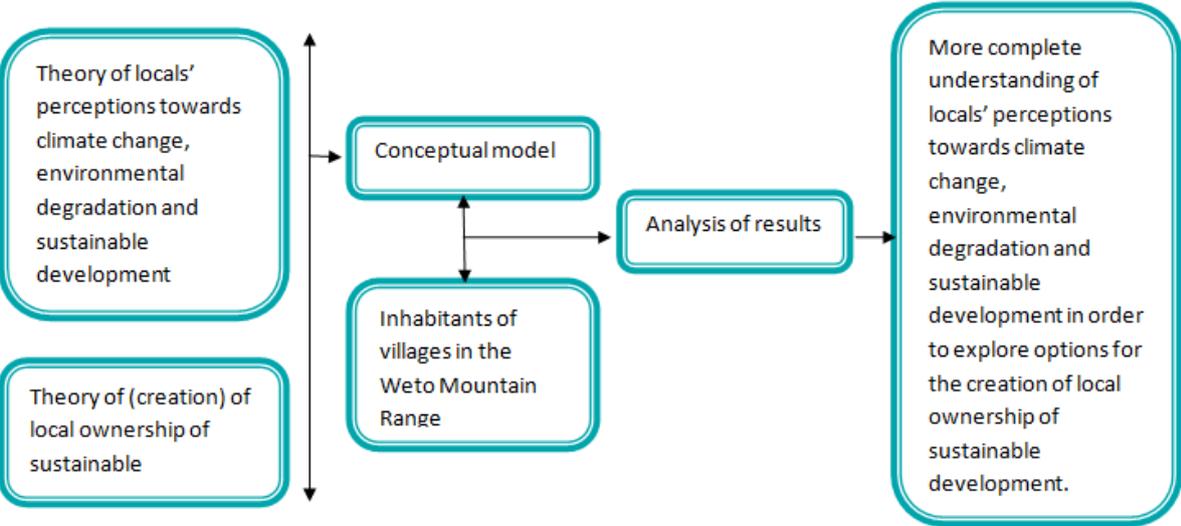


Figure 3: Research Model

A) The study of literature on locals' perception towards CDS¹ and on (the creation of) local ownership of sustainable development, has lead to a conceptual model (B) with which perception of the local inhabitants towards CDS and the options for the creation of local ownership of sustainable development, could be examined. (C) An analysis of the results has lead to more understanding of the locals' perceptions towards CDS and the exploration of options for the creation of local ownership of sustainable development.

By means of literature study of locals' perception towards CDS and of (the creation of) local ownership of sustainable development, a conceptual model was developed about the role of the examination of this perception for the exploration of options for the creation of local ownership of sustainable development. Therefore it was required to look at the different conceptualizations and aspects of both local perception and local ownership.

Research was carried out in the Weto Mountain Range to apply the conceptual model in interviewing and observation, in order to answer the research objective by the local inhabitants of the Weto Mountain Range. With this in mind, the different aspects and conceptualizations of their perception towards CDS were examined. This also included the exploration of options for the creation of local ownership of sustainable development among the inhabitants.

In the analysis of the results there is tried to determine which the perceptions of the local inhabitants of the Weto Mountain Range towards CDS are, in addition, options for the creation of local ownership of sustainable development are explored. From this analysis, conclusions are derived, which will be used to contribute to further understanding of the examination of locals' perceptions towards CDS in order to explore options for the creation of local ownership of sustainable development among the inhabitants.

1.7 THESIS OUTLINE

The outline of this thesis is as follows: Chapter 2 describes the different theoretical concepts of sustainable development, perception and local ownership, and closes with the conceptual model. Chapter 3 discusses the methodology that was used for this research, whereby the research strategy, research methods, collection of the material, and analysis of the data are handled. Chapter 4 provides background information about the Weto Mountain Range by combining a literature study with the socio-economic inventory among the respondents. Chapter 5 gives an analysis of the respondents' perceptions towards climate change, environmental degradation and sustainable development. Following this, chapter 6 presents an exploration of options for the creation of local ownership. At last, chapter 7 provides conclusions and recommendations about locals' perceptions towards climate change, environmental degradation and sustainable development and the creation of local ownership of sustainable development.

¹ For the remainder of this thesis, the repetition of the concepts of climate change, environmental degradation and sustainable development will be referred to as 'CDS', provided that the concepts are not of main importance for the sentence.



2. THEORIES ABOUT SUSTAINABLE DEVELOPMENT, PERCEPTION AND LOCAL OWNERSHIP

Emefa* (51) lives in a small community in the Weto Mountain Range. In order to support herself and her family, she farms and does petty trading. In terms of farming, she says that her main tool is 'man power' as she uses the cutlass to clear the land by herself. When budget allows, she buys weedicide to spray parts of the land. She inherited two acres of land from her mother, but she does not farm the whole portion all at once. The reason for this is that she is not able to do this all by herself and she doesn't have the resources to hire

workers or to buy weedicide for the entire land. She employs subsistence farming by among others combining plantain, banana, maize, palm trees, pear (avocado), orange and cassava. The crops are planted criss-cross on her farm and she says the land is very fertile. Emefa says that the rains have not been as reliable as they used to be, which has had a huge impact on her farming. The

limited time she had available to go to farm because of her trading, has been even further constrained by this. She feels that the current situation is not good and that she and the rest of her village need support in terms of farming. The main form of support should be education. She thinks that if they could learn more about farming practices, either from an individual or an NGO, the community will be able to develop much further.

*In order to safeguard the anonymity of the interviewee, the name Emefa is fictitious.

2. THEORIES ABOUT SUSTAINABLE DEVELOPMENT, PERCEPTION AND LOCAL OWNERSHIP

The overall research philosophy of this thesis is 'interpretivism'. According to Leroy, Horling & Arts (2009), an interpretivist cognizes 'the real' through interpretation. "It is necessary to understand differences between humans in our role as social actors" (Saunders, Lewiss & Thornhill, 2008, p. 116). To understand these differences, the researcher has to enter the social world of his research subjects to identify different social dynamics. With this in mind, one can understand the world from their point of view (Saunders, Lewiss & Thornhill, 2008). Perception can also be seen as the research subjects' point of view, therefore 'interpretivism' is a suitable research philosophy. For this research it is important to look at the perceptions towards CDS of the local inhabitants of the Weto Mountain Range. Their stories have to be interpreted in order to determine their perceptions. The following chapter explains different theories, concepts and backgrounds that are relevant for research on perception towards climate change, environmental degradation and sustainable development and creating local ownership of sustainable development in the Weto Mountain Range.

2.1 SUSTAINABLE DEVELOPMENT

Semi-arid regions in West Africa are expected to continue experiencing increasing temperatures and decreasing rainfall (Hulme et al., 2001; Nicholson, 2001; Kunstmann & Jung, 2005). Farmers are undergoing negative consequences of climate change and the increase of droughts and unpredictable changes in rainfall are impacting local food security and livelihoods (Beunders et al., 2014). Also, the practises of mining, sand winning and chainsaw operations will continue to contribute to environmental degradation as those practises will not be stopped or mitigated from one day to another. Both the continuation of the consequences of climate change and environmental degradation will lead to more threat to food security and livelihood security, which emphasizes the need for a change (Hulme et al., 2001).

The concept of sustainable development has an extensive range of definitions as a consequence of subjectivity and different focuses. Nevertheless, taking future circumstances into account, is dominantly present in different writings (Castro, 2004; Redclift, 2005; Elliott, 2006). From the focus of the 'Our common future' report on "*meeting the needs of the present without compromising the ability of future generations to meet theirs*" (United Nations World Commission on Environment and Development, 1987, p.43) the general focus moved to 'rights' rather than 'needs' after the first Earth Summit in 1992 (Redclift, 2005). As 'living' is a need so important that it becomes a basic right, therefore, this thesis will use the following definition for sustainable development:

Development that ensures the basic rights of the present without compromising the ability of future generations to meet theirs.

Food security is one of those basic rights; 'Without food no life!'. Food security is a concept that simply can be explained as producing enough food to feed the entire population (Garrity et al., 2010). As food security is threatened in the Weto Mountain Range (Beunders et al., 2014), the need for sustainable development is emphasized. Despite the wide range of definitions, sustainable development is widely accepted as a desirable policy objective amongst many institutions concerned with development and natural resources (Elliott, 2006). One option is to develop interventions,

projects or policy for the Weto Mountain Rang with the ultimate goal of moving towards more sustainable practises. The fact that definitions come from different disciplines with different assumptions about the relationship between society and nature (Elliot 2006), also makes that this policy is hard to define. In turn, it will be hard to determine what the local ownership should exactly be about. Therefore for this thesis it should fit with the aforementioned definition of sustainable development in the simplest way. But, it should also be about insights into the different approaches for sustainable development. For instance into the sustainable agricultural practises as opposed to unsustainable agricultural practises that are employed now, such as excessive harvesting or 'slash and burn' activities (Beunders et al., 2014).

There are two critical notes that must be made here, the first is about the contribution by the locals, namely whether 'slash and burn' is per definition unsustainable. Padoch & Vasquez (2010) state that, despite its complexity and problematic management, swidden ('slash and burn') also has proven to be an important source of livelihood and a great generator of diversity. They acknowledge that it disagrees with conventional conservation of 'charismatic' animals, landscapes and 'hotspots', but in addition emphasize the potential payoffs. The latter are claimed to include "*the conservation of much biodiversity with special meaning to human communities, and the conversation and even creation of cultural diversity that has long been part of the diversity, complexity, and dynamism of swidden and smallholders*" (Padoch & Vasquez, 2010, p. 552). On the contrary, the importance of soil organic carbon (SOC) is emphasized in a recent research on impact of farm management practises in Ghana (Boakye-Danquah et al., 2014). SOC is a key sustainability indicator of land or soil health and is severely degraded all across Ghana. Further decline in SOC functions may lead to a drastic reduction of crop yield. Fire is claimed to be counterproductive for SOC as burning returns carbon fixed by vegetation to the atmosphere and exposes soil to further carbon loss through erosion (Boakye-Danquah et al., 2014). In addition, the Development Institute (DI), an NGO working in the Weto Mountain Range, states that by burning biomass is lost which causes to soil to be exhausted. Thereby fires often lead to larger bushfires, causing major forest degradation (Beunders et al., 2014). Since the local inhabitants of the Weto Range are largely dependent on the soil and the forest for their livelihoods, especially in the form of crop yield, slash and burn seems to be unsustainable in their case.

The second critical note is not on the locals' contribution, but rather about negative consequences of sustainable development or more specifically 'conservation' projects. Several scholars (Brockington et al., 2006; Sanderson & Redford, 2003; Price et al., 2004) point at serious problems of combining conservation with poverty reduction. Protected areas have expanded threefold in recent years, a process that has caused displacement of the areas' human residents (Brockington et al., 2006). In most cases the resources are being occupied and used illegally, a lawlessness that in practice often denies the evicted of any rights, creating many environmental refugees (Geisler & de Sousa, 2001). Brockington et al. (2006) state that "*People and nature can coexist in a way that is worth protecting*" (p. 251) and call for both social scientists and ecologists to contribute to the debate about how this can be established. They point out that the ecologies and social impacts of coexistence are important because it is an issue that extends far beyond the boundaries of conservation areas (Brockington et al. (2006). In the Weto Mountain Range there are several forest reserves, one of them is the Kalakpa forest reserve. It is important to look at conservation projects in the reserves (and beyond) to find out whether local inhabitants have been affected.

2.2 PERCEPTION

An Important element needed for the interventions, projects and policy as mentioned in the previous section, is to integrate the locals' perceptions of the concepts, contexts and problems of climate change, environmental degradation and sustainable development (Fosuh-Mensah et al., 2010). Kusakari et al. (2014) emphasize that the farmer's viewpoint on the effects of climate change on their livelihoods can help create strategies for responding to climate and ecosystem changes in an appropriate and practical manner. In his study on the perception and adaptation to climate change variability/change by small-scale and commercial farmers, Yaro (2013) argues that local knowledge and perceptions of weather and climate change should not merely be acknowledged by policy makers, but should form the foundation of agricultural policies in a bottom-up approach. Bryant et al. (2000) put emphasis on the essence of the role of human agency in the adaptation process. Decision-making by different actors with regard to climate change cannot be taken for granted as adaptation in agriculture is determined by the translation of perception of climate change into decision-making processes (Bryant et al., 2000). But how can one's perception be determined? And firstly, what is perception?

In different academic fields (e.g. psychology or neuroscience), perception is defined in several ways. The definitions of the concept are influenced by subjectivity and different viewpoints. Early work on perception (mainly by psychologists) explains that one's knowledge of the world was derived from the senses and the stimuli acting upon the senses. Later, the importance of past learning and motivation were added (Wood, 1969). Relevant to this thesis, is the field of perception geography. In the real world, people do not behave on the basis of objective knowledge, but in terms of subjective images of it. Behavioural or perception studies dealing with man-environment relationships base upon a common theoretical framework: 'cognitive behaviourism' (Bunting & Guelke, 1979). *"The theoretical premise of cognitive or environmental behaviourism is based on the assumption that man reacts to his environment as he perceives and interprets it through previous experience and knowledge"* (Bunting & Guelke, 1979, p. 449). In this way, more objective interpretations and conventional assumptions (e.g. rational economic man) of man's interaction with the environment are dispelled and variation in individual response to the environment is emphasized (Bunting & Guelke, 1979). Moreover, perception is present in all human activity and is capable of having a marked effect on the appearance of the landscape and on the behaviour of the individuals operating in the landscape (Wood, 1969).

Vedwan (2006) concludes that perception towards climate change is on one hand structured by activities in terms of the knowledge and intentions actors possess, and on the other hand by parts of the landscape that make sense only in light of the activities. With this in mind, the climate is perceived to embody a set of constraints and opportunities for those activities. As perception simply can be explained as knowledge of the world (Wood, 1969), it can be determined by asking people about their knowledge and keeping in mind that this knowledge is derived from several factors. In his research about the perception and adaptation to climate change in Africa, Maddison (2007) asked farmers to describe verbally any long-term changes in temperature and precipitation in order to draw conclusions about their perception on these changes. The previous experience and knowledge as mentioned by Bunting & Guelke (1979) and the past learning as mentioned by Wood (1969), emphasizes the need to examine the history of the subjects that the perception is examined of. Since this thesis will focus on climate change, degradation and sustainable development. For degradation, the tradition of subsistence farming will be of great importance, as land use has a big impact on

degradation. How did people conserve resources in the past? For how long have they been dealing with the consequences of degradation? Also, stories about how traditional leaders were elected can provide insights into why local-decision makers are influential within their community, which can be useful for the exploration of options for the creation of local ownership. In addition, stories on changes in climate change adaptation can help determine important factors in its decision-making process. Are the same options still available? Why have they shifted? Motivation, as mentioned by Wood (1969), can be examined by informing about what changes people are willing to make to ensure a sustainable future for example.

Perception is an important factor in decision-making processes. However, decision-making is influenced by an extensive range of factors, for example, economic incentives, or influential persons within the community, local governance structures, traditions, relationships with friends and family, values, beliefs and more. Thus, the outcomes of decision-making in turn influence local perception on sustainable development in the form of past learning and motivation (Wood, 1969). Therefore decision-making processes on livelihood activities and natural resources are of importance when examining local perceptions towards sustainable development and thus are other factors influencing or inhibiting those processes next to local perception.

Despite the extensive range of factors influencing the decision-making process, there have been examples of projects in the Weto Mountain Range where factors as budget and logistics were taken care of, but as soon as that incentive fell away, because the project had the ability to sustain itself, people would eventually return to their old practises (Beunders, personal communication, 16th of March, 2014). This raises further questions. Why is that? What other factors have been at stake there?

Thereupon, it is not possible to explain a complete situation only by determining the local perception. However, local perception can provide useful insights into why the community is employing practises the way they do now and why they would or would not like to change that. When analysing these insights, it will be important to keep in mind that the community does not have one common perception. *“The way in which people experience climate shocks varies across different social groups, geographic locations, and seasons of the year, with men, women, and children all experiencing different levels of hardships and opportunity in the face of climate change”* (MEST, 2010, p. 10). Displaying the different perceptions against age and education for example, can show how knowledge and perceptions on CDS are distributed among the local inhabitants.

2.3 LOCAL OWNERSHIP

Local ownership is highly important for any development to bear fruitful outcomes. Hence, how can interventions, projects and policy for the Weto Mountain Range area with the ultimate goal of moving towards more sustainable development, be achieved? In 1996, The Development Assistance Committee already emphasized the importance of locally-owned development strategies: *“Sustainable development, based on integrated strategies that incorporate key economic, social, environmental and political elements, must be locally owned”* (DAC, 1996, p. 13). This also means that the concept of sustainable development needs to be locally owned. People have to be educated and convinced to move from their traditional and daily practises to something new. Today, for a lot of farmers in the Weto Mountain Range the need for sustainable development seems to be an ‘imported phenomenon’, something that is imposed by the NGOs that come to the area. Several times after the completion of a project, the locals have returned to their own ways. (N. Beunders, personal communication, 16 March, 2014). What reasons are underlying these processes? Is it because of poverty, or a lack of security that they will succeed? Or farmers might recognize climate change, but do not know of or believe in sustainable development for example.

Now, many farmers are used to ‘spread the risk’ through subsistence farming (see photo 3), but in the end this will only lead to having to little of everything. Subsistence farming is a tradition that has sufficed as long as they can remember, but for the past few years they have seen it becoming less fruitful (Paku, 2013). Farming in the area is mostly rain fed, meaning that the unpredictability of the climate has its impacts. The farmers are affected by both the changes in climate and environment and are adapting to these changes in several ways. This makes it important that they will move towards more sustainable livelihood activities as those have more potential of ensuring current and future food security. This also means that they have to be educated on this and convinced of the importance of the necessary changes. ‘Local ownership’ of sustainable development needs to be created among the Weto farmers, by letting them know of the benefits for them and that they can be empowered enough to make a change. How do you create local ownership of a



Photo 3: Subsistence farm in the Weto Mountain Range

phenomenon that is perceived to come from outside? How do you prevent your intervention from being perceived as yet another ‘imported phenomenon’? Next to education about the consequences of climate change, the causes of environmental degradation and sustainable development, people

need to be introduced to more sustainable livelihood alternatives and convinced of the benefits and potential.

Local ownership is a concept of which the definition does not need much explanation. However, it is also a concept that is used in different contexts and disciplines, ranging from the economy, so the actual ownership of a house for instance, to a peace building process. In his article on local ownership in post-conflict peace building processes, T. Donais (2009) defines local ownership as “*the extent to which domestic actors control both the design and implementation of political processes*” (p. 3). Control emphasizes that believe in or knowledge of sustainable development is not enough, matters have to be taken in own hands. The full support and participation of the local community is needed (Strong in Ghai & Vivian, 1992), and is part of local ownership. This is also pointed out when looking at statements by the OECD about local ownership of structural adjustment programmes and aid coordination arrangements. It is said that developing countries themselves are responsible for determining and implementing their policies, so the basis for coordinated international action must be the policy and programme statements and actions carried out by the developing countries itself (Helleiner, 2000). Next to control, responsibility comes forward here as being an important aspect of local ownership. Does the local community know that they are partly responsible for the environmental degradation in the area? Do they feel the responsibility to start adapting to the changing climate and environment in a more sustainable way?

Following on to the prior elucidation, in this thesis local ownership of sustainable development will be understood to refer as:

The extent to which the local community is aware of, believes in, controls, is responsible for and implements sustainable development.

It is important to determine influential persons within a community. These could be chiefs for instance, of which Ghana has a tradition. However, the dominance of chiefs differs across the country due to different social processes within the communities (Ubink, 2008). Today, chiefs are supported by the government through the Ministry of Chieftaincy and Traditional affairs. They are educated and supported administratively and financially. The ministry was established inter alia in response to the Ghanaian public opinion (ghana.gov.gh, 2014). The latter might point at the valuation of chiefs by the Ghanaian population. It is important to determine the role of chiefs and other influential persons within a community, as they also have the capability to influence peoples’ perceptions.

Another useful option for the creation of local ownership are local governance structures. Government agencies in Ghana often do not have adequate capacity and capabilities to enforce legislation concerning illegal use of natural resources nor to create an enabling environment for sustainable development (Asscher, 1999; Atta-Mills et al., 2004; Yelibora, 2014). A lot of communities form their own groups or committees for regulation, such as farmers groups, youth groups or women groups for instance. However the local governance structures have to be explored thoroughly, in order to find out whether these structures include all members of the community and how the structures are influenced by differences like gender, age and wealth for example.

At last a phenomena that can possibly be an important factor influencing the move towards more sustainable development and the creation of its local ownership, is how land rights and ownership are arranged in Ghana. “*A complex mix of constitutional and legislative sources is the basis for land governance in Ghana, which is mostly the results of the co-existence of different tenure*

systems: customary law, statutory law, constitutional provisions, judicial decisions and religious law. Managing these systems to ensure the security of tenure for all sections of the society is a challenge to the legal system in Ghana” (Hilhorst & Porchet, 2012, p. 3). With regards to religious law, people believe that their ancestors are the rightful owners of the land in their community, therefore the Chief holds these lands in custom and decides who gets what (Sarpong, 2006).

2.4 CONCEPTUAL MODEL

The theoretical background of the former paragraphs is shown in the conceptual model in figure 4. The two most important concepts as identified in chapter 1 are locals’ perception and local ownership. The research objective is to examine one in order to explore the other, and thus there is a one-headed arrow representing the influence of local perception on options for the creation of local ownership. It was also made clear that climate change and environmental degradation form the context of the research, and are thus represented as an independent factor influencing the locals’ perception.

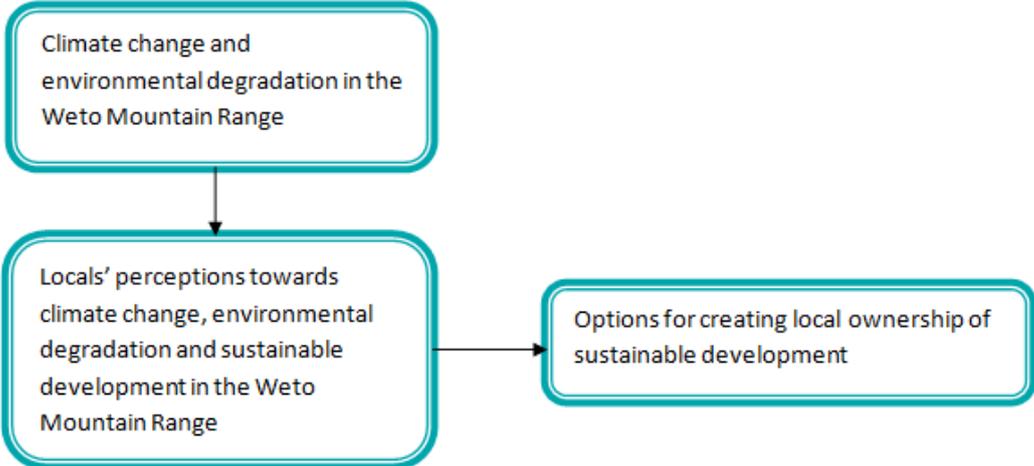


Figure 4: Conceptual Model

The elements of the theoretical framework have to be operationalized for the purpose of the empirical research. Both main concepts contain different dimensions that are relevant to identify in the context of this research. The main concept of locals' perceptions towards CDS is further operationalized by including (non-exhaustive) indicators that are justified by and based on the literature research presented in the theoretical background and on my own interpretation of translation of the concepts to the local context (see figure 5). For the sub dimension of peoples' own (sustainable) development situation, in addition the meaning of several indicators to them is important, in order to try to get insight in their point of view.

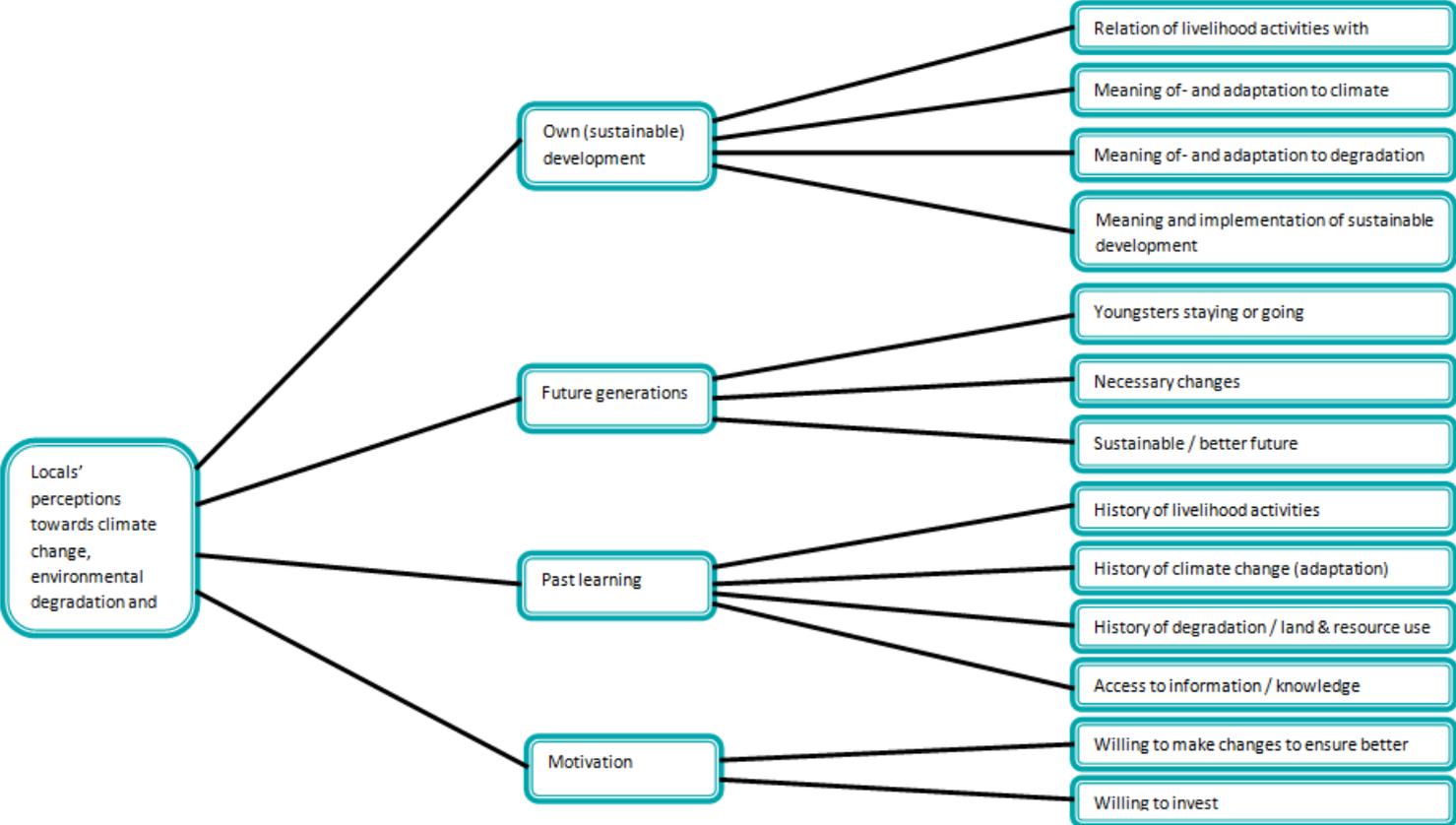


Figure 5: Operationalisation of locals' perceptions towards climate change, environmental degradation and sustainable development

In the theoretical background, the following definition of local ownership of sustainable development was given:

The extent to which the local community is aware of, believes in, controls, is responsible for and implements sustainable development

In addition, it was pointed out that the identification of influential persons and local decision makers is important in combination with exploring the use of local governance structures such as farmer or women’s groups. This can be used to identify dimensions and eventual indicators for the exploration of options for the main concept of local ownership of sustainable development, as shown in figure 6.

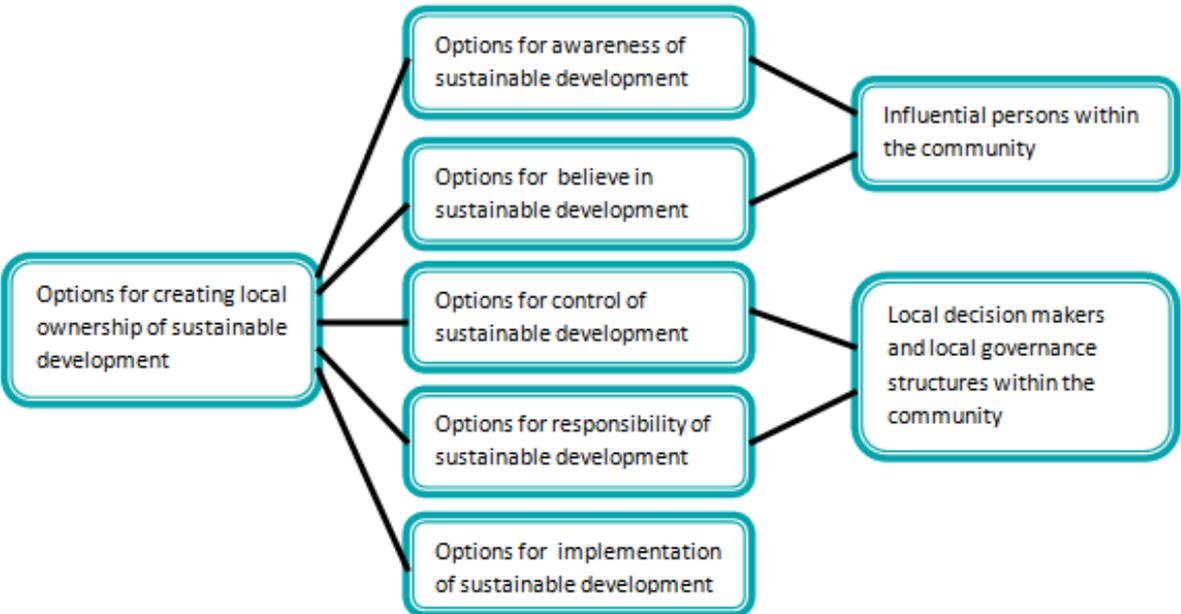


Figure 6: Operationalisation of options of the creation of local ownership of sustainable development

3. METHODOLOGY

Drumming and dancing is an important part of the Ewe culture. Many of the villages in the Weto Mountain Range have 'Drumming and dancing groups'. One 'youth drumming and dancing group' participated in a group discussion. Their goal is to support each other and to promote both African culture and the development of their community. They derive income from member fees and from performances. The group was targeted for this research in hopes of gaining more insight into why a lot of the youth is leaving the villages for the urban areas. However, upon arrival, they turned out to be not as youthful as one would expect them to be from a 'Western' perspective. Out of the 30 people present, only 10 were under the age of 21. Thereby, the eldest member of the group is at the respectable age of 60. During the fieldwork it happened several other times that people up to the age of 50 were referred to as 'youth', showing a major cultural difference.



3. METHODOLOGY

The following section discusses how relevant material was obtained and analysed in order to answer the research questions. Both the project framework and the theoretical background were used to determine the best manner in which this was done. First, the research strategy is described, followed by the research methods, elaboration on the collection of the material and at last the analysis of the material.

3.1 RESEARCH STRATEGY

The scale of the research is small: communities in the Weto Mountain Range Area in the Volta Region. A small scale leads to less generalizable knowledge, but enables deeper examination of complex processes (Verschuren & Doorewaard, 2007). As highlighted in the theoretical background, the overall research philosophy is 'interpretivism'. In order to understand the research object from their point of view, a more qualitative approach is useful. However, in order to create a profile of respondents, in addition a quantitative inventory was done to cover the indicators that are measurable and to quantifiable data, such as age or assets for example.

As interpretation plays an important role in this research, the collection of relevant material was mainly done through empirical research. In addition, literature and internet research was also done to obtain background information. In order to make statements about the Weto Mountain Range Area, it was necessary to collect the data among the local inhabitants. In addition experts that have been working in the area have been interviewed. The Weto Mountain Range forms the case for this research in which the more general concepts of local perception and local ownership are examined. A case study enables deeper analysis of space-time constrained objects or processes (Verschuren & Doorewaard, 2007). The use of one small area increases the possibility of coincidence playing a role in the research outcomes. However, it also provides more opportunities to deeper examine the complex concepts of local perception and local ownership.

The research objective is to contribute to a more complete understanding of locals' perceptions towards climate change, environmental degradation and sustainable development in order to explore options for the creation of local ownership of sustainable development. In this research the focus is on the Weto Mountain Range in the Volta Region in Ghana. Therefore the two units of analysis consist of (1) the locals' perceptions towards CDS and (2) the options for the creation of local ownership of sustainable development among the inhabitants of the Weto Mountain Range. Each unit of analysis is covered by the sub questions described in chapter 1 and operationalized in chapter 2.

3.2 RESEARCH METHODS

In order to determine the methods required for this research, let us turn to the research questions:

Sub question 1

Which are the perceptions of the rural inhabitants of the Weto Mountain Range towards climate change (and its causes and consequences)?

Sub question 2

Which are the perceptions of the rural inhabitants of the Weto Mountain Range towards environmental degradation (and its causes and consequences)?

Sub question 3

Which are the perceptions of the rural inhabitants of the Weto Mountain Range Area towards sustainable development?

For these questions information is needed about the locals' perception towards CDS. The sources for this information are the inhabitants of communities in the Weto Mountain Range Area. Through in-depth interviews people were asked to describe their previous and current experience and knowledge of CDS using the operationalisation in chapter 2.

Sub question 4

which options are available for creating local ownership of sustainable development among the rural inhabitants of the Weto Mountain Range?

To be able to answer this question information is needed about the possible options for the creation of local ownership. The sources for this information are the inhabitants of communities in the Weto Mountain Range and their practises. Through in-depth interviews respondents were asked about traditional leaders in their community and the way elections were conducted in the past, in order to better understand the choice for certain local decision makers and the reasons these people are influential. When asking inhabitants about their knowledge, they were also asked about how they obtained that knowledge, as the identified sources might offer potential options for creating awareness and persuasion of the importance of sustainable development. Questions were also posed about local governance structures, in order to determine how these are carried out, whether they are reaching a large population and whether those structures might prove useful for the creation of local ownership. Finally, they were asked about their current farming practises, land use and conservation of resources in order to determine possibilities for the implementation of more sustainable practises. These agricultural practises, land use and the conservation of resources were also observed in more detail in order to generate additional information. Also, experts who worked in the area were interviewed.

The operationalisation of the central objective (see chapter 2) formed the basis for the interview guide that can be found in appendix 1. Because knowledge of English in the rural areas is limited, use was made of a translator/interpreter. In order to facilitate the translation process, the interview guide consists of complete questions. This interview guide was tested in the field and adjusted based on experiences gathered. However, it was important that respondents were able to tell their own story and therefore the questions and their order were only guiding and non-exhaustive.

Based on available time and resources, the goal was to reach a respondent population of 60-70 people. Different villages along the Weto Mountain Range were selected in order to enhance representativeness. In addition, focus group discussions were organized to gather additional information. As mentioned earlier, due to lack of capacity and capability by the government, local inhabitants have formed their own groups. The different groups and age groups were targeted for focus group discussions using the same interview guide where applicable. A focus group with a drumming and dancing youth group for example, was very valuable to provide a better understanding for the reasons why young people are planning on staying in the community or why they might decide to leave.

Central question

Which are the perceptions of the rural inhabitants of the Weto Mountain Range towards climate change, environmental degradation and sustainable development?

To be able to answer the central question the answers to the sub questions are needed. The in-depth interviews were transcribed and structured into text. Eventual observations and literature research outcomes were also structured in text. The programme Atlas.ti was used to code the interview transcripts and other data. Hereafter the codes were used to analyze the collected information and to answer the research questions. In addition, use was made of the quantitative method of scaling for analysis of the respondents' perceptions. Given these points, the analysis is strengthened by triangulation. Both scaling and triangulation are further explained in paragraph 3.4.2. At first, sub questions 1 to 4 were answered, as these were needed to answer the central question. Finally, the analysis was used to make statements about locals' perceptions towards CDS and available options for creating local ownership in this research and thereby answering the central research question.

3.3 COLLECTION OF THE MATERIAL

The goal was to select respondents from a wide variety of ages, in order to be able to display different perceptions and knowledge against age. Therefore respondents in the villages were mostly selected based on their age. In some cases however, we interviewed one or two respondents selected by the traditional authority, in order to maintain a good relationship with the authority in each village. With the help of interpreters I was able to personally interview 63 respondents in 9 different villages. In addition 4 group interviews were carried out with the elderly, a women’s group, a youth drumming and dancing group and a mix of representatives of a village. In addition, four experts with each having a specific knowledge were interviewed, a regional Queen mother, a representative of the Volta Forestry Commission, the District Executive of Ho West District and director of the Development Institute Ken Kinney.

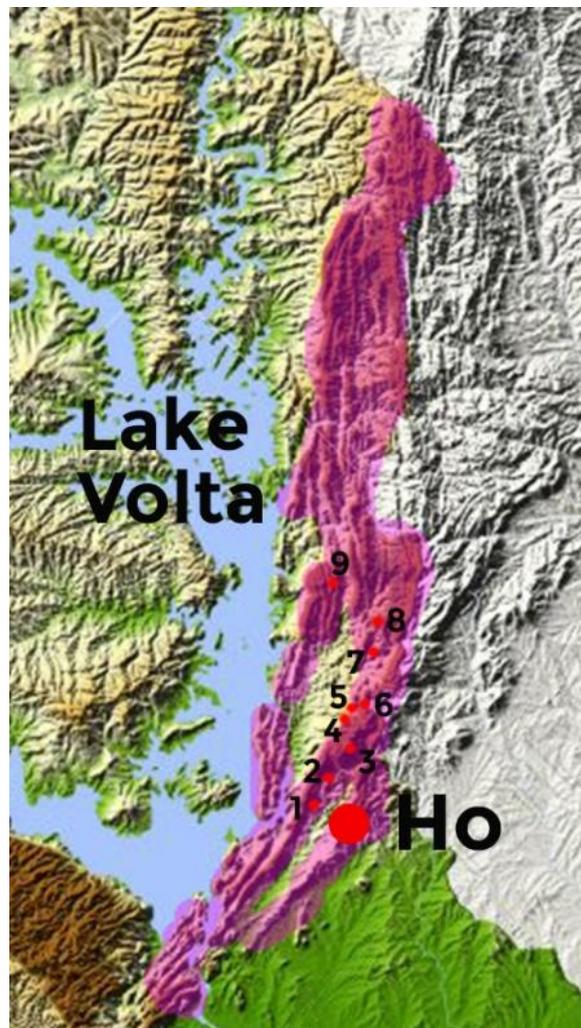


Figure 7: Research communities

3.3.1 Respondent population

For the respondent population a total of nine communities (see figure 7) in the Weto Mountain Range were selected based on feasibility and distance. The total sample population consists of 63 respondents, of whom the age and gender division can be found in table 1. For the purpose of involving different ages, respondents were selected based on the age they looked like. However, estimation of exact age was hard and therefore the respondent population does not contain an equal age distribution. The biggest amount of respondents can be found between the ages of 40 and 44.

Age groups	Male	Female	Total
15-19	3 4.8%	4 6.3%	7 11.1%
20-24	3 4.8%	4 6.3%	7 11.1%
25-29	3 4.8%	1 1.6%	4 6.3%
30-34	2 3.2%	4 6.3%	6 9.5%
35-39	1 1.6%	1 1.6%	2 3.2%
40-44	3 4.8%	7 11.1%	10 15.9%
45-49	3 4.8%	1 1.6%	4 6.3%
50-54	4 6.3%	1 1.6%	5 7.8%
55-59	3 4.8%	2 3.2%	5 7.9%
60-64	3 4.8%	2 3.2%	5 7.9%
65-69	1 1.6%	0 0%	1 1.6%
70+	4 6.3%	3 4.8%	7 11.1%
Total	33 52.4%	30 47.6%	63 100%

Table 1: Age distribution of respondent population

In order to be able to make significant statements in analysis, the above age groups are computed into three groups: 'youth' (age 0-29), 'adult' (age 30-59), 'elderly' (age 60+). According to 'western' standards, the age of 29 for youth might be considered quite old. As shown in the introducing textbox of this chapter, in Ghana this is different. My understanding of youth is from the age of 0 to 21, or if you want to take children separately the ages 16 -21. This sometimes caused misinterpretations like with the youth drumming and dancing group.

Because the above makes it hard to draw a line, for the 'youth' category a compromise was made between 'western' and Ghanaian values. Thereby, using 'school going' for the youngest category, would create problems as young respondents who have dropped out of school could end up in the middle category together people of their parents' age for instance. Table 3 shows the age and gender distribution of the new age groups.

Age groups	Male	Female	Total
Youth (0-29)	9 14.3%	9 14.3%	18 28.6%
Adult (30-59)	16 25.4%	16 25.4%	32 50.8%
Elderly (60+)	8 12.7%	5 7.9%	13 20.6%
Total	33 52.4%	30 47.6%	63 100%

Table 2: Age and gender distribution of age groups youth, adult, elderly

The above table shows that the respondents are not evenly distributed among the different age groups. When looking at the current demographic trend of an aging population in Ghana, one might expect a higher share in the 'elderly' group. However, precisely because of their old age, in relation to the 'adult' group, less elderly were in the condition to participate in an interview. The low share in the 'youth' group represents the current trend of the youth leaving the rural areas.

Table 3 shows the marital statuses for the three age groups. The majority of the respondents is married (54%), followed by the single status with 39.7%, widowers are also part of the single group. The distribution of the 'elderly' age group might point at more traditional values as in that group respondents are either married or single, but not co-habiting or having courtship.

Age groups	Single	Married	Co-habiting	Courtship	Married with more wives
Youth (0-29)	13 20.6%	4 6.3%	1 1.6%	0 0%	0 0%
Adult (30-59)	7 11.1%	22 34.9%	1 1.6%	1 1.6%	1 1.6%
Elderly (60+)	5 7.9%	8 12.7%	0 0%	0 0%	0 0%
Total	25 39.7%	34 54.0%	2 3.2%	1 1.6%	1 1.6%

Table 3: Age and marital status distribution of age groups youth, adult, elderly

With regards to ethnicity, all but one respondent replied. Table 4 shows that all respondents are from the Weto Mountain Range Area, whereby 90.3% was born in the same village as they were still living in and 9.7% had migrated from another village.

Ethnicity	Frequency	Percentage
Same as village	56	90.3%
Other village in Weto Range	6	9.7%
Total	62	100%

Table 4: Ethnicity distribution of respondent population

Table 5 shows the number of people in the households of the respondents. As the complete respondent population is located in the rural areas, the low percentage of 3.2 for single-person households can be explained. The biggest share is from three persons households and six persons households, both accounting for 15.9%. Hereafter the percentages decrease as the size gets bigger.

Number of people in household	Frequency	Percentage
1	2	3.3%
2	8	13.1%
3	10	16.4%
4	7	11.5%
5	6	9.8%
6	10	16.4%
7	6	9.8%
8	4	6.6%
9	3	4.9%
10	1	1.6%
12	3	4.9%
16	1	1.6%
Total	61	100%

Table 5: Household size distribution of the respondent population

As for the gender and age of the household heads of the respondent population, table 6 shows a majority of adult males between the age of 30 and 59 (46.0%), followed by 25.4% for elderly males (60+). There were no 'Youth female' household heads among the households of respondent population.

Household head	Frequency	Percentage
Elderly male (60+)	16	25.4%
Elderly female (60+)	4	6.3%
Adult male (30-59)	29	46%
Adult female (30-59)	8	12.7%
Youth male (0-29)	6	9.5%
Total	63	100%

Table 6: Distribution of household heads by age and gender of the respondent population

3.3.2 Ewe translation

Before the start of an interview, the respondents were asked whether they preferred the interview to take place in Ewe, Chi or English. The division of Ewe and English was quite equal (there was only one interview in Chi). Often different languages have been mixed. Some of the respondents that spoke English had trouble with understanding my accent, they still preferred the self-called 'Ghana English' accent of my interpreters. Mostly, I was able to understand their English dialects, which resulted in only the need for one way interpretation. To make sure the interpreters knew what the goals of the interviews were and how questions should be asked, the earlier mentioned interview guide (appendix 1) was discussed extensively on forehand. In addition, the interpreters explained how they translated some of the concepts in Ewe:

"I did word for word interpretation where I know the Ewe version of the words and explained the English text where I did not have the Ewe version handy. In some cases, I interpreted based on the contextual meaning of the words or sentences and as well "paraphrased" but without losing the original meaning of the sentence from English to Ewe. In cases where I do not know the word in the Ewe language, I interpret by explaining the text as it means in Ewe. For example, I didn't know the word sustainability so I explained it in Ewe as "wa lebe ne nade ne walike" which when directly translated means "to take care of something so it lasts longer". This sentence could also mean, "to maintain something". Also for Climate Change, the concept is widely known in Ewe as "dixeme fe eya fe trɔtrɔ" which when translated means "changes in weather patterns" but literally (word for word translation) means "the world's wind changes".

There was no word for Degradation that I know so the word was explained as "ayhi gba fe nyinyi" which when translated in English means "the wearing out of the land" and when more clarity was needed I used "ne nade mete nti wo efe dɔde asio" which when translated means "if anything loses its function or the work it is meant for".

The responses were also interpreted word for word in some cases. In situations where people repeated their responses or says something that is not related to the question or talks more than necessary, I simply paraphrased" (M. Agba, personal communication, April 14, 2015).

3.3.3 Socio-economics

In addition to the qualitative approach, a quantitative inventory was done to cover the indicators that are measurable and that can produce quantifiable data, such as age for example. Basic socio-economic information was collected in order to create a profile of the respondents and to determine other influencing factors in decision-making processes, such as access to healthcare, water, electricity, government support and police and fire service for example. Because personal situations and levels of education varied, estimations of expenditures or size of land, for example, were more challenging for some than others. With regards to income, the only people with a steady salary in rural area were those working for the government (this constituted a small minority). For farmers and traders the ability to estimate their income formed an obstacle. Therefore respondents were asked about food security and what they mainly spend their money on. In table 7, all the variables of the socio-economic inventory are shown.

Village	Livelihood	FireserviceSufficient	PerceivedLandCondition
Gender	ClaimedFoodSecurity	InformalRelationships	PriceMarket
Age	SuspectedFoodSecurity	FormalRelationships	EnergySource
MaritalStatus	LawRestrictions	ChemicalUse	Sanitation
Ethnicity	SupportGovernment	FarmingOwnUseSelling	Crops
Householdnumber	WealthCategorization	HealthcareAccess	FarmingTools
Householdhead	HouseholdHealthInsurance	FarmingLand	Chemicals
Education	PoliceSufficient	LandProperty	Market
BiggestExpenditure	WishesForSpending		

Table 7: Socio-economic variables used in SPSS

The above variables were used in the quantitative data analysis conducted with the programme SPSS and for each respondent the accompanying data were entered. For a more complete overview of the dataset including labels and values, see appendix 2. The dataset also contains some missing values, as not every respondent wanted to/ could answer every question. Nevertheless, each variable still contains enough data to draw representative conclusions.

Most of the variables are self explanatory, but the following required some further elaboration:

- *Household Head*: The gender and age of the head of the household are covered by this variable.
- *Education*: The highest education that the respondent has completed is covered by this variable.
- *Livelihood*: The different activities (jobs) of the respondent to support his household are covered by this variable.
- *Claimed food security & Assumed food security*: Sometimes respondents seemed to provide us with answers that did not necessarily represent the truth, but rather with what they expected would generate the most benefit for them. For instance, by claiming not to have any food security, they could possibly think that we would be more inclined to provide them with support. Therefore, the variable of 'Suspected food security' was added. Based on observations and answers to other questions, such as those covering expenditures, for each respondent it was interpreted whether they are likely to have food security. However, the

view of the respondent is of great importance, therefore this is covered by the variable of 'Claimed food security'.

- *Law & Restrictions:* This variable was included in order to determine other influences in decision making processes. Whether people have ever been withheld in their daily life by law or restrictions is covered by this variable.
- *Support Government:* This variable was included in order to determine other influences in decision making processes. Whether people are feeling supported by the government in their daily life is covered by this variable.
- *Wealth Categorization:* Because of the earlier mentioned obstacles for estimation, for this variable each respondent was divided into a different category of wealth. This was done based on observation and answers to other questions such as tools, livelihood and education for example. For more information see paragraph 3.4.1.
- *Household Health Insurance:* Whether the whole household has basic health insurance is covered by this variable.
- *Police sufficient & Fire service sufficient:* These variables were included to determine other influences in decision making processes. Whether the respondent thinks the police and fire service in their area is sufficient is covered by this variable. In the Weto Mountain Range there are several fire stations in the big cities such as Ho and Hohoe, however their reach is mostly limited to the cities themselves. Further elaboration on the causes is part of the qualitative research.
- *Informal relationships & Formal relationships:* These variables were included in order to determine other influences in decision making processes. Whether respondents can rely on or are relying on or can provide for other informal and formal relationships is covered by these variables.
- *Farming for Own Use or Selling:* Whether respondents are farming for their own use or for selling or for both is covered by this variable.
- *Farming Land:* The land that the respondent is farming on today is covered by this variable. Through family inheritance people own wide arrays of land, but because of money and manpower problems they only farm on small portions. This variable only covers those portions that were being used at the moment of the interview, as this represents assets such as money for labour, seeds and chemicals.
- *Land Property:* Whether the land is family owned, tenured or borrowed is covered by this variable.
- *Perceived Land Condition:* Research and other data can tell one story about the land and the people who are using it another, because of the importance of the respondent's own view, this variable covers their opinion on the land condition.
- *Price & Market:* Whether respondents think they get a good price for their goods on the market is covered by this variable. Further elaboration on causes is part of the qualitative research.
- *Market:* What market the respondents sell their products is covered by this variable.
- *Biggest expenditure:* This variable was included as an indicator for the variable of wealth categorization by focussing on the biggest expenditure of respondents on a weekly basis.

- *Wishes for spending*: This variable was included as an indicator for the variable of wealth categorization. And, if the respondents would have more money, what would be the first thing that they would spend it on.

3.4 ANALYSIS OF THE DATA

The main method of analysis for this research was through the coding of the interview transcripts with the qualitative programme Atlas.ti. Two other methods were also used in this which include: (1) the method of 'wealth categorization' that was used to understand the relative wealth between the respondents, in order to find out about possible influential links between peoples' economic status and their perception; and (2) the method of 'scaling' that was used to quantify the qualitative data in order to be able to summarize the interpretations of the respondents' perceptions as an addition to the qualitative method of coding with Atlas.ti. The combination of qualitative and quantitative methods is referred to as triangulation.

3.4.1 Coding with Atlas.ti

All transcripts were coded with the qualitative programme Atlas.ti. The codes were based on the operationalisation from chapter 2 such as 'access to knowledge' or 'past learning' for example and on notes collected during the field work. An example of the latter is the code of 'knowledge distribution' that was based on the fact that during the field work I experienced a very unequal knowledge distribution, that later turned out to be dependent on gender, ages and educational backgrounds of the respondents. A complete list of codes can be found in appendix 3. The codes were used to determine relevant outcomes that are presented in chapter 4, 5 and 6. These outcomes were structured for each dimension and sub dimension as presented in chapter 2. The number of appearances of a code, the combinations of codes and more importantly the quotations belonging to a code, were used to analyse the respondents' answers for each dimension.

3.4.2 Wealth categorization

In order to find out about possible influential links between peoples' economic status and their perception, it is useful to understand relative wealth in a specific area. Identifying respondents from different socio-economic groups can help examine the impact of an intervention on these different groups. A popular method is Wealth Ranking, in which local inhabitants are asked to rank their fellow community members from rich to poor (Guijt, 1992). Since, this method might be experienced as intrusive and uncomfortable and can be influenced by hidden agendas, or status in other dimensions or friendship ties - for this research a form of wealth categorization was used. It should be recognized that wealth is a continuum, that the boundaries of categories are fuzzy, and that there are marginal and individual households and that there is mobility between the categories over time. Nevertheless, wealth categories could be a useful heuristic device. It can be expected that those people in certain categories have sustainable livelihoods; other people are at risk, while yet others have no prospect of sustainable livelihoods (Rennie & Singh, 1995). *"We expect that people in one category have certain options or adaptive strategies open to them under stress, while those in other categories have different options, or no choice"* (Rennie & Singh, 1995, p. 81).

The division of categories stems from the Guidebook for Field Projects from the International Institute for Sustainable Development (Renni & Sing, 1995, p. 82):

1. “Those who can manage”, a euphemism for the relatively wealthy who can look after their own interests without help from anybody.
2. “Those who have something”, have some small assets such as animals, equipment and an opportunity of developing.
3. “Those who earn slowly”, i.e. have no real capital assets but struggle on a daily basis to make ends meet.
4. “Those who cannot manage”, the obverse of the first group who are destitute and therefore require external support to survive.

The indicators above are supplemented with indicators that are based on my own interpretations and observations gained during the fieldwork. Land property as an asset is not taken into account as a large majority has vast areas of family land that they inherited and are not using. Therefore, there was a need to look at the amount of land that they actively farmed at the moment of the interview, as this depended mostly on the available budget (for both crops and labour hiring). In addition, sanitation is not taken into account. The interviews proved that having a toilet was not necessarily a priority. Respondents by obvious means to provide one did not have one and mentioned other wishes for spending. Thereby, having a latrine for ones household does not have a big value as an asset, because these were easily made by digging a hole in the ground and putting sticks on the sides. As mentioned before, the answers to food security seemed to be influenced by what respondents expected would generate the most benefit for them. A woman that owned a smart phone for instance, claimed that she was not able to feed her household. Therefore food security is not taken into account for this wealth categorization.

Table 8 shows the indicators for the different categories that are based on my own interpretations of the interviews and observations gained in the fieldwork. The subjective factor of this method has to be emphasized. However, with the earlier mentioned obstacles of the lack of capability to estimate and different perspectives, this is the closest where one can get to generating an income division. Thereby, the respondents are compared to each other; creating a relativity factor that somewhat complements the subjective factor. This method aims to make statements about the relative wealth within the communities and does not try to place respondents on a scale based on the assets they have. Creating a bond of trust and receiving honest answers were more important for this research, therefore no possibly provoking questions were asked.

	1: Those who can manage	2: Those who have something	3: Those who earn slowly	4: Those who cannot manage
Indicators	Not relying on anyone + providing for others / elderly and being well provided for	Not relying on anyone for basic rights / elderly and being provided for	Not relying on anyone for basic rights / elderly and being provided for	Relying on others if possible / elderly and still working
	Well built brick house	Well built house	Renovation for house is necessary	Ramshackle hut / small hut
	Not asking for funds / only asking funds for further investments	Only asking funds for further development and further education	Firstly asking funds for high school education / asking funds for further development	Firstly asking funds for basic education / money / asking funds for basic rights
	Television, other technological equipment, decorations and a lot of furniture	Wearing jewellery/ good clothes / shoes Special hairdo's	Worn off clothes / normal clothes	Worn off clothes / no shoes / slippers
	Smartphone	Mobile phone	No phone	No phone
	Those who want in the household have received further education	Children have all finished junior or senior high school or will finish	Children have finished elementary school or junior high school or will finish, But senior high school/secondary education is difficult	No access to elementary school
	Access to healthcare and buying all necessary medicines	Access to healthcare and buying all necessary medicines	Access to healthcare but not buying all necessary medicines	No Access to healthcare or access to healthcare but not buying all necessary medicines
	Pipe in the house or own borehole	Fetching water from borehole/pipe	Fetching water from borehole / pipe/well	Fetching water from the stream/ public well
	Farming land of 6 acres or more	Farming land of 4-5 acres	Farming land of 2-3 acres	Farming land 1 acre or less
	Steady income /Business owner / plantation or cashcrop farmer /working with a lot of self owned equipment of value	Steady income / Business owner / plantation or cashcrop farmer / working with self owned equipment of value	Ongoing job / farmer and constant seller / trader	Dependent on subsistent farming for food / small small worker
	Main expenditure on something else than food and school	Main expenditure on school	Main expenditure on food	Main expenditure on food
	Electricity	Electricity	Sometimes electricity	No electricity
	Advanced tools, own spray machine	Advanced tools, own spray machine	Own simple tools, hiring spray machine	Borrowed tools, cutlass, no chemicals because of lack of money

Table 8: Wealth categorization indicators

3.4.3 Triangulation & Scaling

In 1959, Campbell and Fiske argued that more than one method should be used in the validation process to ensure that the variance reflected the characteristics and not the method. They named it 'multiple operationism', today known as triangulation, which is defined by Denzin (1978) as "*The combination of methodologies in the study of the same phenomenon*" (p. 291). Triangulation's effectiveness lies in the fact that the different methods will compensate for each other's weaknesses with their counter-balancing strength. Qualitative data and analysis are used as critical counterpoints to quantitative methods. That is under the assumption that they do not share the same weaknesses or potential for bias. The combination of qualitative and quantitative methods allows researchers to be more confident of their results, and can stimulate the creation of inventive methods, and can uncover the deviant dimension of a phenomenon, as well as lead to a synthesis or integration of theories. Therefore, advocates of triangulation encourage qualitative researchers to systemize observations, utilize sampling techniques and to develop quantifiable schemes for coding complex data sets (Jick, 1979).

Triangulation also has its shortcomings. Replication, often considered an important step in scientific progress, is hard, especially for qualitative methods. Secondly, there is the danger of using either quantitative or qualitative methods merely as window dressing for the other in order to legitimate a personally preferred method. At last, practical constraints like time and costs can prevent effective use of the extensive method of triangulation (Jick, 1979).

Denzin (1978) outlines different types of triangulation: data triangulation, including different kinds of data such as time, space and persons; investigator triangulation, using different researchers; theory triangulation, using different theories; and at lastly methodological triangulation, using multiple methods. Within the latter type of triangulation, a distinction is made between so-called 'within-methods' and 'between-methods'. The first refers to the use of multiple techniques within a method (Jick, 1979), whereas the second actually refers to the use of different methods. The 'within-methods' approach is said to have limited value, as in essence only one method is used (Mathison, 1988). Therefore, for this thesis, two different methods are used to analyse the perception of the inhabitants towards climate change, environmental degradation and sustainable development.

One of the two methods as mentioned before is the qualitative method of coding the transcripts with the programme Atlas.ti. The second method is the quantitative method of scaling. Scaling is a primitive form of triangulation (Smith, 1975) and is therefore expected to contribute to the feasibility of this research because of practical constraints. Scaling is defined by Jick (1979) as "*the quantification of qualitative measures*" (p. 603) and is said to be at the 'simple end' of the continuum of triangulation design (Jick, 1979). Scaling is often used in social and psychological sciences for large classes of qualitative observations. From these observations it is desirable to be able to summarize the qualitative data (Guttman, 1944). The data for scaling is often obtained through qualitative questionnaires, however "*scaling analysis is a formal analysis, and hence applies to any universe of qualitative data of any science, obtained by any manner of observations*" (Guttman, 1944, p. 142). Therefore, for this thesis, next to coding, I use scaling for analysis of the answers of the respondents to the open questions posed during the in-depth interviews.

The answers of the respondents were interpreted and each respondent has received a score on a 5-point scale for their perception towards: (1) climate change; (2) environmental degradation; (3) sustainable development. The 5-point scale used is a Likert Scale, with categories ranging from least to most categories indicating how much a person agrees or disagrees, approves or disapproves etc. (Allen & Seaman, 2007). A critical note is that the Likert scale was developed to let respondents directly score their own opinion. It has to be emphasized that due to the interpretation of the scores by the researcher based on the answers of the in-depth interviews, there is a subjective factor at stake, which will make it hard to replicate the method in the future. Therefore, for this thesis the scaling on the likert scale is merely used to summarize the interpretations of the respondents' perceptions, as an addition to the analysis method of coding that generated elaborate answers including quotes and provide in-depth knowledge.

The following statements were used to score the different perceptions:

Climate change:

- The respondent thinks climate change is happening in his or her environment.
- The respondent thinks climate change is a problem that deserves attention.
- The respondent thinks climate change is influencing his/her daily life.

Environmental degradation:

- The respondent thinks environmental degradation is happening in his or her environment.
- The respondent thinks environmental degradation is a problem that deserves attention.
- The respondent thinks he or she is contributing to environmental degradation.
- The respondent thinks environmental degradation is influencing his/her daily life.

Sustainable development:

- The respondent thinks sustainable development deserves attention.
- The respondent thinks he or she is already practising sustainable development.

Per statement, each respondent has received a score on a five point scale ranging from “strongly disagree” to “strongly agree”, based on the coding of the respondents' transcripts in Atlas.ti. In chapters 5 & 6 this process of scoring based on codes is extensively handled as it is used to explain the research results. For example, when respondents gave extensive accounts of the changes in weather over the years, they received a high score for the first climate perception statement. Another example is when respondents talked about the dwindling density of the forest, the drying up of the streams, the changing vegetation, and the reducing fertility of the ground, they received a high score for the first environmental degradation perception statement. When they passionately talked about negative consequences and influences, they received a high score for the second degradation perception statement as well. Thereby, the perceptions of the respondents are compared with each other, this relative factor aims to complement the subjective factor. When there were respondents who talked about more severe consequences such as the changing sowing patterns and yield because of climate change, they would receive a higher score than those who only mentioned that there was less shade for example.

The respondents' knowledge on the concepts is of great importance as well. They might think that climate change is happening in their environment, but when one thinks climate change is '*the sun and the moon coming together and creating darkness*' as one respondent said, views are still far apart. Therefore they received scores on a 3-point scale on their knowledge of climate change, environmental degradation and sustainable development and the causes and consequences. The categories of the scale consist of:

Has no accurate knowledge – has little accurate knowledge – has extensive accurate knowledge

Per concept, each respondent received a knowledge score. Again comparison of the respondents played a role for the scoring. When one respondent mentioned a lot of causes of environmental degradation, such as sand winning, tree felling, over cultivation and mining for example, he received the extensive accurate knowledge score as compared to a respondent who only mentioned the tree felling and received a little accurate knowledge score. It should be taken into account that some people are less talkative than others and therefore could show less knowledge than they possess in reality. In order to counteract this as much as possible, respondents were also asked several more specific questions about causes and consequences after the starting question about the definition of a concept. It can be expected that knowledge influences perception. However, for this research it was deemed important that respondents received accurate knowledge on the concepts after showing no or little accurate knowledge, both to raise awareness and as an exchange for their participation. Their scores on their initial knowledge might not reflect this influential relationship with their perception as they received accurate knowledge in between. Accurate knowledge refers to the definitions used for the concepts in this thesis.

Both the perception scores and the knowledge scores were displayed against age, gender, wealth and education in order to examine correlations between these aspects and certain perceptions. Such an analysis can provide insights into which characteristics are necessary to achieve the best results with an intervention.

In sum, for this thesis there is made use of between-methods methodological triangulation, by using the qualitative method of coding with the programme of Atlas.ti and by using the quantitative method of scaling with scores on a 5-point scale and a 3-point scale. Of these scores the correlations with age, gender, wealth and education were examined.

4. THE WETO MOUNTAIN RANGE

“The Weto Mountain Range is starting from the river Volta, where we are crossing the river now, that is where it starts from and it runs from there to Togo land and Benin. Here we call it Weto, because there is a small mountain close with that name. But the official name of the whole range is Akwapim-Togo-Atakora Ranges. And with Weto we describe the portion that lies within the Volta Region. So that delineation of the Weto range is adopted by NGOs. But if you go to Amedzope, they use a different mountain peak to describe the whole range and if you go to Afadatjo, they use that. Even in the local language we have Weto Beka, which means mountain ranges” -Mr. Amaglo from the Forestry Commission



4. THE WETO MOUNTAIN RANGE

The Weto Mountain Range in Ghana stretches from the Eastern shores of Lake Volta to Togo and Benin. When driving through the range in the wet season, one will observe a pallet of greenness composed of deciduous forest and savannah landscape (see photo 5). As shown in the introducing quote of this chapter, internationally, the name 'Weto' is not well-known. In Ghana it is better known as part of the Akwapim-Togo Ranges. I got to know range as the Weto Mountain Range, both through the local NGOs and government entities that were working there and because of the inhabitants I spoke to. Therefore for this thesis, the name Weto Mountain Range is used.

Examination of the perceptions of the inhabitants of the Weto Mountain Range towards climate change, environmental degradation and sustainable development and exploration of options for creation of local ownership of sustainable development requires some general background information about the research area. This chapter presents an overview of existing literature on the area and the results of the socio-economic inventory in the nine communities.



Photo 4: Deciduous forest in the Weto Mountain Range

4.1 SOCIO-ECONOMICS

This paragraph presents socio-economic characteristics of the Weto Mountain Range area, based on existing literature and the results of the socio-economic inventory among the respondents. The Weto Mountain Range covers a large part of the Volta region (see figure 9) which for understanding socio-economic trends allows us to refer to the 'Regional Analytical Report of the 2010 population & housing census' of the Volta Region (Ghana Statistical Service, 2013).

4.1.1 Demographics

Table 9 shows a significant growth of the population between 1960 and 2010, the population almost tripled over these 50 years. For a more recent growth rate, we look at the growth between 2000 and 2010. The population increased by 29.5%, translating into an annual growth rate of 2.5 % (Ghana Statistical Service, 2013).

Census year	Population	Population increase	Percentage increase	Annual growth rate
1960	777,288	-	-	-
1970	947,268	169,980	21.9	2.0
1984	1,211,097	237,639	25.1	1.8
2000	1,635,421	423,514	34.9	1.9
2010	2,118,252	482,831	29.5	2.5

Table 9: Trends in population size and growth rate, 1960-2010 (Ghana Statistical Service, 2013, p. 14)

The average population density increased from 46 inhabitants per square kilometre in 1970 to 103 inhabitants in 2010. Concerning the rural-urban distribution in the region, it is clear that the the percentage still clearly is tilted towards the rural areas as 66.3% lives here (Ghana Statistical Service, 2013).

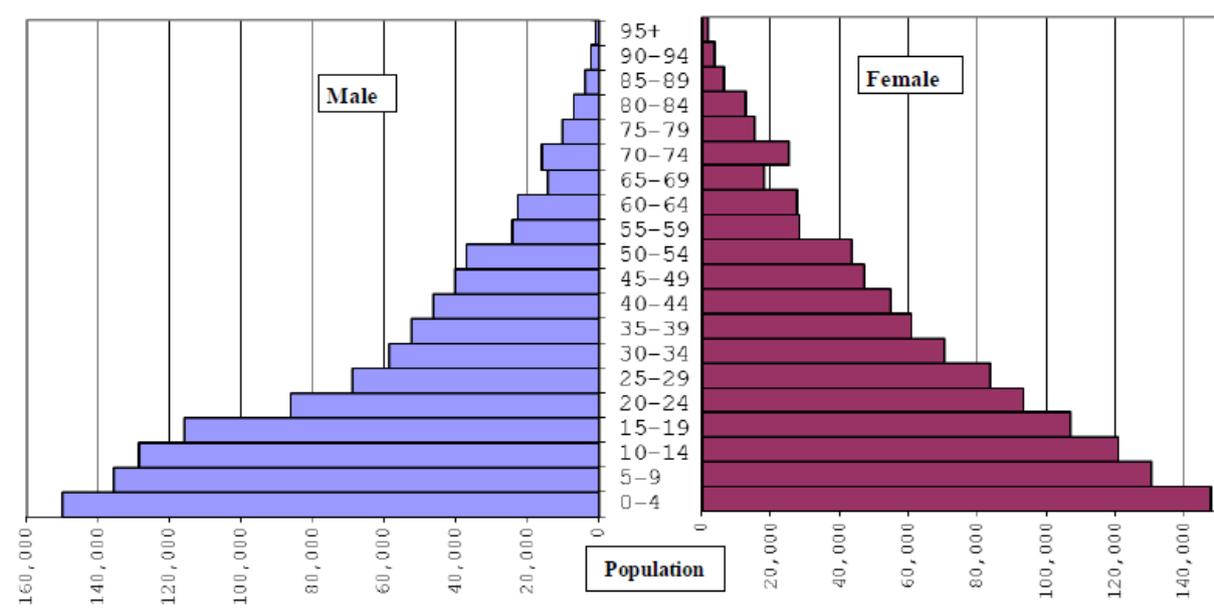


Figure 8: Population of the Volta Region by Age and Sex (Ghana Statistical Service, 2013, p. 29). age

Figure 8 displays the distribution by age and sex of the population of the Volta Region in 2010. As is characteristic for most developing countries, it has the form of a pyramid, with children having a major share at the bottom and the elderly a minor one at the top. In line with this, the dependency ratio is high, with 81 dependants (children and old aged) for every 100 people working. As is the case for most developing countries, females form a small majority in the Volta Region with a sex ratio of 92.8 (Ghana Statistical Service, 2013). From 20 onwards this sex ratio becomes more visible in the pyramid, a possible reason for this is outwards migration of young men seeking new opportunities in the bigger cities such as Accra for example. Because of traditional values, young men are more likely to go on their own than young women (Ghana Statistical Service, 2013).

The total fertility rate of the Volta Region is an average of 3.2 children for a woman in the age 15-49 at the end of her reproductive period if the current age-specific fertility rates continue to prevail. Comparing this to a total fertility rate of 6.7 in 1988 a slow demographic transition becomes apparent (Ghana Statistical Service, 2013). The report does not cover a crude death rate or life expectancy. The crude death rate for the whole country went from 17 per 1000 in 1988 to 9.4 in 2008 (Ghana Health Service, 2010).

Most people in the Volta Region are Ghanaian by birth (85.9%) and 17.8% of this is represented by intra-regional migration, whereas a small number moved from other regions in Ghana into the Volta Region. There are eight major ethnic groups in Ghana. In the Volta Region the major ethnic group is Ewe (73.8%), whereby the districts in the south house a overwhelming majority of Ewe. In the North, Ewe is still the biggest group, but does not make up for a major part of the population. That major part exists out of different ethnic groups. (Ghana Statistical Service, 2013).

The majority of the Volta Region population is Christian (72.8%) (see photo 6), Muslims form 5.7% of the population and can be found more towards the north. 14.1 % practises traditional religion, 6.6% practise none and only 0.8% can be categorized as 'other' (Ghana Statistical Service, 2013).

Single-person households form the biggest share in the household size distribution in the Volta Region at 18.0%, most of these households are located in urban areas. Two up to four person households stand at around 14% each. Bigger households are less common with only 2% representing eleven persons or more. The majority of the heads of household is male (61.6%) versus a percentage of 38.4 for females. The proportion of males who are heads of household increases with age up to the 65-69 years category, and then declines thereafter. Female headship rates are higher at the older ages of 70 years and over. The same pattern is observed in both rural and urban areas. The higher rate of female headship at the older ages can be explained by the higher life expectancy for females in the Volta Region (Ghana Statistical Service, 2013).



Photo 5: Church in a village in the Weto Mountain Range

Table 10 shows the distribution of marital status by age in the Volta Region. The highest percentage of married people is in the age group of 30-34 years. The higher proportion of widowers can be found in the older age groups. The divorce rate also increases with older age groups. Informal union only forms a total percentage of 4.6 of the Volta Region population of 12 years and older.

Age group	Total	Never married	Informal Union	Married	Separated	Divorced	Widowed
All ages	1,449,077 100%	547,725 37.8%	66,263 4.6%	646,657 44.6%	40,474 2.8%	49,983 3.4%	97,975 6.8%
12-14	143,650 100%	135,061 94%	843 0.6%	7,746 5.4%	0 0%	0 0%	0 0%
15-19	222,553 100%	198,217 89.1%	4,235 1.9%	18,609 8.4%	849 0.4%	342 0.2%	301 0.1%
20-24	179,449 100%	112,538 62.7%	11,628 6.5%	50,857 28.3%	2,432 1.4%	1,351 0.8%	643 0.4%
25-29	152,521 100%	51,870 34.0%	13,264 8.7%	80,779 53.0%	3,389 2.2%	2,339 1.5%	880 0.6%
30-34	128,752 100%	20,521 15.9%	10,132 7.9%	88,467 68.7%	4,181 3.2%	3,770 2.9%	1,681 1.3%
35-39	113,090 100%	9,816 8.7%	7,879 7.0%	84,110 74.4%	4,350 3.8%	4,603 4.1%	2,332 2.1%
40-44	101,280 100%	5,673 5.6%	5,729 5.7%	75,499 74.5%	4,763 4.7%	5,608 5.5%	4,008 4.0%
45-49	87,382 100%	3,920 4.5%	4,466 5.1%	63,195 72.3%	4,495 5.1%	5,987 6.9%	5,319 6.1%
50-54	80,340 100%	2,863 3.6%	3,042 3.8%	54,946 68.4%	4,577 5.7%	6,614 8.2%	8,298 10.3%
55-59	52,416 100%	1,524 2.9%	1,714 3.3%	34,003 64.9%	3,144 6.0%	4,784 9.1%	7,247 13.8%
60-64	50,287 100%	1,538 3.1%	1,247 2.5%	29,426 58.5%	2,875 5.7%	4,607 9.2%	10,594 21.1%
65-69	32,362 100%	973 3.0%	650 2.0%	17,357 53.6%	1,603 5.0%	3,003 9.3%	8,776 27.1%
70+	104,995 100%	3,211 3.1%	1,434 1.4%	41,663 39.7%	3,816 3.6%	6,975 6.6%	47,896 45.6%

Table 10: Distribution of Volta Region Population 12 years and older by marital status and age (Ghana Statistical Service, 2013, p. 50)

4.1.2 Livelihood activities

The Weto Mountain Range has an agrarian economy with over 60% of the working population employed in the agricultural sector (see photo 6) (Ghana Statistical Service, 2013). This group mainly consists of elderly, a rural exodus of the young has been taking place. One of the reasons being that they have been discouraged to get involved in agricultural activities by the lack of livelihood perspectives. As a result, the current farmer population is ageing. Moreover, land abandonment of marginal lands in the mountain areas has become a issue (Beunders et al., 2014).

Next to agriculture, there are a few people who are engaged in government services such as teaching and health services delivery, but they often combine that work with farming and animal rearing. Other activities are agro processing (mainly by women), carving, carpentry, masonry and trading. Non-timber Forest Products (N.T.F.P.) collection forms a significant aspect of the socio-economic life of the people. Recently chain sawing to produce lumber has become a major source of employment, especially for the youth (DI, 2013). In Ghana every tree that is not planted privately, belongs to the government. For each tree that a person wants to fell in the forest, a permit is needed and the use of has to be registered. For both a fee is charged. Therefore, the felling largely takes place illegally (M. Agba, personal communication, 21 September, 2014).



Photo 6: Farm in the Weto Mountain Range with i.a. contumeri, cassava, banana and cocoyam

The distribution of livelihood activities among the respondent population also shows a majority engaged in agriculture (see figure 9). However, there is only a small group that focuses on farming only (19%). Many more, 34.9 % combines farming with their own business (trade and craft) and a total of 3.2% (two respondents) combines it with either employment by the government or a company. However, some of the retirees would have also fitted within those categories in their working days. Nevertheless, it is a small minority. The group that has a business only is 14.3% in size. They derive an income from a business such as a small shop or working as a carpenter, electrician or hairdresser, for example. Following closely is the group of retirees with 11.1%. Only two of the retirees receive a pension, the rest is being taken care of by the family. A small number of respondents (6.3%) does not have any constant employment, they do some 'small small' work here and there, hang around during the day, are housewife or are waiting for money for further education. Despite 17.5% of the respondents being between the age of 16 and 23 (general school going/further education age), only 6.3% was still in school. 4.8% is represented by respondents who are helping family with business, all these respondents were youth who were waiting for money to further their education.

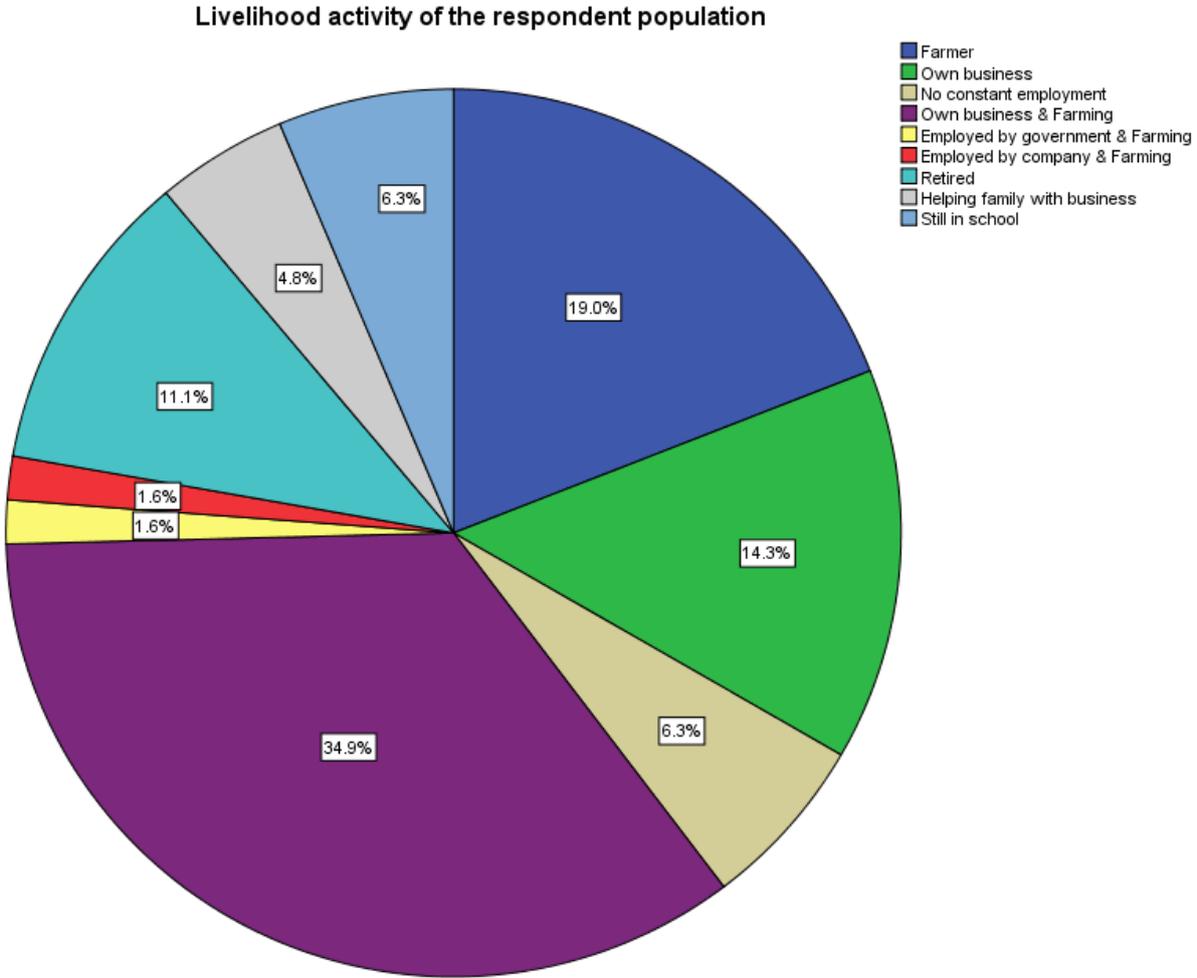


Figure 9: Livelihood activity distribution of respondent population

The farmers (26 respondents answered this question) that are selling their products at markets, were very evenly distributed in their opinion about the price for their produce. Figure 10 shows that 34.6% of the farmers claim that they never get a good price, similar to the group that reported that they sometimes get a good price. The main reason given by both groups is the fact that the crops they produce are in abundance, causing too much competition and forcing them to concede to the customers will. 30.8% is of the opinion that the price they get is okay. Next to selling the produce within their own community, larger villages and towns nearby contain popular markets. The city Ho and selling within the own village, were the most popular answers. Often selling of farm produce was a combination of the surrounding community and a market close by.

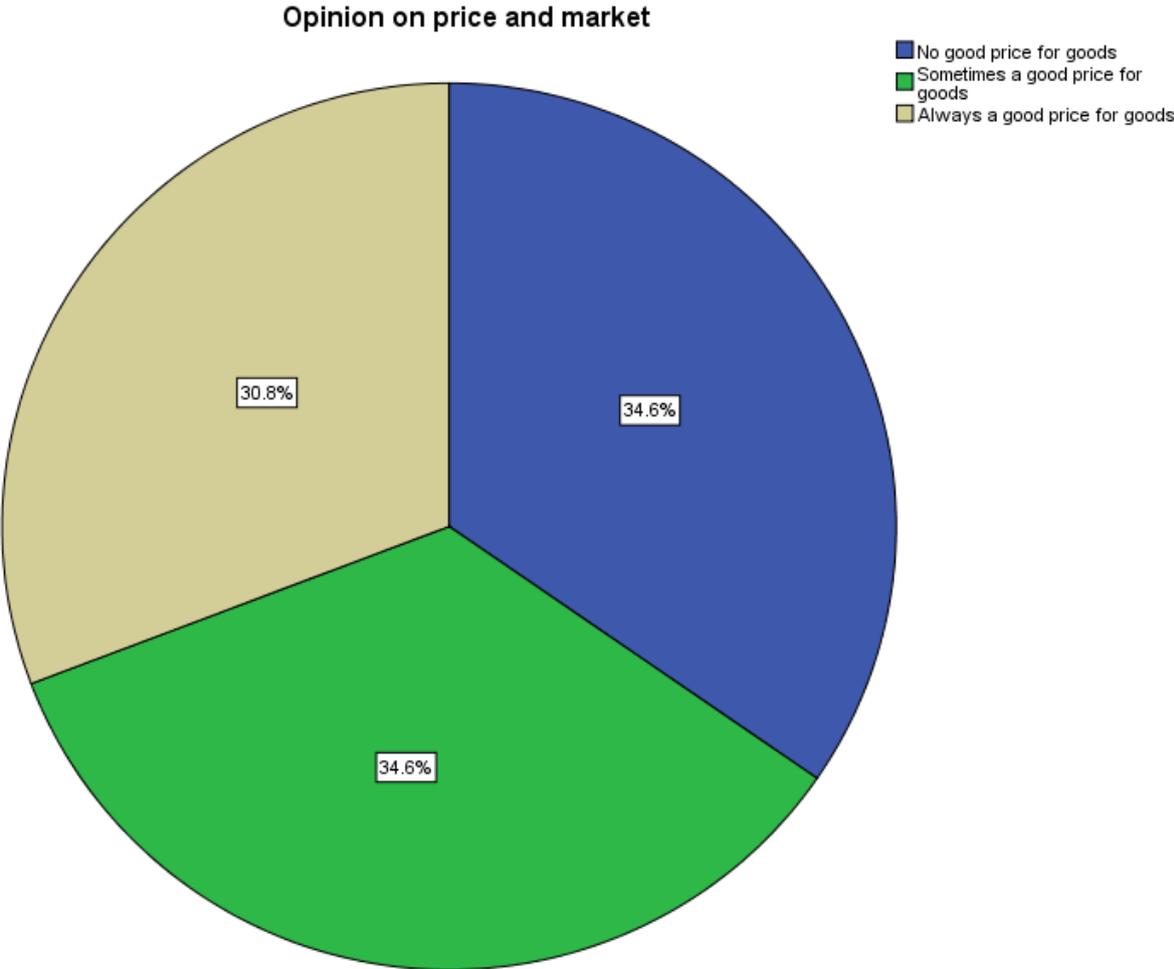


Figure 10: Distribution of farmers' opinion on the price for their goods

4.2.3 Wealth category division

Apart from the aforementioned account of income activities, there is very little information available concerning levels of wealth for the Weto Mountain Range Area. No exact data for income categories are available. However, the census report does give information about the economic activity status of the population. In the Volta region, 69.9 % of the persons of 15 years and above were economically active in 2010. This refers to people who have a paid employment, self-employment or contributing family workers, persons who did not work but had a job to return to, and persons who were unemployed. Not economically active refers to persons who did not work and were not seeking work. This includes homemakers, students, retired persons, disabled persons and persons who were unable to work due to their old age unhealthy, not healthy or sick (Ghana Statistical service, 2013). Table 11 shows that the proportion of females who were economically active in 2010 is higher (52.9%) than males (46.6%) and in all age groups. Thereby the proportion of economically active population increased with age from 15-24 years to 35-44 years and subsequently decreases with older age groups. Despite the minimum age of 15 for entry into the labour force, 13.2% of the children aged 5-17 was employed (Ghana Statistical Service, 2013).

Age group	Total			Economically Active			Not active		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
All ages	1,305,427	46.4%	53.6%	69.6%	47.1%	52.9%	30.4%	44.8%	55.2%
15-24	402,002	50.2%	49.8%	41.5%	48.3%	51.7%	58.5%	51.6%	48.4%
25-34	281,273	45.3%	54.7%	85.3%	46.2%	53.8%	14.7%	39.8%	60.2%
35-44	214,370	45.9%	54.1%	91.8%	47.2%	52.8%	8.2%	31.5%	68.5%
45-54	167,722	45.9%	54.1%	91.1%	47.2%	52.8%	8.9%	32.2%	67.8%
55-64	102,703	45.6%	54.4%	81.6%	47.7%	52.3%	18.4%	36.4%	63.6%
65+	137,357	39.4%	60.6%	49.8%	45.7%	54.3%	50.2%	33.1%	66.9%

Table 11: Population 15 years and older by age, sex and economical activity status (Ghana Statistical Service, 2013, p. 93)

In paragraph 3.4.2 the method of wealth categorization was explained. The indicators for the different categories are based on my own interpretations of the interviews and the observations during the fieldwork. Thus, the subjectivity of this method must be emphasized. Nevertheless, this is the closest one can get to create a division in wealth. This way the respondents are compared to each other creating a relativity factor that somewhat complements the subjective one. In this thesis, wealth categorization aims to make statements about the relative wealth in the communities.

As explained before, answers to food security seemed to be influenced by respondents' expectation of what would generate the most benefit for them, based on observations and interpretations of the interviews it can be stated that every respondent has at least enough to eat every day, ensuring food security. However, not every respondent has an equally varied diet.

Some of the indicators are based on the results of the socio-economic inventory. Table 12 shows the different farming tools that respondents use. A cutlass is the main tool that was used by all farming respondents. This tool is owned by all respondents themselves, except for one. A spraying machine is used by 68% of the respondents, but only owned by a few themselves. 57% uses weedicide. For the respondents who do not use it, this is often so because of lack of budget or a conscious choice. With regards to tools belonging to other professions, such as seamstresses, electricians and hairdressers, these were all owned by the respondents themselves.

Farming tools	Count	Percentage of farming respondents using the tool
Cutlass	37	100%
Hoe	32	86%
Boots	3	8%
Spraying Machine	25	68%
Picker	1	3%
Axe	1	3%
Pesticide	9	24%
Weedicide	21	57%
Fertilizer	4	11%

Table 12: Farming tools used by farming respondent population

As explained before, the amount of land that is owned was not focused much, as it is very common to have vast areas of inherited land. More important is the amount of land that respondents actually use for farming, as this is very dependent on available budget for crops, chemicals and eventually hired labour. Figure 11 shows the amount of land for the farming respondents. The majority farms a small amount of land, two acres or less covers more than half of the respondents. Only one out of the 28 respondents who answered the question farms ten acres of land, he has a palm oil plantation. This also accounts for the two respondents with eight acres.

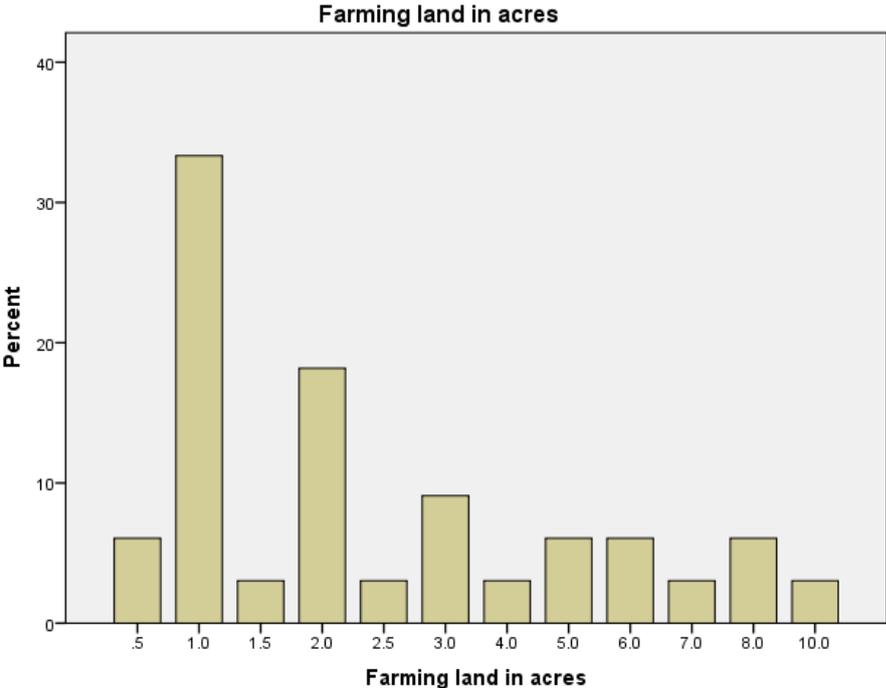


Figure 11: Land in acres that respondents actively use for farming

To grasp levels of income questions were also posed to enquire about the biggest expenditure people made. Figure 12 shows that the main item money is spend on by the respondents is food (48.4%), followed closely by school fees (12.9%) and combination of the two (9.7%), in addition both are often mentioned in other combinations (school fees, food and others: 3.2%; food, cloths, bills: 1.6%; clothing and school fees: 1.6%).

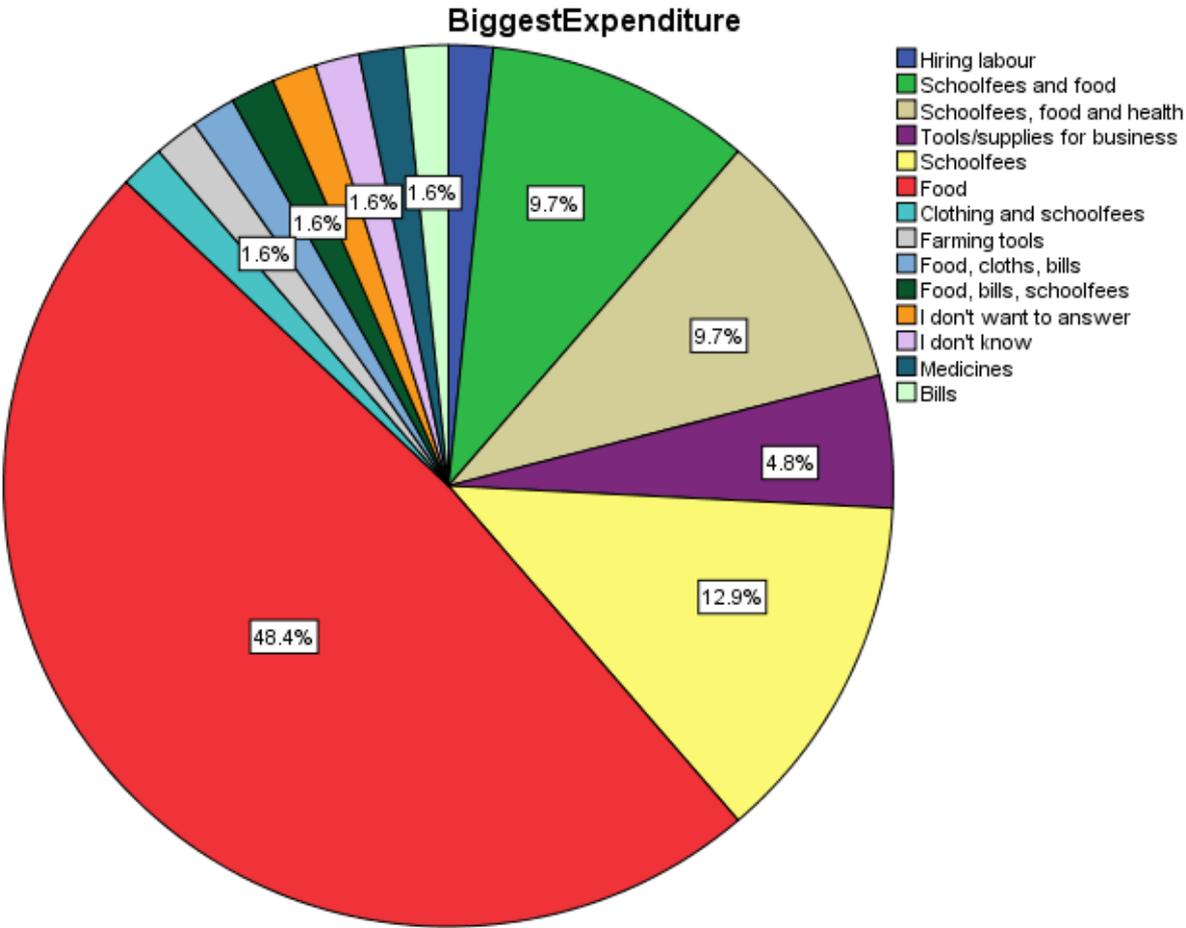


Figure 12: Biggest expenditures of respondent population

Another, though related indicator is the wish for spending. Respondents were asked what the first thing would be they would spend their money on if they would receive more money today. In figure 13 you can see that the majority would want to invest in their business (19%), followed closely by starting a business (17.5%) and investing in the farm (14.3%). Remarkable is that despite the fact that a large number of respondents claimed to be struggling to make ends meet, the wish to build a new house (despite living in one) was the key one for 12.7% of the respondents. This was even often mentioned by a respondent who claimed that he or she was not able to go on to further education because of money problems. Also investing in a business or in the farm was sometimes preferred over going for further education. This emphasizes the influence of priorities and different perspectives. A total of 11.1% of the households would like to send their children for further education.

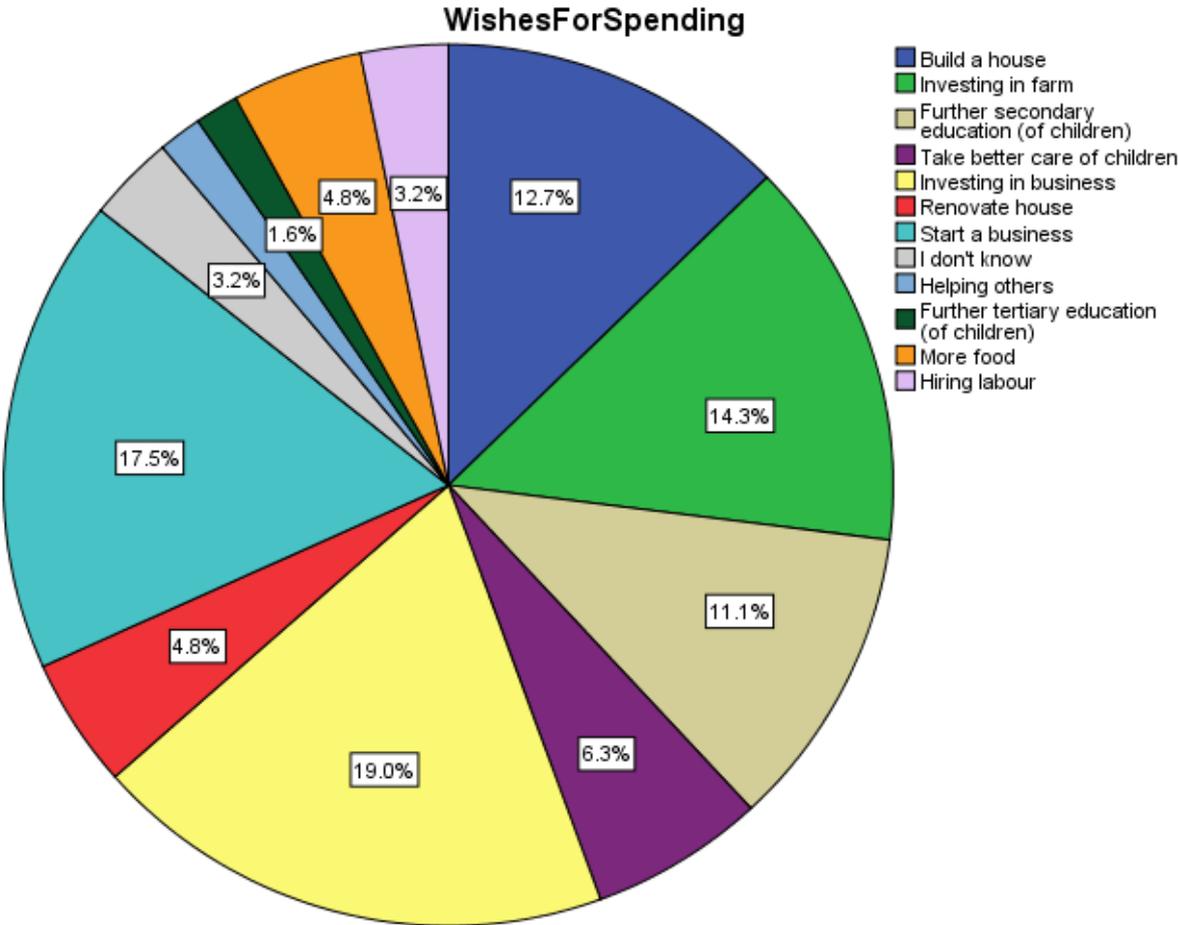


Figure 12: Wishes for spending of the respondent population

Another indicator important for the division into wealth categories, is the relying of the respondents on either formal or informal relationships, because if a person needs help to maintain his livelihood, it can mean that he does not have enough means to do that himself. On the other hand, providing help for others also says something about the relative wealth status of a respondent, because that means he has enough means to maintain more than one livelihood. 67.7% would be able to rely on their informal relationships (friends and family), whereas 4.8% was relying on them at the moment of the interview. Another 4.8% is providing for informal relationships and 22.6% cannot rely on any informal relationships.

With regards to formal relationships, such as committees, church, farmers groups, women groups and other groups, only 4.9% is relying on them. The majority (75.4%) says they cannot rely on formal relationships, whereas 19.7% thinks they would be able to rely on formal relationships if necessary.

Figure 14 shows the division of the respondent population into the different wealth categories that were explained in paragraph 3.4.2:

1. "Those who can manage", a euphemism for the relatively wealthy who can look after their own interests without help from anybody.
2. "Those who have something", have some small assets such as animals, equipment and an opportunity of developing
3. "Those who earn slowly", i.e. have no real capital assets but struggle on a daily basis to make ends meet
4. "Those who cannot manage", the obverse of the first group who are destitute and therefore require external support to survive

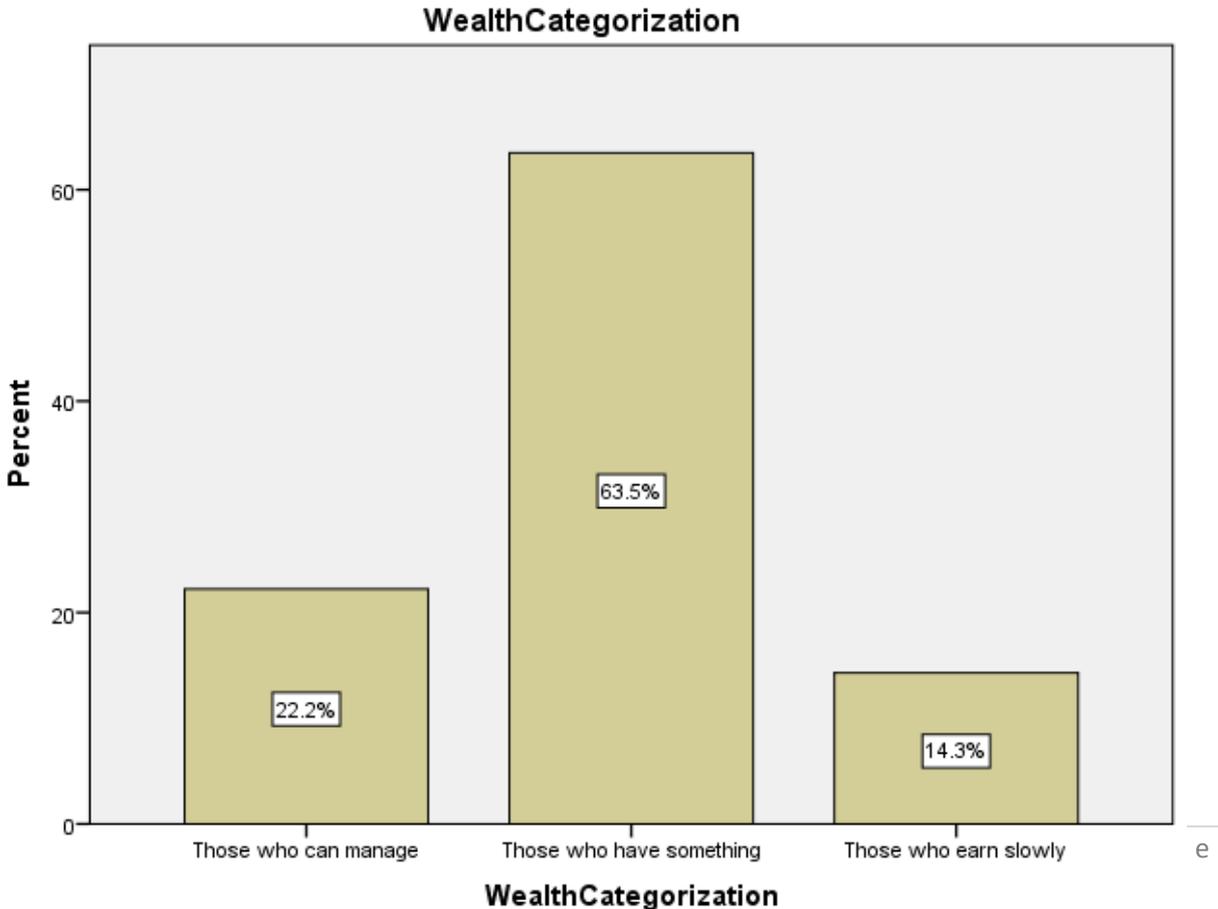


Figure 14: Wealth categorization of the respondent population

Through interpretation of the interviews and observations in the field, the respondents were divided into one of the wealth categories using the indicators as explained in paragraph 3.4.2. An important factor in this division was the comparison of the respondents with each other. As mentioned before, the method of wealth categorization was used in order to make statements about the relative wealth in the communities. Often, indicators from different categories could be applied to a respondent. The main causes for this seemed to be the priorities of people. For instance, they might be living in a well-built stone house and have all kind of gadgets, but still claim not to be able to send their children to secondary school. Another a respondent was wearing all kind of jewellery but still claimed to struggle to provide food security. Next to priorities, this also says something about the spending pattern of the respondents, in which saving seems to be of less importance. One respondent confirmed this himself: *“Most of us, we don't handle our money well, we don't take good records. So we need a basic education, because when you give me 10 million now old GHC, probably I am just praying for your departure, after that I am going for two bottles of beer”*².

Another critical note has to be made with regards to the indicator of farming land as an asset. People who are combining farming with other activities have less time and are thus more likely to farm on less land, which does not necessarily means they belong in a lower wealth category than another respondent who farms on more land, but does nothing in combination.

Figure 14 shows that not one of the 63 respondents were divided into category 4 ‘those who cannot manage’. Each respondent was surviving without external support by organisations or government for example. This does not mean that there is no poverty in the communities. Yet, all respondents had food security at the moments of the interview, even though some were struggling for this, and it does not say anything about the quality of their diet.

Also, 14.3% of the respondents were divided into the category 3 ‘those who earn slowly’, they mostly lived in houses of which renovation was necessary and often had trouble with providing money for secondary education.

The majority (63.5%) was divided into category 2 ‘those who have something’, these respondents had mostly well built houses, often owned a phone, and were able to provide money for up until secondary education. They too were wearing jewellery and good clothes.

Furthermore, 22.2% of the respondents was divided into category 1 ‘those who can manage’, these respondents lived in the best houses compared to the rest of the respondents, as they owned several gadgets like a smartphone, television and were able to provide money for higher education and often had a steady income.

4.1.4 Education

In 1987 the education system of Ghana was reformed (UNESCO-IBE, 2006). Middle school was used in the old system of education; Six years of education where the highest level was middle school form four. Anyone who completed this level received a certificate referred to as ‘Middle School Leaving Certificate’ (M. Agba, personal communication, April 14, 2015). Today this is replaced by primary education, which lasts for six years (UNESCO-IBE, 2006).

In the old system, this was followed by five years of education known as the Ordinary Level

² Due to the large amount of respondents, no pseudonym names were given to the respondents for the quotes. All quotes in *italics* in this thesis without a reference in brackets, are from one of the 63 respondents, in order to safeguard the anonymity of the interviewees, only characteristics will be mentioned.

and eventually the Advanced Level (two more years) (M. Agba, personal communication, April 14, 2015). Today this is replaced by secondary education that exists of three years of Junior High School, after which the nine years of basic compulsory education is completed and students have to pass the 'Basic Education Certificate Examination'. This was followed by another three years of Senior High School leading to the 'Senior Secondary School Certificate Examination' administered by the West African Examinations Council. After Junior High, a student can also proceed to technical or vocational education as part of their secondary education (UNESCO-IBE, 2006).

After finishing their secondary education, at the age of 19, a year of compulsory National Service follows (UNESCO-IBE, 2006). At last, "tertiary education consists of four years of university education, or three to four years of training at polytechnics, teacher training colleges or other training institutions" (UNESCO-IBE, 2006, p. 7).

When looking at past school attendance for the Volta Region, for 22.9% of the school going population the highest level attained is primary school. Junior High School and Middle school are represented by respectively 26.9% and 28.3%, together more than half of final level of education reached among the respondents. Senior High School, Secondary School, Vocational and Technical training and Post-middle school together stood at 17.3%, whereas a total of 4.6% only has completed tertiary education such as polytechnic or university (Ghana Statistical Service, 2013).

The elderly respondents of the population followed the old system of education. To be able to make comparisons among the whole respondent population, their highest levels of education have been converted into the new system based upon the number of years they had completed. Respondents that are still in school, are classified based on the previous year. Table 13 shows that for the respondent population, for the majority the highest level of education completed is Junior High School, as 27% stopped after that and another 27% continued to Senior High School but did not complete, making a total of 54%. The census report did not mention any non-educated people, a category that is represented in the respondent population by only two respondents, of which both were women. Thereby the only people that were higher educated people being men with 4.8%.

Highest level of education	Male	Female	Total
No education	0 0%	2 3.2%	2 3.2%
Did not finish primary	2 3.2%	3 4.8%	5 7.9%
Did not finish Junior High	2 3.2%	4 6.3%	6 9.5%
Finished Junior High	6 9.5%	11 17.5%	17 27%
Did not finish Senior High	10 15.9%	7 11.1%	17 27%
Finished Senior High	5 7.9%	1 1.6%	6 9.5%
Technical School	5 7.9%	2 3.2%	7 11.1%
Higher education (University, Polytechnic etc.)	3 4.8%	0 0%	3 4.8%
Total	33 52.4%	30 47.6%	63 100%

Table 13: Highest level of education of respondent population

4.1.5 Local government

According to various reports and articles, it is pointed out that government agencies in Ghana often do not have adequate capacity to enforce legislation concerning illegal use of natural resources nor to create an enabling environment for sustainable development (Asscher, 1999; Atta-Mills et al., 2004; Yelibora, 2014). Ghana has a multi-party constitutional democracy and is committed to transfer functions, powers and authority from central government to local government. Meaning that necessary measures are undertaken by the parliament to co-ordinate, manage and execute policies in respect of all matters affecting the people within their areas, with a view to ultimately achieving localization of those activities, which is further articulated in the local government legislation (Goel, 2010). The local government is represented by District Assemblies of the belonging districts. At the moment there are 216 Districts in Ghana, but as the population grows, districts are readjusted (ghanadistricts.com, 2014).

Research in the Weto Mountain Range on the role of the local government, has shown that in the communities, leadership is vested in traditional leaders and central government local governance representatives. However, it was also said that the current government system does not see natural resources governance as a duty, but considers families and individual land owning entities as those who must ensure the safety of resources. Community members mentioned that traditional rulers needed to have greater stake in natural resources management (DI, 2013). According to the mission of the Ghanaian Ministry of Lands and Natural Resources this should already be the case: *“To ensure the sustainable management and utilization of Ghana’s lands, forests, wildlife and mineral resources for socio-economic growth and development”* (ghana.gov.gh, 2014).

The variables shown in table 14 were developed to determine other influences in decision-making processes. As can be seen only a minority (8.5%) feels he or she was ever withheld by the government, but a majority (89.8%) does not feel supported. Concerning the police and fire service the opinions are evenly distributed. However, when looking at the different communities, there is one community that specifically contributes to the number of respondents that answered this question in the negative and that village lies high on a mountain. However, another village that lies high on a mountain had a majority of respondents answering yes. This points at difference in quality of the different police stations. Communities that did not have their own police station mentioned that the police are often too late, or that they have to pay for a car to come and get them. The fire service, no community has its own station, but in some villages the local fire volunteers were seen as sufficient. Also, some respondents claimed that there had not been any fires in years.

	Yes	No	Total of respondents
Ever withheld by law or restrictions from the government	8.5 %	91.5%	59
Feels supported by the government	10.2%	89.8%	59
Thinks the police service in his/her village is sufficient	53.2%	46.8%	62
Thinks the fire service in his/her village is sufficient	52.5%	47.5%	61

Table 14: Opinion on government, police and fire service

4.1.6 Access to services

Healthcare

The report notes that many of the Ghana Health Service health centres were community initiated. In 2010, the Volta Region had 326 health centres, but unfortunately inadequate numbers of health care professionals, especially doctors and nurses (Ghana Statistical Service, 2013). Out of the respondent population of 63, only one respondent does not have access to decent healthcare, because of the lack of money for transport to the hospital. Due to the free National Health Insurance, the other respondents have at least access to consultation, and for most of the medicines and transport they have to pay themselves. For 77.8% of the respondents, all household members have health insurance, whereas 15.9% indicated that only some of the household members were insured. Only three respondents indicated that none of the household members had a health insurance.

Sanitation

The census report states that there are two main sanitation facilities available in the Volta region, being public toilets (30%) and a pit latrine in the house (18.7%), the remainder of the population uses the bush or the beach (Ghana Statistical Service, 2013). Experience has shown that these public toilets mostly consist of self made latrine pits in the rural areas. For the respondent population, the majority makes use of a public latrine (61%), whereas 23.7% has a private latrine for household use only and 11.9% claims to have a toilet inside the house, only 3.4% uses the bush.

Water

In 2010, 71.3% of the communities obtained their drinking water from boreholes, meaning that only a small proportion of the communities had access to piped water (Ghana Statistical Service, 2013). It should be realized that within communities people that have access to these boreholes can differ because of their financial status. The major part of the respondent population combined different water sources depending on budget and functioning of the source (see tables 15 and 16 and photo 7). 41 respondents made use of piped water in the community, whereas seven had piped water in their house. There were two respondents who owned a polyester tank and rainwater harvesting was a major source of water next to any other source of water used. Six respondents depended on a stream and rainwater harvesting for water. All of the water sources are used for drinking water, in combination with the purchase of water sachets depending on budget and availability.

Watersource	Count	Used by percentage of respondents
Stream	18	28.6%
Well in community	8	12.7%
Own well	3	4.8%
Pipe in the community	41	65.1%
Pipe in the house	7	11.1%
Rainwater harvesting	48	76.2%
Polytank	2	3.2%

Table 15: Different water sources used by respondents



Photo 6: Water sources in the villages: pipe (top), polytanks (left bottom) and well (right bottom)

Combination of water sources	Count	Used by percentage of respondents
Pipe in the community	7	11.1%
Well in the community	2	3.2%
Pipe in the community and rainwater harvesting	22	34.9%
Well in the community and rainwater harvesting	4	6.3%
Polytank and pipe in the community	1	1.6%
Stream and rainwater harvesting	6	9.5%
Pipe in the community, rainwater harvesting and stream	11	17.5%
Own pipe, pipe in the community and rainwater harvesting	1	1.6%
Own well and pipe in the community	1	1.6%
Pipe and well in the community and rainwater harvesting	1	1.6%
Own pipe and rainwater harvesting	4	6.3%
Own pipe	2	3.2%
Own well and rainwater harvesting	1	1.6%
Total	63	100%

Table 16: Combination of water sources by the respondents

Energy source

According to the census of 2010, the main sources for lighting in the Volta Region were electricity (49.6%) and kerosene lamps (40.4%). For cooking, wood was the main source (57.1%), followed by charcoal (29.6%) and gas (9.3%) (Ghana Statistical Service, 2013). Each village of the socio-economic inventory had electricity (see photo 8). Some respondents described about projects undertaken by the government where electricity cables were drawn to the village and the inhabitants themselves had to take care of the poles and connection to the houses. In line



Photo 8: Electricity a village in the Weto Mountain Range

with the results of the census, electricity was not used for cooking, mostly for light and charging phones. Table 17 shows the use of energy sources by the respondent population. Firewood and electricity are both used by 87% of the inhabitants, and often in combination. The eight respondents that do not have electricity used either torches or lantern for lighting and some respondents also used both during power cuts. Gas is only used by 16% of the respondent population and often in combination with other sources for cooking. The same accounts for charcoal that is used by 52% of the respondents.

Energy source	Count	Used by percentage of respondents
Firewood	55	87%
Gas	10	16%
Charcoal	33	52%
Electricity	55	87%
Lantern	8	13%
Torch	4	6%

Table 17: Energy sources used by respondents

4.1.7 Land ownership

In Ghana, land rights and ownership have complex arrangements. This is caused by a co-existence of different tenure systems such as customary law, statutory law, constitutional provisions, judicial decisions and religious law (Hilhorst & Porchet, 2012). With regards to religious law for example, people believe that their forefathers are the rightful owners of the land in their community and therefore the chief holds them in custom and property is based on family heritage. In the Weto Mountain Range, land ownership is predominantly clan based. Not every clan member has equal access to land which also makes land tenure a real issue. Some people farm based on lease, others on crop sharing agreements, but their legal protection is minimal. The plurality of tenure systems has major impacts on the access of the rural poor to natural resources and their vulnerability to major threats (Sarpong, 2006). In the Volta Regions census report it is stated that in 2010, 59 % of the housing units in the region were owner occupied. The more urbanized districts had a higher rental unit tenure, whereas the more rural districts had more rent-free tenures (Ghana Statistical Service, 2013).

It is important to examine how the local inhabitants themselves define the ownership of their land and whether this is the same among the various villages. As the respondent population is located in rural areas and are majorly engaged in agriculture, the farming respondents were asked about the ownership of all their land, so not only the part their house is located on. In table 18 it shows that out of the 37 respondents who answered the question, 34 farm on land that is family property. Two respondents hire a piece of land and one respondent borrows it from someone.

Land ownership	Count	Percentage
Family land	34	91.9%
Tenured land	2	5.4%
Borrowed land	1	2.7%
Total	37	100%

Table 18: Different sorts of land ownership among respondents

4.2 TRADITIONS

Traditional heritage is strong in the communities of the Weto Mountain Range. The majority is Ewe, an ethnic group that is said to originate from Togo and Benin. The traditional authority exists out of several functions, with the Chief as a political head (see photo 9). The Elders also play a major role. The 'Zikpuitɔ' (stool father) is the 'Chief' elder on whose shoulder much responsibility rests. He has the final say in the decision regarding the 'enstoolment' and 'distoolment' of a Chief. There is also the 'Fiato', which literally means father of the Chief and there are other elders who function as the Chief's advisers. In addition there is the Queen mother, who is the head of all women of a village and the Youth Chief who represents the local youth in decision making. Another important function is that of the Linguist. The Chief's Linguist represents the Chief and all communication should be directed at him instead of at the Chief directly. In addition, there is a Linguist for each other function mentioned above, so the Queen mother, Elders and the Youth Chief have their own Linguist representing them. In some villages, there is the 'Mankrado', a function that actually originates from the Akan culture (other major ethnic group in Ghana) and mainly performs purification rituals.



Photo 9: Chief and his entourage

The Chief is selected by the Elders or 'kinmakers', based on the family he was born in, his intelligence and his behaviour. *"We have a chief who is not selected by a single person, we have kinmakers who meet and discuss or request from the specific family who should hold that post to nominate candidates to us. This is done by the kinmakers secretly and disclosed, and eventually we strategize and catch you unaware"*

There are royal families or clans within the communities, who supply people for the traditional functions. When a Chief and Queen Mother have to be 'enstooled', they literally are captured and confined in a room for a period ranging from 6 to 8 days. During that period the council of elders is teaching them about their function. After this period they have their 'outdooing', a ceremony in which they are officially 'enstooled'.

There is also traditional religion that is interwoven with the ceremonies of the traditional authority. *"They have the fetish priest who is also more like their pastor, so for the traditional religion they also have a leader, who calls the gods, speaks with the gods and them, so he is more of a liaison between the ancestors and the people"*

Communities have different traditions and festivals that are important to them. A popular festival is the Yam festival (see photo 10), when the harvest is celebrated. *"During this period, they call it eating yam. They will come with small yams and then they will make some rituals. After the rituals they will cook some yam and they can eat it among themselves or they will invite people from different places to join them to eat and then they make merry and have fun"* Festivals are also used by communities to raise funds for community development. *"R: First we have got youth day and secondly we used to celebrate Easter that also generates funds for the community's development. I: And how does it generate funds, does everyone pay some money? R: Yes, we pay some money. Then when we collect all money paid by our peoples than we get some"*.



Photo 70: Yam festival in Ho in the Weto Mountain Range

Stories about traditions also show an impact on land and resource use. This can also help to explain changes, as traditional religion has lost a great deal of influence to Christianity. *“Apart from that, on our market days, traditions maintain that no one should go to farm” “In the olden days our grandfathers, all of them had their lands. So you can't go and farm on another person's land. So if the land that your grandfather was having is very limited, we have to farm according to that so you can't move to another person's land” “R: Our rivers, our great grandfathers, they made most of our rivers fetishes. Rivers are covered by forests, so they made it plain that it is a fetish place that you would not go and fell a tree there. You will not farm on the river side, simply because they know, if you do it, the river will become dry. I: And they still obey to that today? No, simply because of Christianity and the Christians don't believe in these fetishes and they will say this forest is a virgin forest; we have to farm it and feed the children. And unfortunately all our rivers are dry. At the moment we only have seasonal rivers”* Mr. Ken Kinney, director of DI describes it as ‘Pandora’s box’ being opened. From old traditions forests were not cleared because they were sacred, but once people started clearing the forest and found out that they did not die from it, things went out of control.

4.3 CLIMATE CHANGE

In this thesis, Climate Change is defined according to the Intergovernmental Panel on Climate Change:

“Climate change refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity” (IPCC, 2007, p. 87)

Clear data for either the whole Volta Region or the whole Weto Mountain Range over an extended period, is hard to find. Several studies exist, but they all contain different demarcated parts of the region and look at different time periods. Studies that do focus on the whole Volta region are not over an extended period and only focus on the past decade and predictions for the future. That is why in this chapter data from studies on different demarcated areas and different time periods are compared and used to make statements about the climate in the Volta Region.

The Volta Region has a semiarid to subhumid tropical climate with a moderate temperature ranging from 21°C -32 °C for most of the year (Jung & Kunstmann, 2007; Nyatuame et al., 2014). In the ‘Climate Change 2014’ report, IPPC states that over West Africa, surface temperatures have increased over the past 50 years. The number of warm days and warm nights have increased at the cost of cold days and cold nights between 1961 and 2000 (IPCC, 2014). A linear trend analysis of the whole Volta basin (which occupies 6 West-African states, mostly Ghana and Burkina Faso) shows that over the last decades, there has been a clear trend of an increase of temperature in the basin (data up to the year 2000) (Neumann et al., 2007). In a report on adaptation to the changing climate and environment in Ghana, Kinney et al. (2012) claim that the mean annual temperature has increased by 1°C for the period 1961-2000 in Ghana. All three state an increase in temperature up to the year 2000, but all make statements about a larger area than just the Volta Region. Unfortunately, no data on temperature past the year 2000 was accessible for this research.

Regional climate modelling for the Volta Region concludes that the positive trend will most likely continue as “*simulated temperature change shows a clear signal of increase in future simulations*” (Jung & Kunstmann, 2007, p. 15). When looking at IPCC mean annual temperature projections for the mid 21st century (2046-2065) and late 21st century (2081-2100) for Africa, it shows that in only one of the two prediction models, temperature is predicted to rise (see figure 15).

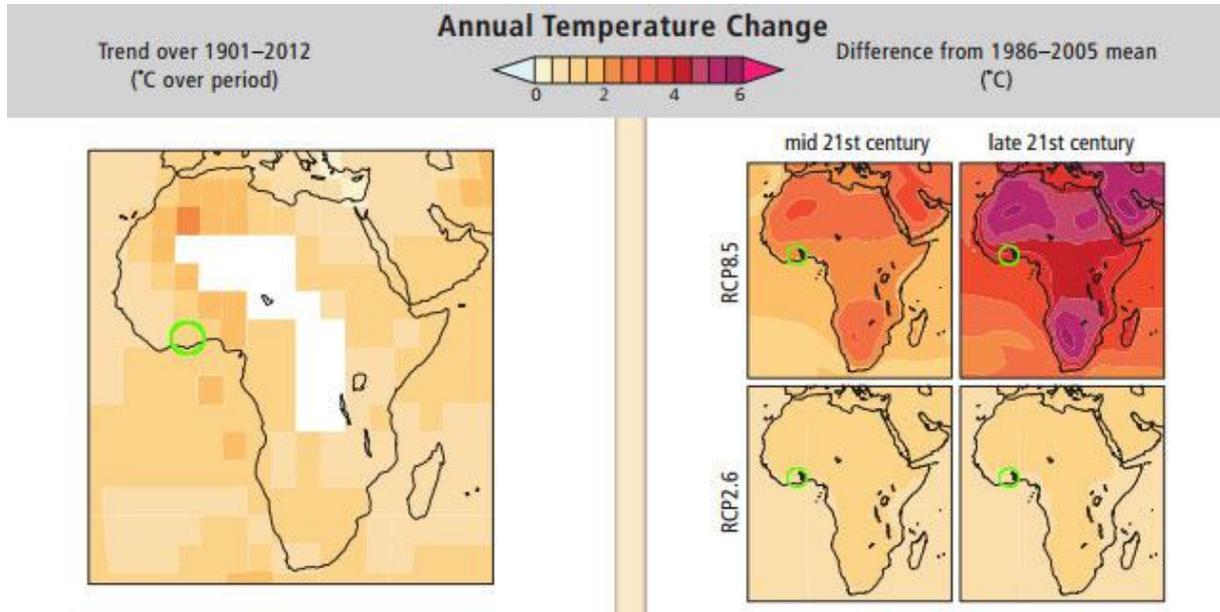


Figure 15: Annual temperature change in Africa (IPPC, 2014, p. 1207)

The rainfall regime of the Volta region has a high interannual as well as interdecadal variability (Jung & Kunstmann, 2007). The Worldbank climate variability tool, looking at the seasonal average from January to December, shows a slight decrease in rainfall over the years for Kete-Crachi, located in the north of the Volta Region, but goes only up to the year 2000 (figure 16; IRI, 2015).

Jan-Dec Seasonal Average Station Precipitation Values, Decadal Variability & Linear Trend from 1901-2000

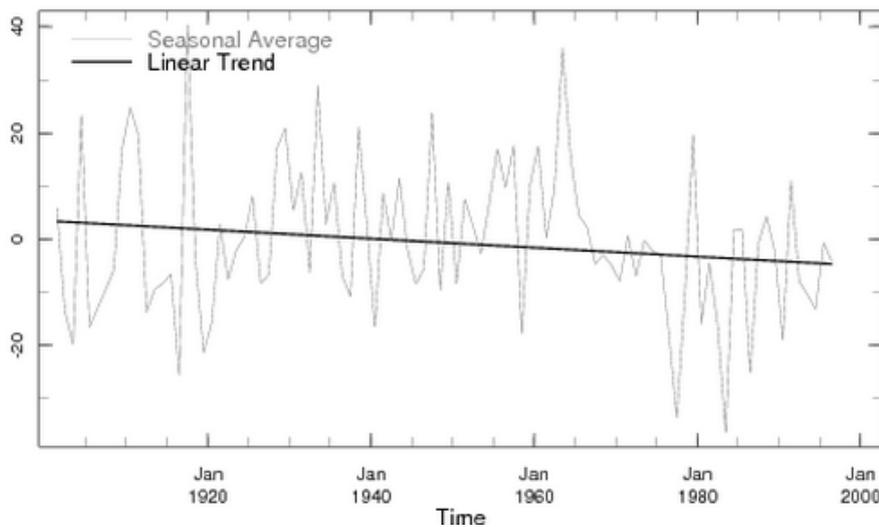


Figure 16: Seasonal Average Precipitation Values, Decadal Variability & Linear Trend from 1901-2000 Kete Crachi (IRI, 2015)

Figure 16 shows that the decadal variability has both increased and decreased over the decades in Kete-Crachi. The last decade on the graph shows again a reducing variability. The linear trend is negative for the period 1920-2000 (IRI, 2015). In addition, Owusu & Waylen (2009) compare the mean annual rainfall of the period of 1951-1970 with 1981-2000 for West Africa. Figure 17 shows that in the East of Ghana where the Volta Region is located, in the upper part the mean stayed in between 1200-1400 mm, whereas in the middle part the mean changed from 1400-1600 mm to 1200-1400 mm. A small part at the coast changed from 1000-1200 mm to 800-1000 mm. This also points at a high precipitation variability within the Volta Region (Owusu & Waylen, 2009). As the Weto Mountain Range stretches from the South to the North of the Volta Region, it can be expected that within the range there is a high precipitation variability as well.

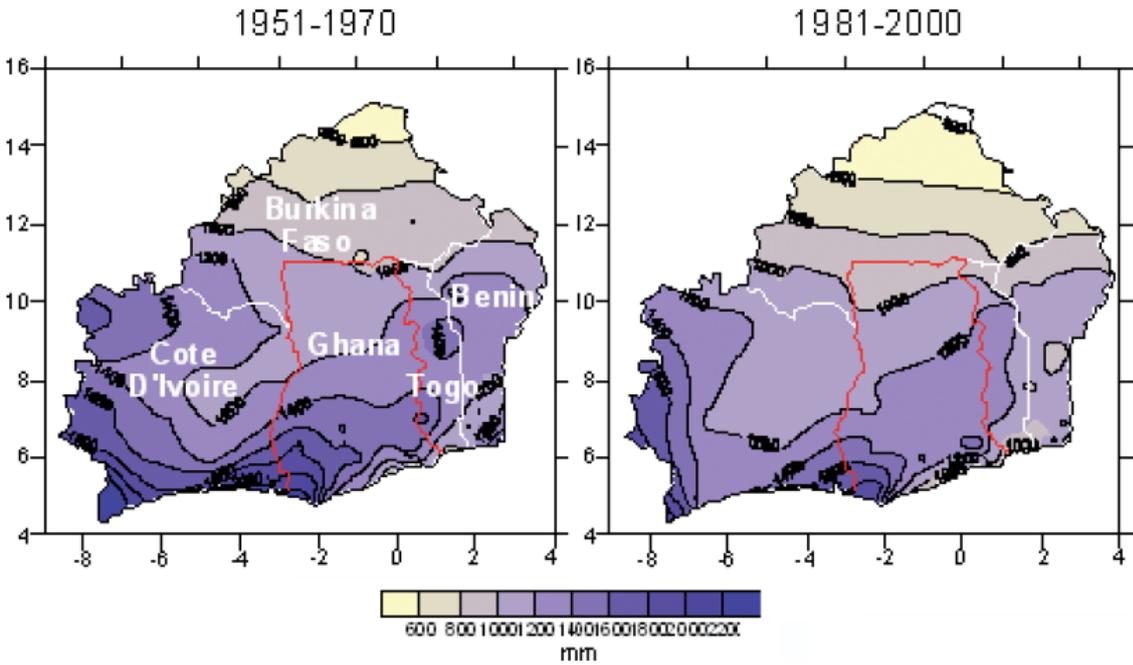


Figure 17: Regional mean annual rainfall in 1951-1970 (P1) and 1981-2000 (P2) In Central West Africa (Owusu & Waylen 2009, p. 118)

The former two studies, both not looking further than the year 2000, show a decreasing precipitation trend for the Volta Region. Two studies looking beyond the year 2000 on the other hand, both show a positive linear precipitation trend. Data by the Ministry of Food and Agriculture is in fact for the whole Volta Region, but only for the period of 2001-2009. Figure 18 shows an increasing trend line for the Volta Region (MOFA, 2009).

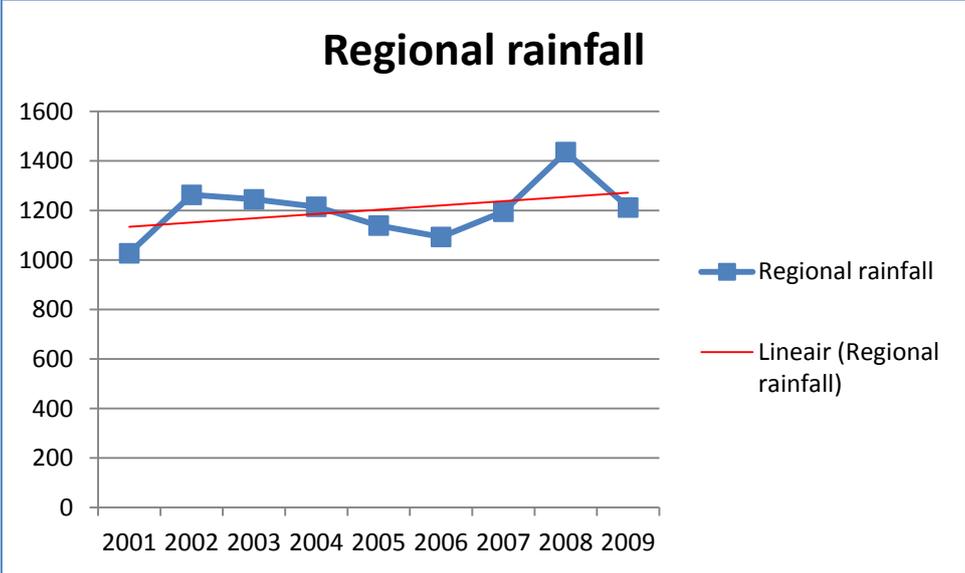


Figure 18: Regional rainfall for the Volta Region (MOFA, 2009, p. 7)

A statistical analysis of rainfall trend for the Volta region for the period 1981-2011 agrees with the intra-regional precipitation variability shown by Owusu & Waylen (2009) in figure 17. For the study the Volta Region was divided into a coastal zone, middle zone and northern zone. Among the three zones, significant differences were observed (see figure 19). The coastal zone clearly shows a much lower annual precipitation than the other zones, and the northern zone shows the highest annual precipitation. All three show a linear positive precipitation trend for 1981-2011 (Nyatuame et al., 2014).

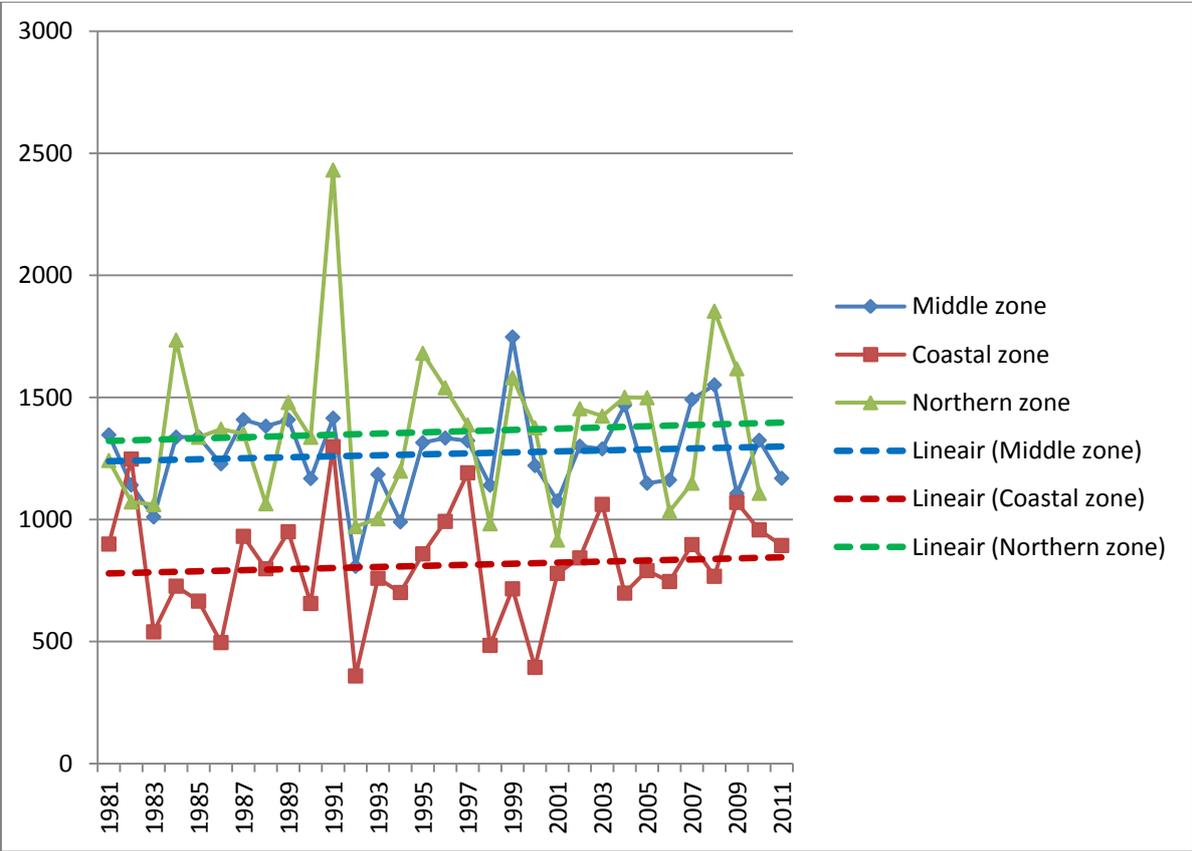


Figure 19: Annual rainfall 1981-2011 for the coastal, middle and northern zone of the Volta Region (Nyatuame et al, 2014, p. 4)

The study by Nyatuame et al. (2014) is the one of the two found studies that look at both a period before and after the year 2000. In order to examine whether this study also shows a negative precipitation trend until the year 2000 like figure 16 and 17, the graph in figure 20 shows the data of Nyatuame et al. (2014) to the year 2000. Unfortunately the data does not go as far back as those for figure 16 and 17.

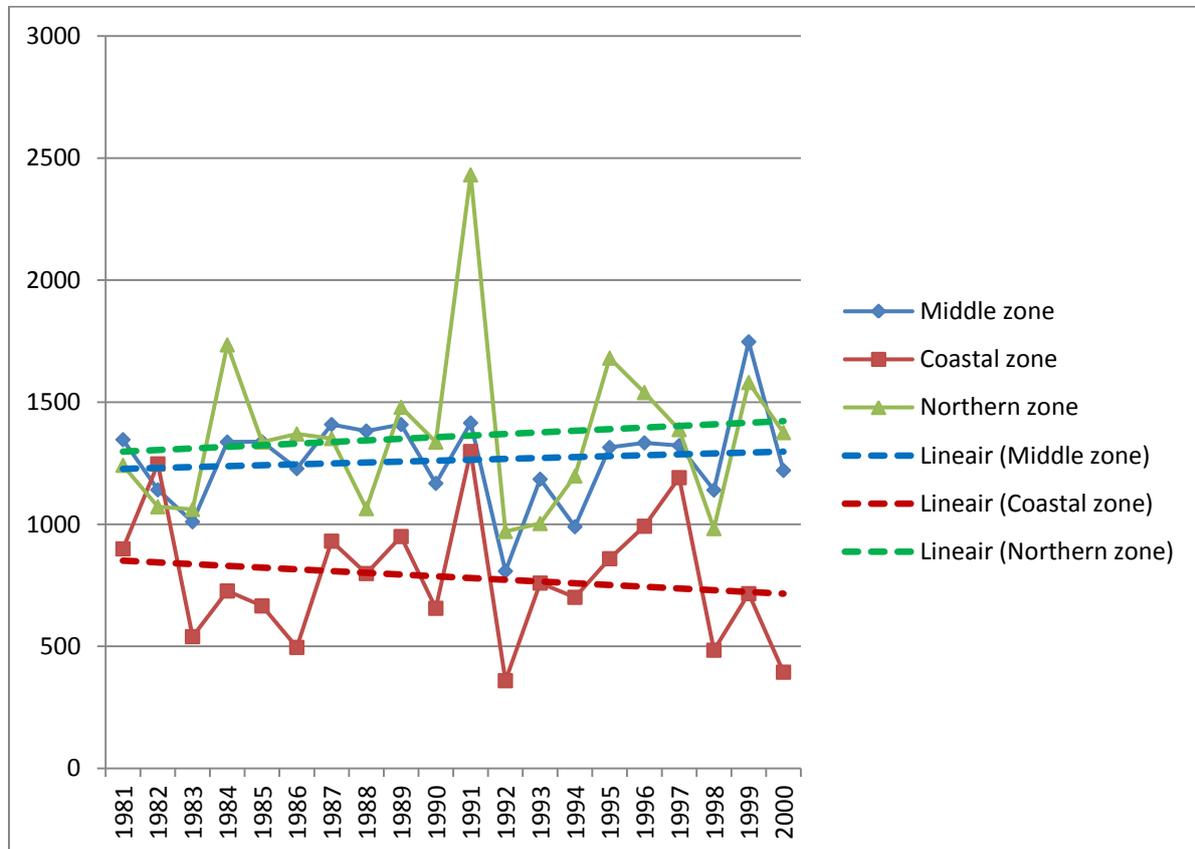


Figure 20: Annual rainfall 1981-2000 for the coastal, middle and northern zone of the Volta region (Nyatuame et al., 2014, p. 4)

It shows that only for the coastal zone a negative rainfall trend can be concluded for the period 1981-2000. This again emphasizes the intra-regional precipitation variability. It must be emphasized that this is a rather short period to look at climate change and does not go as far back as figure 20 and 21.

The different studies with different outcomes show that locally within the Volta region, precipitation trends can vary greatly. Unfortunately studies for the same places for the same periods are hard to find. The only conclusion that can be drawn with certainty is Kunstmann & Jung’s earlier mentioned statement about the rainfall regime having a high interannual as well as interdecadal variability (Jung & Kunstmann, 2007). A high intra-regional variability can be added to that (Owusu & Waylen, 2009; Nyatuame et al., 2014). For larger demarcated areas, such as the Volta basin, research has shown that rainfall has decreased over the decades.

The Volta Region has two rainfall regimes in the year, one from March to June and one from mid-August to October. Rainfall figures are the highest in the forest zone and the central highland areas of the Volta region (Nyatuame et al., 2014). The strongest negative precipitation trend in the linear trend analysis of the whole Volta basin was found in the early rainy season (Neumann et al., 2007). This is predicted to continue, as *“a delay in the onset of the rainy season as well as an increasing interannual precipitation variability in the early stage of the rainy season were detected in the simulation of the future climate”* (Jung & Kunstmann, 2007, p. 15). This creates a more concentrated rainy season, making it more intense. These predictions were made in 2007, now 8 years later, they seem to be being validated by a majority of the respondents giving accounts of the shifting of the rainy season, causing them to change their sowing patterns.

An extensive range of prediction models exists for future climate simulations. The regional climate simulations by Jung & Kunstmann (2007), predict a mean annual change in precipitation from -150 mm to +200 mm. IPCC discusses several prediction models, stating for West Africa that a majority of the models also indicate a wetter core rainfall season with a small delay to rainy season by the end of the 21st century (IPCC, 2014). Nevertheless the models show a high variation with regards to the amplitude and direction of the future precipitation changes: *“There is low to medium confidence in projected changes of heavy precipitation by the end of the 21st century”* (IPCC, 2014, p. 1211). Like Jung & Kunstmann, IPCC predicts a small increase in rainfall, but based on highly varying models (IPCC, 2014). On the other hand, Kinney et al. (2012) state a projected decrease in rainfall, but this is only for the Dayi basin that is located in the middle of the Volta region (Kinney et al., 2012). With regards to future climate projections on precipitation, there is a high level of uncertainty. Two sources project an increase in rainfall for the Volta Region and West-Africa, and another projects a decrease for only part of the Volta region. A prediction that has been made with more certainty, is about the shifting and shortening rainy season, that at the same time will become more intense (Jung & Kunstmann, 2007; IPCC, 2014).

Next to a shifting rainy season, other important remarks were made by respondents about the past three years. Part of them claimed that rainfall had decreased over the past, but it had started to rain more days again since the last years. The studies above do not show any data after 2011. Unfortunately, data on precipitation for the years 2011-2014 was not accessible for this research. Hypothetically, these perceptions could agree with projected precipitation increase by part of the prediction models. However, it was only part of the respondents that had seen these changes. The differences in perception will be further elaborated in chapter 5.

From the different studies and data, it can be stated that the Volta Region has seen an increase in temperature at least until the year 2000 and following the temperature projections and stories by respondents, presumably until today. It is expected that the temperature will continue to rise in the future. With regards to rainfall, the only conclusion that can be drawn with certainty, is that the precipitation regime has a high interannual, high interdecadal and high intra-regional variability. For a precipitation trend for a period as long as 1920 to today, there are no sources available for this research. From 1920 and 1951 to 2000 a decrease in rainfall for the Volta region was found, while studies looking at more recent periods from 1981 and 2001 to 2011 and 2009 show a slight increase in rainfall. Studies about the whole Volta basin and the whole of West Africa, do show a decrease in rainfall for those areas (Neumann et al., 2007; Hulme et al., 2001). Prediction models for future precipitation trends, vary greatly in their projections. Several sources do predict with more certainty

a shifting, shortening and intensifying rainy season. It must be kept in mind that it is not solely climate change that puts stress on amongst others water availability in the near future. An increased water demand due to industrialization and an intensification of agricultural activities, both following population growth, will most likely be of greater importance (Jung & Kunstmann, 2007).

4.4 ENVIRONMENTAL DEGRADATION

In this thesis environmental degradation is defined according to the Organisation for Economic Cooperation and Development:

“Environmental degradation is the deterioration in environmental quality from ambient concentrations of pollutants and other activities and processes such as improper land use and natural disasters” (stats.oecd.org, 2015)

Considering its unique biodiversity and endangered status, the Weto Mountain Range is part of the Guinean Forest Global Diversity Hotspot. Unfortunately, the range is suffering from environmental stresses such as high levels of deforestation and associated loss of biodiversity, environmental degradation, uncontrolled soil erosion, loss of soil fertility, degradation of water sheds and pollution of water bodies. Due to overexploitation, natural resources get depleted to irreversible levels. (Beunders et al., 2014). Figure 21 shows the changes in land use and land cover between 1975 and 2000:

Ghana Land Use / Land Cover Change

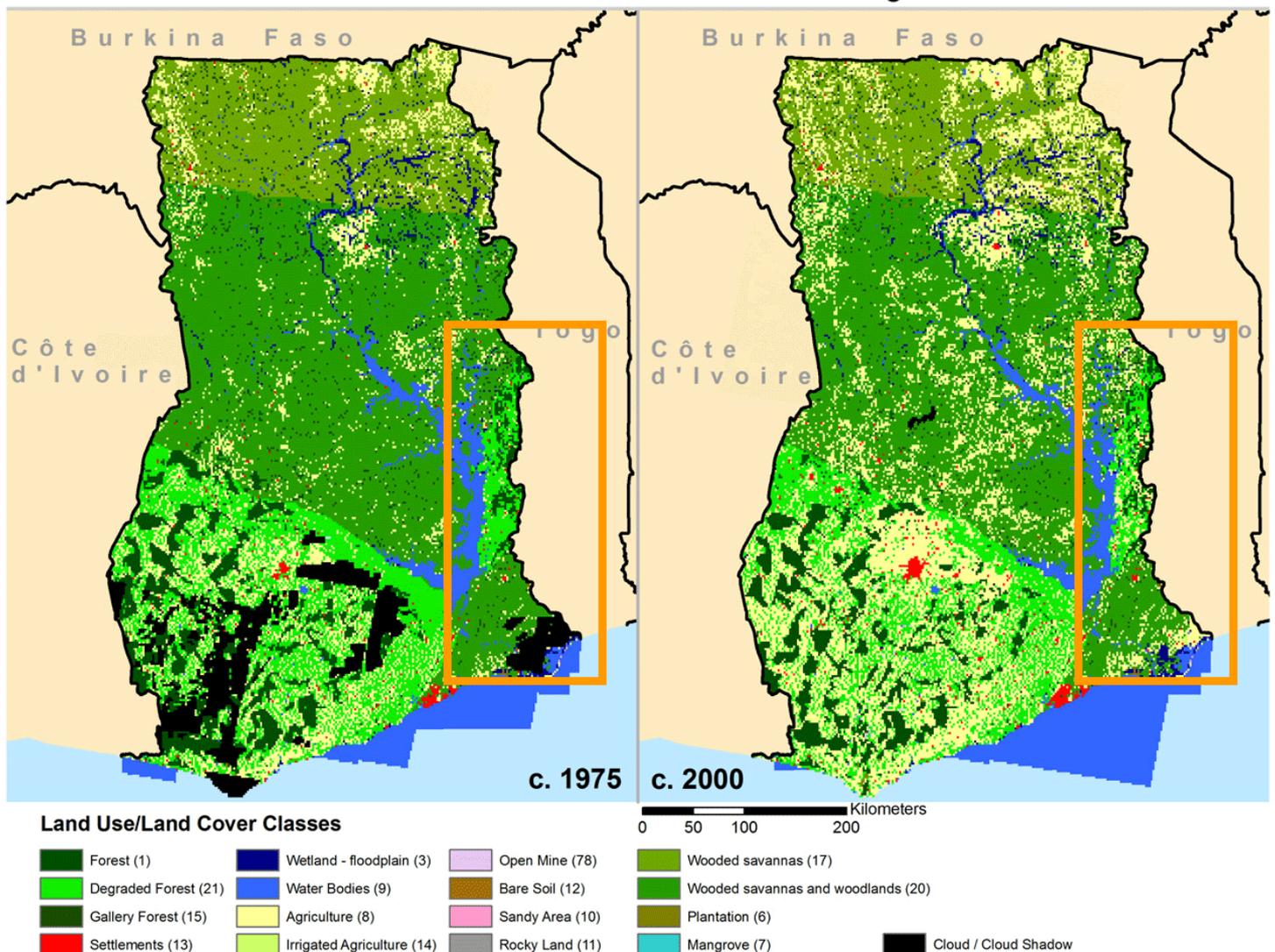


Figure 21: Ghana Land Use / Land Cover Change (lca.usgs.gov, 2015)

Most striking is the expansion of agricultural area, also in the Weto Mountain Range Area. Where in 1975 the range mostly exists out of forest and degraded forest, in 2000 it is fleckered with yellow dots representing agricultural land. Figure 22 shows that in 2009, agricultural lands (croplands) had expanded even more and that deciduous forest was predominant in few places. Not only deciduous forest has disappeared. Local timber species such as Odum, Mahogany and Afram have dwindled and medicinal plants such as Monodera and Zailopea have become less common (Beunders et al., 2014).

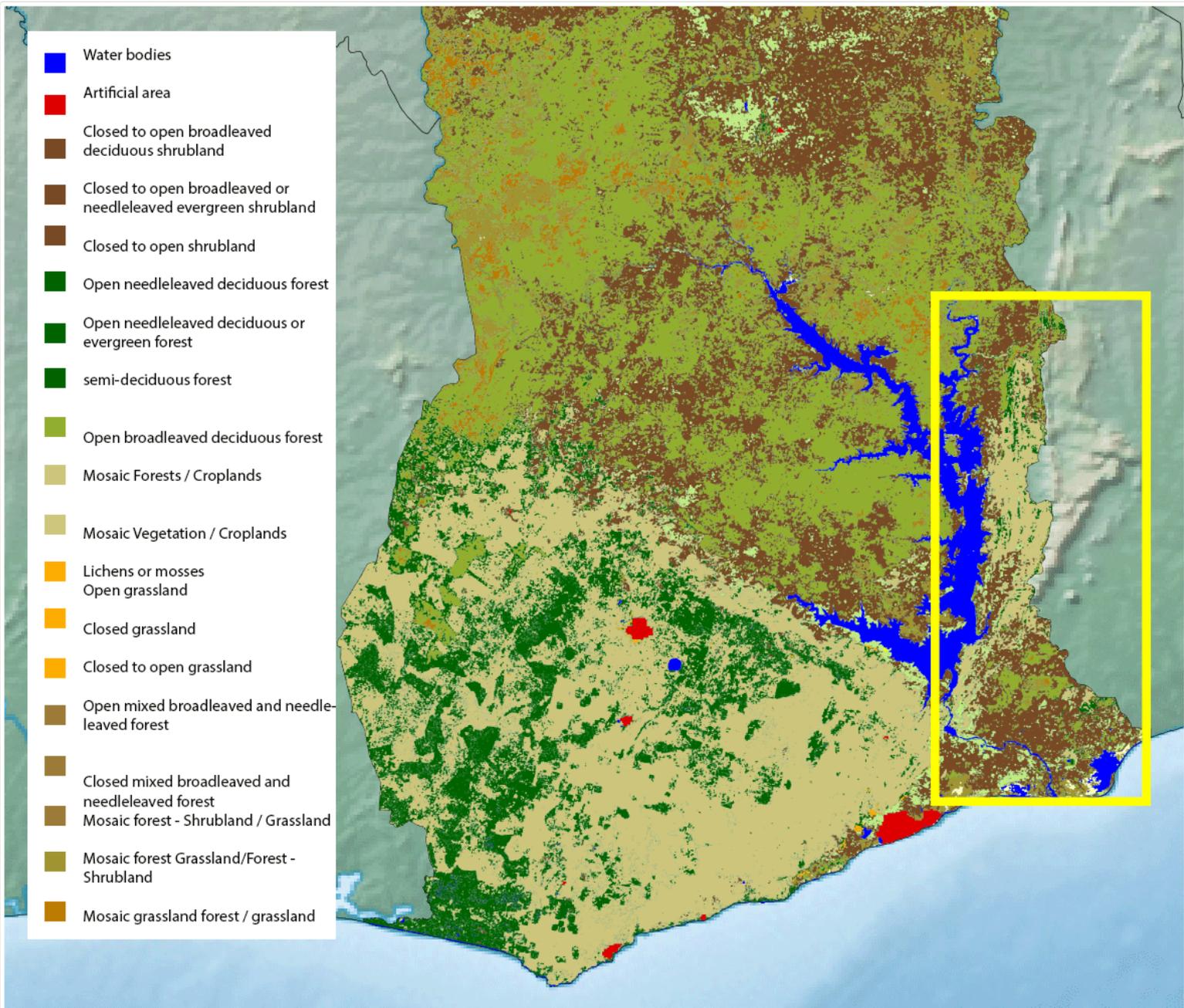


Figure 22 Landcover of Ghana Globcover Regional Map 2009 (fao.org/geonetwork, 2015)

Many respondents talked about how the streams used to be flowing all year long, but nowadays dry up in the dry season or have become smaller or disappeared as a whole. The loss of the mountain forest cover can be linked to the seasonal and perennial drying up of rivers and streams. It influences the microclimate which in turn plays a great role in evaporation of local water bodies (Beunders et al., 2014; Kinney et al., 2012). Other great influences are industrialization and an intensification of agricultural activities (Jung & Kunstmann, 2007). Next to the diminishing of local streams, the locals have seen a lot of animals disappearing from their surrounding forest. Biodiversity loss is happening at an alarming rate in the Weto Mountain Range. Animals such as monkeys, buffalos, antelopes, bush pigs and the Marshal eagle were in abundance until the 60s and 70s, but today they have virtually become extinct. The changing microclimate has made habitats for fauna such as small forest foliage frogs, birds, butterflies and insects rare (Beunders et al., 2014).

There are some practises that contribute a major share to environmental degradation in the area: The mining industry causes among others land degradation, deforestation and water pollution in the whole of Ghana (Hirons et al., 2014). For more than 1000 years, the extraction, processing and trading of mineral wealth has been an important part of rural economies in Ghana and throughout sub-Saharan Africa (Hirons, 2014). Another industry with an immense influence on land degradation, is sand winning. Sand winning in Ghana takes mostly place in coastal, river and savannah areas (the Weto mountain range contains all three). Sand winning is the gathering of parts of the solid earth such as sand and gravel and using it for the construction of roads and buildings (Peprah, 2013). Ms. Mabel Agba from the Development institute tells that in her work in the Weto Mountain Range, she has heard several stories about large companies contributing to environmental degradation in the area, and with negative consequences for the surrounding inhabitants: *“I remember that during our forest forums, dialogue with communities on issues of forest governance, two of the communities talked about it. Kpale mentioned that a construction company destroyed their farms with threes on their land during a construction activity. Ziavi also narrated a story of sand winning by a company in their area, which they said destroyed their land and forest cover. Unfortunately we don’t have evidence to show, but their stories mean that there are incidences”* (M. Agba, personal communication, June 25, 2015).

A practice in which both local inhabitants and larger scale actors are involved, are chainsaw operations. A ban makes tree felling illegal. Still illegally felled trees make up for a major part of the supply of lumber for the domestic market (Obiri & Damnyag, 2011). When a tree is planted privately, the felling is legal. But then one would need money and patience to grow trees for felling. Thereby a chainsaw has to be registered with the local government in order to be used legally, which comes with a registration fee. Enough reason to make illegal felling more attractive (M. Agba, personal communication, May 15, 2015). Locals see it as a preferable livelihood activity as compared to agriculture because of the higher income it provides. The lumber is sold at local markets and to carpenters, but also to larger furniture companies and even government projects (Obiri & Damnyag, 2011). *“Operators don’t work by order. They log and process into lumber at anytime and sometimes it depends, it’s likely they would have ready buyers like carpenters in the communities or they take the lumber to the local timber market for sale. In short, the buyers are everywhere!”* (M. Agba, personal communication, May 15, 2015).

The local community has its share of contribution in the degradation of the ecosystem through agricultural expansion (Antwi et al., 2014) overexploitation, deforestation and poor agricultural and hunting practises, contributing to the irreversible depletion of natural resources in the area. An observed growing indiscriminate use of chemicals pollutes the soil (see photo 11) (Beunders et al., 2014). In Ghana, several studies on pesticide residues in food have been done. In part of the food samples, residues from banned or restricted chemical pesticides have been found (NPAS, 2012). Next to the health risks, which have been the motive for most of these studies, an incorrect or indiscriminate use can have consequences for the ecosystem (Ntow, 2001; Ntiamoah & Afrane, 2008). Part of the soil flora and fauna can be destroyed due to physical and chemical deterioration caused by pesticides (Ntiamoah & Afrane, 2008). Also, pesticides that are meant for particular crops such as cacaoa or coffee for instance, are used on vegetables as well due to indiscriminate use, while vegetables take up the residue (Ntow, 2001).



Photo 11: Chemical use in a farm in the Weto Mountain Range

Even though specific chemicals such as DDT are banned from importation, sale, and use in Ghana, there is evidence of their presence and continued usage. (Ntow, 2001). There have been cases of chemicals that have been smuggled across the Togolese border (N. Beunders, personal communication, 16th of March, 2014). This can both mean that dangerous chemicals are used, but also that due to illegal prices they are easier to afford for farmers. From the in-depth interviews it became clear that not everyone could afford chemicals, a lack of budget was often given as a reason for the non use of chemicals. 41.3 % of the farming respondents (36) uses chemicals. Table 19 shows that weedicide is the most used chemical with 84%, followed by pesticide with 36%. Fertilizer is only used by 16% of the farming respondents. Often weedicide is used in combination with either fertilizer or pesticide.

Chemicals	Count	Percentage
Pesticide	9	36%
Weedicide	21	84%
Fertilizer	4	16%

Table 19: Chemical use by 36 farming respondents

An event in history that has had a major impact on degradation in the Weto Mountain Range as well, are the bushfires of 1983. Before 1983, cacao was a major product in the area. The bushfires in the whole of Ghana, caused by periods of immense drought, have caused a lot of deforestation. After the bushfires there was a lack of continuous adequate support to farmers for re-planning their farms to recover from the droughts and the fires (Beunders et al., 2014). Cacao needs at least three years after planting before it can be used for harvesting. After 1983 a lot of people moved away from cacao to cassava and maize production says Mr. Amaglo from the Forestry Commission : *“T:You know cacao was really promoted by the government. I: Back then, already? T: yes, so if you moved along the range you would have offices from the government where they would buy cacao (photo 12). So in those days that was giving the input for the cacao to be planted. After the fires, that was a very difficult period for Ghana, so the government was unable to promote the cacao farming. So people moved away from it”* (T. Amaglo, personal communication, December 19, 2014). The cacao that remained featured poor yields due to ageing trees, extensive farming practises and disorganized producers (Beunders et al., 2014).



Photo 12: Old rusty signboard from a no longer existing cacao seed production unit of the government

An old tradition is subsistence farming (see photo 13), a practice that is becoming less fruitful due to inefficient and excessive farming and thus contributes to environmental degradation in the area (Paku, 2013). Thereby, the farming by the locals is rain fed, this creates peaks and periods of scarcity. A wide variety of crops is grown by the respondent population. The crop that is grown by almost all farming respondents is cassava accounting for 92% (see table 20), followed by maize with 53%. Sweet potatoe, Zailopea, Mango, tomato, orange, monodeira and watermelon are all only grown by one respondent each. Most respondents combine several crops. The most popular combination was maize and cassava, often with the addition from plantain. In most respondent households women are responsible for the vegetables.



Photo 8: Subsistence farm with i.e. papaya, cocoyam and banana

Crop	Count	Percentage
Maize	20	53%
Cassava	35	92%
Cocoyam	13	34%
Spices	4	11%
Banana	7	18%
Plantain	15	39%
Rice	2	5%
Watermelon	1	3%
Palm tree	6	16%
Monodeira	1	3%
Pear (avocado)	4	11%
Orange	1	3%
Beans	3	8%
Yam	8	21%
Coconut	1	3%
Garden egg	2	5%
Tomato	1	3%
Cacao	9	24%
Mango	1	3%
Vegetables	4	11%
Zailopea	1	3%
Sweet potatoe	1	3%

Table 20: Crops used by the farming respondents

Livestock rearing is mostly on the household scale in the Weto Mountain Range. When driving around, you will barely see any cows. Most people raise a few fowls and or goats and or sheep in homes using the free range system (see photo). That means that animals are allowed to go out and look for food and come back home in the evening to sleep. Livestock rearing is mostly done for home use and during festive occasions like Christmas and Easter. Some people do sell theirs for money. In addition, the sheep are also sheared and the skin used for drums and other purposes (M. Agba, personal communication, June 19, 2015).

In sum, the Weto Mountain Range area is suffering from several environmental stresses to which both major industries such as mining and sand winning and the local inhabitants, on a smaller scale, contribute. Indiscriminate use of chemicals is worrying for both human health and the ecosystem in the range. The main form of environmental degradation in the range, deforestation, was immensely impacted by the bushfires of 1983, after which many people moved away from cacao production. The old tradition of subsistence farming is still practiced by many today, but features poor outcomes due to inefficient and excessive practises.



Photo 9: Goats roaming around the village (medicalmissioninghana, 2012)

4.6 SUSTAINABLE DEVELOPMENT IN THE WETO MOUNTAIN RANGE

In chapter 2, sustainable development was defined as:

Development that ensures the basic rights of the present without compromising the ability of future generations to meet theirs.

In the Weto Mountain Range, several activities with the goal to move towards sustainable development are carried out by both national and international actors. The goal here is not to sum up each and every project that is taking place, rather on elaboration on what specific work has already been done.

The combination of environmental threats as mentioned in the former paragraph with a largely agricultural based economy leads to several nature conservation and restoration projects. Respondents often mentioned tree planting projects such as the CREMA project by Ecosystem Alliance, managed in the range by the Development Institute (DI). CREMA stands for Community Resource Management Committees and the goal is to replace ineffective state governance and law enforcement over use of natural resources in Ghana. Each community has formed a committee that functions as a local governance structure to ensure environmental security. Cacao nurseries (see photo 14) were set up in the different communities to create rural enterprises that form the basis of cacao value chain development (Beunders et al., 2014). Sustainable cacao production is perceived as an effective tool for reforestation through agro-forestry. It can also function as an incentive to protect the existing forest cover on the mountain crests, contributing to making cacao production climate change resilient through the stimulation of rainfall and retention of rain water. Farmers can get certified when planting shadow trees next to their cacao or coffee and are then at the same time contributing to higher biodiversity values than those of monocultures. Agroforestry also provides opportunities for more extensive forestry, which in turn can mean possible extra income (PBL, 2013).



Photo 10: Cacao nursery in one of the villages

Other value chains that are being developed by both DI and other actors are tourism and Non Timber Forest Products. Despite the environmental issues, the area is blessed with beautiful nature and waterfalls, for example, that could, if done in a sustainable way, be used to generate income through the tourism sector. Beekeeping has been promoted by NGOs and the Forestry Commission, which is an government entity. It is believed to be a livelihood alternative that is well combined with forestry management. Another product that is promoted as a livelihood alternative are spices, as these also do not require large areas to be deforested (T. Amaglo, Personal Communication, December 19, 2014).

A lot of education and awareness raising activities have taken place in the Weto Mountain Range. The earlier mentioned forestry commission for example, has conducted educational programmes on reforestation through radio broadcasts, community gatherings and special vans that visit each community (T. Amaglo, Personal Communication, December 19, 2014). Furthermore, a promising development is the Weto Platform, a multi-stakeholder platform that advocates for sustainable development and conservation of biodiversity and landscapes. Government entities like the Forestry Commission, NGOs like DI and local groups such as the beekeepers association are all involved.

It can be stated that the Weto Mountain Range provides many opportunities for sustainable development. A lot of work has already been done by different actors, but more needs to be done to respond to the environmental threats that stress the Weto Mountain Range.



5. LOCALS' PERCEPTIONS TOWARDS CLIMATE CHANGE, DEGRADATION AND SUSTAINABLE DEVELOPMENT

Sena (29) thinks that now the rains are good for him as compared to the past, because then it would rain so heavily that he was not able to go to farm. Now he is able to go to the farm in the morning and even sometimes in the evening. Edem (45) is also a farmer, he says that in the olden days, it used to rain heavily, but he thinks now it has reduced because of the felling of the trees. It has had a negative impact on his work. Nevertheless, the past year has been good for them. It was still raining in November, a month in which the dry Harmattan had already started in the previous years. Selikem (39) thinks that nowadays, less rain is falling per year than when he was a child. He explains that in the past they would experience landslides as a consequence of heavy rain, but they haven't experienced that of late. Dzifa (38) says that in the olden days there used to be a lot of rainfall between March and April, but it is not like that today. So if you make the mistake of planting at that time, everything dies. Klenam (60) also acknowledges that the seasons have changed. In the past you could depend on January or Februari to plant your crops. But nowadays you have to wait, because the rains will not come until May or June.

* In order to safeguard the anonymity of the interviewees, all the names used in this textbox are fictitious.

5. LOCALS' PERCEPTIONS TOWARDS CLIMATE CHANGE, DEGRADATION AND SUSTAINABLE DEVELOPMENT

The concept of perception was explained in the theoretical background and operationalized in the methodology. The concept was divided into four dimensions: 'Own (sustainable) development situation of the household' 'Future (generations)' 'Past learning' and 'Motivation' each with (non-exhaustive) indicators that are justified by and based on the literature research presented in the theoretical background and on my own interpretation from the translation of the concepts to the local context. These dimensions determine the division of the analysis of the locals' perceptions of climate change, degradation and sustainable development, which is the main focus of this chapter.

5.1 OWN (SUSTAINABLE) DEVELOPMENT SITUATION

The dimension of the 'household's (sustainable) development situation' was operationalized using four indicators: (1) 'Relation of livelihood activities with environment'; (2) 'Meaning of- and adaptation to climate change'; (3) 'Meaning and implementation of sustainable development'; (4) 'Meaning of- and adaptation to environmental degradation'. For the last three indicators, 'meaning' is used to emphasize the goal to get insights into their point of view and their perception. The triangulation method is used in the analysis of the last three indicators. In paragraph 3.4.3 the value of triangulation was emphasized. The effectiveness of the combination of different methods in the study of the same phenomenon lies in the fact that the different methods will compensate for each other's weaknesses. In this thesis use is made of the combination of the qualitative method of coding with the program Atlas.ti and with the quantitative method of scaling. Scaling is used to summarize the interpretations of the respondents' perceptions. This is done to provide an addition to the method of coding that will generate elaborative answers including quotes as well as in-depth knowledge. Knowledge is expected to influence perception. Both the perception and the knowledge of a respondent of the concepts of climate change, environmental degradation and sustainable development have received a score. For perception on a 5-point "strongly disagree"- "strongly agree" scale and for knowledge on a 3-point "no accurate knowledge" – "extensive accurate knowledge" scale. These scores will be displayed against age, gender, wealth and education in order to cross tabulate and examine correlations between these aspects and certain perceptions. Such an analysis can provide insights into which characteristics are necessary to achieve the best results with an intervention.

5.1.1 Relation of livelihood activities with the environment

When simply being asked whether they think their daily activities influence the environment, which is explained as the surroundings, the trees, the air, the land, the soil and the water, often respondents answered no. Another common answer was the positive influence of respondent's farming providing food for the community, as this woman said: *"I rather think that it benefits the community because when I produce crops, the community benefits from what I have been producing and even the things that I am selling"*. This line was followed when being asked the other way around, whether the environment influences their daily activities, then the positive influence of the crops providing themselves food to eat, was mentioned: *"the environment has influence on my activity, I am also a farmer, I am a cacao farmer, I plant cacao on my land and it helps my crops to grow"*.

Apart from the foregoing, some indications on views on environmental degradation also became apparent with this exploring question. The felling of the trees and land degradation were mentioned a few times. One respondent asserted: *“they spoil the land, because sometimes they used to cut trees”*. Another mentioned *“they are cutting down the trees, they are spoiling the forest”* Especially during the dry period, bushfires, both weather and human induced, are a common phenomenon. (Bush) fires were also an example that passed in review a few times when exploring respondents’ perceptions on their relation with their environment for the first time: *“and the second thing is that in terms of my farming activities, bushfire is one of the activities that affects our farm. Usually if it is not checked earlier, it comes into my farm and destroys my crops”*.

At first sight people mostly did not think there was a relation between them and the environment except for the crops that grow on the land. In some cases felling of trees and bushfires were mentioned. Indications of climate change and environmental degradation in most cases became apparent later on in the interviews, but only when it was not being asked in relation to their daily lives. It was only after specific questions were asked such as ‘Have you seen any changes in the natural environment over the years?’ or ‘Have the changes in weather had any impact on your daily life?’, which is when more influences became apparent. These more profound influences are handled in the following paragraphs as the perceptions of the respondents on climate change, environmental degradation and sustainable development are further discussed.

5.1.2 Meaning of- and adaptation to climate change

The concept of climate change in Ewe is widely known as ‘*dixeme fe eya fe trɔtrɔ*’, which translates into ‘changes in the weather patterns’, but word for word means ‘the world’s wind changes’. Attempts by the respondents to self-explain on the basis of their literal understanding of the words, often led to a reference to the seasonal change of the dry to the wet season. Some came up with even more creative explanations: *“interpreter: climate change, the word in English, she has never heard. But the ewe version of it, she says she thinks it’s the time that, she is referring to the eclipse of the sun, the moon and the sun come together and there is darkness”*. More than half (59.7%) of the respondents did not have accurate knowledge on the concept of climate change, followed by 24.2% who had little accurate knowledge, whereas only 16.1% had extensive accurate knowledge at the time of the interview. Little accurate knowledge represents the respondents that answered along the lines of changes in the weather patterns over the years. One respondent described: *“I understand climate change as changing weather”*. They received this score, because in comparison with respondents who mentioned causes and consequences, they had less knowledge. So the scores also serve the function of displaying knowledge among the respondents in relation to each other. For example, no one mentioned contribution of the rich countries and greenhouse gasses as a cause for climate change, nevertheless people could still receive the knowledge score of extensive accurate knowledge. They answered along the lines of changes in the climate measured over a long time, and mentioned both rainfall and temperature, causes and consequences. As one respondent explained, *“climate change, what I have learned about climate change. That is the changes in the temperature. Looking at records taken from some time in the past and then comparing the temperature you know it is known as global warming. And as a result of this deforestations, we are experiencing global warming. And over here actually, the weather as I knew it from my infancy it has been relatively warm, now. It has been getting warmer than before. And a November like this, I wouldn’t need this (sweater) throughout the year”*.

When cross tabulating the knowledge score on climate change with gender and age groups (Table 21), it shows that the youth is the only group with an equal knowledge division with regards to gender. Both 88.9% of the females and of the males did not have any accurate knowledge, whereas both 11.1% of females and males had little accurate knowledge. In the adult and elderly group overall, more males than females had either little or extensive accurate knowledge. The highest relative percentage of respondents having extensive accurate knowledge is represented by elderly males (37.5%). It can be stated that in total, among the respondents males had more accurate knowledge on climate change. This possibly can be attributed to the fact that it was established in chapter 4 that in general the male respondents were higher educated. Also, relatively, the elderly age group had the most respondents with little or extensive accurate knowledge.

Knowledge score of climate change		Male	Female	Total
Youth (0-29)	Has no accurate knowledge	8	8	16
	%within gender	88.9%	88.9%	88.9%
	Has little accurate knowledge	1	1	2
	% within gender	11.1%	11.1%	11.1%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Has no accurate knowledge	7	12	19
	% within gender	43.8%	75%	59.4%
	Has little accurate knowledge	4	2	6
	%within gender	25%	12.5%	18.8%
	Has extensive accurate knowledge	5	2	7
	% within gender	31.3%	12.5%	21.9%
	Total	16	16	32
	%within gender	100%	100%	100%
Elderly (60+)	Has no accurate knowledge	0	2	2
	% within gender	0%	16.7%	16.7%
	Has little accurate knowledge	5	2	7
	% within gender	62.5%	50%	58.3%
	Has extensive accurate knowledge	3	0	3
	% within gender	25%	0%	25%
	Total	8	4	12
	% within gender	100%	100%	100%
Total	Has no accurate knowledge	15	22	37
	%within gender	45.5%	75.9%	59.7%
	Has little accurate knowledge	10	5	15
	%within gender	30.3%	17.2%	24.2%
	Has extensive accurate knowledge	8	2	10
	% within gender	24.2%	6.9%	16.1%
	Total	33	29	62
	% within gender	100%	100%	100%

Table 21: Knowledge score of climate change, age groups and gender crosstabulation

With regards to age, Spearman’s Rho was used to calculate the correlation between age (note: this is the scale variable without age groups) and the knowledge score of climate change. Spearman’s Rho was used because we are dealing with one ordinal variable. Table 22 shows that there is a positive correlation between knowledge on climate change and age ($R_s=0.45$, $n=62$, $p < 0.001$).

			Knowledge score of climate change	Age
Spearman’s rho	Knowledge score of climate change	Correlation Coefficient	1.000	.453 **
		Sig. (2-tailed)		.000
		N	62	62
	Age	Correlation Coefficient	.453 **	1.000
		Sig. (2-tailed)	.000	
		N	62	63

** . Correlation is significant at the 0.01 level (2-tailed)

Table 22: Spearman’s Rho correlation between knowledge score of climate change and age

One could argue that this is because experience comes with age. However, the youth was all of school going age and during the interviews it was mentioned several times that people had learned about climate change in school. Therefore it is important to look at the knowledge scores in relation with education as the percentage of youth without accurate knowledge might be represented by school drop-outs. Again Spearman’s Rho was used, because we are dealing with two ordinal variables (the rest of the Spearman’s Rho tables can be found in appendix 4).As could be expected, there is a positive correlation between knowledge on climate change and the highest level of education ($R_s=0.45$, $n=62$, $p < 0.001$). In order to find out whether the wealth category of a respondent also correlates with his knowledge on climate change, Spearman’s Rho was used for these two ordinal variables as well, but did this not show any significant correlation.

The respondent thinks climate change is happening in his or her own environment

Next to the knowledge score, respondents received scores for their perception on climate change based on three different statement. As mentioned before, it was deemed important that respondents received an accurate knowledge on the concepts after showing no or little accurate knowledge, both to raise awareness and as an exchange for their participation. Whether or not after explanation, most of the respondents acknowledged that climate change was going on in their environment. 65.1 % was interpreted to agree, whereas 30.2 % was interpreted to strongly agree.

Table 23 shows that overall, a higher relative percentage of males agreed strongly with the statement and a higher relative percentage of females agreed. There was one male respondent who was interpreted to disagree and two females. Within the youth group females all agreed, whereas 77.8% of the youth males agreed and 11.1% strongly agreed. For the adult group both the females and male have the largest relative percentage that was interpreted to agree (68.8% and 50%). Furthermore 43.8% of the adult males strongly agreed, whereas this was only the case for 18.8% of the adult females. Among the elderly, 75% of the males strongly agreed, whereas only 14.3% of the females strongly agreed. 66.7% of the female elderly agreed however while this was the case for 33.3% of the males. With regards to age groups, relatively, the elderly had the most respondents agreeing strongly that climate change is happening in their environment. This could be attributed to

the fact that they are comparing the climate over a longer period than younger respondents, due to their old age.

Climate Change Perception Statement		Male	Female	Total
1				
Youth (0-29)	Agree	7	9	16
	% within gender	77.8%	100%	88.9%
	Strongly Agree	2	0	2
	% within gender	11.1%	0%	11.1%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Disagree	1	2	3
	% within gender	6.3%	12.5%	9.4%
	Agree	8	11	19
	% within gender	50%	68.8%	59.4%
	Strongly agree	7	3	10
	% within gender	43.8%	18.8%	31.3%
	Total	16	16	32
	% within gender	100%	100%	100%
Elderly (60+)	Agree	2	4	6
	% within gender	33.3%	66.7%	46.2%
	Strongly agree	6	1	7
	% within gender	75%	14.3%	53.8%
	Total	8	5	13
	%within gender	100%	100%	100%
Total	Disagree	1	2	3
	% within gender	3%	6.7%	4.8%
	Agree	17	24	41
	%within gender	51.5%	80%	65.1%
	Strongly Agree	15	4	19
	%within gender	45.5%	13.3%	30.2%
	Total	33	30	63
	% within gender	100%	100%	100%

Table 23: Cross tabulation of climate perception statement 1, gender and age groups

With regards to age, there is a small positive correlation between the first climate change perception statement and age ($R_s=0.26$, $n=63$, $p < 0.38$). This possibly also can be attributed to the fact that the elder a person gets, the longer period he has to look at changes in climate. Spearman’s Rho also shows a small positive correlation between the first statement and the highest level of education ($R_s=0.33$, $n=63$, $p < 0.007$). This correlation was slightly smaller than the one with knowledge on climate change(0.45), but both correlated positively with the highest level of education. With regards to wealth categorization, again no significant correlation can be identified.

The views on what the changes in climate look like, were very different (see figure 23). In the theoretical framework it was established that more objective interpretations such as the ‘rational economic man’ can be dispelled if one assumes that a man reacts to his environment as he perceives and interprets it through previous experience and knowledge (Bunting & Guelke, 1979). The emphasis on variation in individual response to the environment also means that people will pick different benchmarks when comparing the weather over time. With this, the diversity of views can be explained.

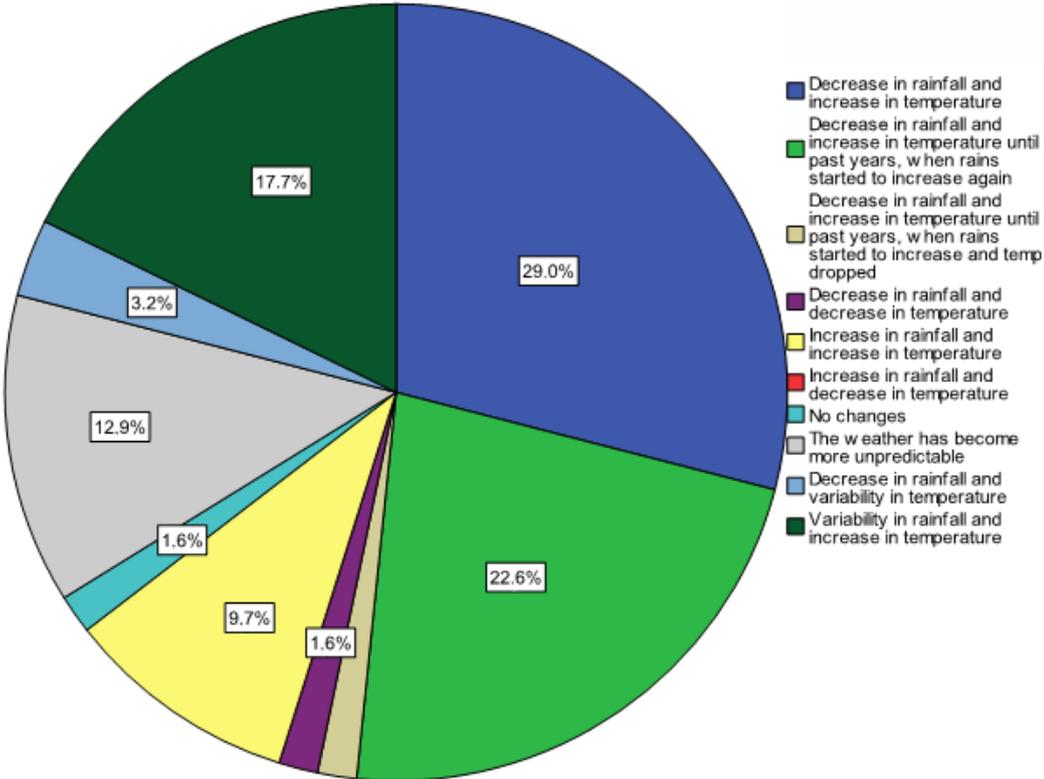


Figure 23: Respondents’ views on the changes in temperature and rainfall

From the respondent population, 29% have reported to have experienced a decrease in rainfall and an increase in temperature over the years. One respondent stated: *“At first when it rains in the community, maybe in three days, you could still see the clouds very thick in the sky and it is so cold, but now it is very hot”*. Another focused only on rainfall: *“The rainfall at first it rained well, but now the rains are not as they used to be”*. Furthermore, 22.6% of the respondents acknowledge a rise in temperature and a decrease in rainfall, however with exception of the last year(s), which they claim have provided them with very good rainfall. The Harmattan season (see box 1) had just started during the time of the interviews, but there still had been rainfall recently. A woman said *“I have seen a change in rainfall, some years back, by November there are no rains, but now about three years now, November to this time. It has been raining since October till this time and I feel the rains are helping them for their crops”*. Another farmer agreed: *“Yes it has effect, due to the rainfall. In the olden days, it rained heavily. But these days I think it has reduced. But this year I can say we have a good weather this year. As of now the rain is still falling. But for the past, by early November we see*

that then the Harmattan started. And now I can see that is a bit okay for us". There was even one respondent who in addition felt that the temperature had dropped as well during the last year: "When you were a little boy and the last few years, then the temperature went up and now it is going down again, is that it? well this is the only year I have seen it is going down"

Many people described how the rainy season has shifted in their view, even giving accounts of months and how it has changed. One respondent expressed: "The way the rain falls, there was a season for it, you know when it is rainy season, dry season and major season, in his work as an agricultural extension officer, they were taught that, in the major season, you plant the 15th of March and then in the minor season, you plant the 15th of September. But because of the changes that are happening now, you plant in February of the major season and then August in the minor season, so that is the adjustment he made to the situation". Another mentioned other months: "Formally I planted my yam in February/March, but this time I have studied the weather has changed, so May/June, so that it meets the big rain". Without knowing, these farmers apply a method that has been scientifically grounded. In their research on agricultural impacts of large scale variability of the West African Monsoon, Sultan et al. (2005) state that delaying of the sowing date that was used at the time of their research (2003/2004), would lead to better yields because on average, the impact of within season drought spells would be less (Giesen et al, 2010).

Unpredictability of the rainfall was sometimes solely mentioned as the change for the rainfall (17.7%) and sometimes it was mentioned as an addition to a decrease or increase in rainfall. A respondent looked back at his childhood: "when I was a kid the rain fell at stipulated times, but now it rains at some time within to these other time when it fells you are really unable to determine the pattern". Another respondent was asked whether he was still waiting: "A (Answer): As the weather is like this, we don't know any time of weeding yet. Q (Question): You are still waiting? A: Yes". 12.9% of the respondents even said that the weather in general has become very unpredictable. A respondent used the sunlight as an example: "But then the sun and the rain is not so consistent. And sometimes too the sun will be so hot, other times it will just be normal sunlight and the heat is not that much and sometimes it comes with the sunlight". In chapter 4 it was established that in the Volta Region, the raining season has shifted over the past (Neumann et al., 2007). In 2007 this was also predicted to continue to do so and to become shorter and more intensive (Jung & Kunstmann, 2007). These changes could represent the predictability the respondents are referring to. This is merely an assumption, precipitation data over a long period for the specific communities would provide more significant substantiation if they would be available.

Box 1: The Harmattan

The Harmattan is a continental wind that carries dry dust (mostly from the Sahara desert). In the Boreal winter many West African countries, including Ghana, are affected by the Harmattan dust plumes (Lyngsie et al., 2013). The wind blows from November to March, replacing the otherwise dominant maritime monsoon wind (Breuning-Madsen & Awadzi, 2005) (Lyngsie et al., 2011). The period in which the Harmattan blows, is by locals referred to as the 'dry' or the 'Harmattan' season, whereas the period of the monsoon is referred to as the 'wet' season. During the Harmattan season the Sahara dust can create a thick fog, extremely reducing long distance visibility. The Harmattan season has dry hot days and relatively cool nights.

A solid 9.7% actually felt that both the rain and temperature have increased over the years. It is expected that they mostly focused on the past few years, which agrees with those views of the recent increase in rainfall after years of decrease. One woman complained that she has lost track of the different seasons: *“but now the sun is so much and the rain is also so much, you don't even know when it's the season, you don't know when it's rainy season, you don't know when it's dry season”* As for the earlier mentioned respondents who saw a decrease in rainfall, they might, on the other hand, have not focused on the past years.

The respondent thinks climate change is a problem that deserves attention

The scores for the second statement were mostly interpreted based on their account of consequences and adaptations. Respondents who have not seen many changes, have not experienced many consequences and did not make any adaptations and were given a lower score on the strongly disagree-strongly agree scale (disagree: 7.9%, neutral: 22.2%). Respondents with high scores emphasized severe consequences, such as the spoiling of the crops, the spoiling of roofs and less time on the farm due to high temperatures (agree: 47.6%, strongly agree: 20.6%). A respondent explained: *“The too much rain has not been helping our farming, most of the crops have been destroyed as a result of the heavy rain and the sunlight too, and the maize doesn't like too much sunlight. The intensity of the sunlight has not made our maize to do well”*. Another described: *“When the Harmattan season comes, everything burns and they are not used to that. So the mountain has been burning”*. One respondent even said not to believe in the concept of climate change, but she had seen changes in weather, namely increase in both rainfall and temperature and even adjusted her farming methods because of that. She was one the only respondent who got a score of disagreement on the first two statements, but it can be expected that she denied the concept simply because she didn't want to show a lack of knowledge: *“Interpreter: when I explained it in Ewe, she said she had heard it before, I asked if she understood it and she said yes. But she added that she doesn't believe in it. Q: Can you ask her why she doesn't believe in it? Interpreter: she thinks it is just a deceptive concept, it is not true”*.

Table 24 shows that overall, a higher relative percentage of males agreed strongly with the statement that climate change is a problem that deserves attention, whereas a higher relative percentage of females agreed. There was one male respondent who was interpreted to disagree and this was the case for two females. Within the youth group females all agreed, whereas 77.8% of the youth males agreed and 11.1% strongly agreed. For the adult group both the females and males have the largest relative percentage that was interpreted to agree (43.8% and 50%). Furthermore 31.3% of the adult males strongly agreed, whereas this was only the case for 12.5% of the adult females. Among the elderly, 75% of the males strongly agreed, whereas only 33.3% of the females strongly agreed. 66.7% of the female elderly agreed however while this was the case for 25% of the males. With regards to the age groups, the elderly had the largest amount of respondents that strongly agreed with 61.5%.

Climate Change Perception Statement 2		Male	Female	Total
Youth (0-29)	Agree	7	9	16
	%within gender	77.8%	100%	88.9%
	Strongly agree	2	0	2
	%within gender	11.1%	0%	11.1%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Strongly disagree	0	1	1
	% within gender	0%	6.3%	3.1%
	Disagree	1	2	3
	% within gender	6.3%	12.5%	9.4%
	Neutral	3	3	6
	% within gender	18.8%	18.8%	18.8%
	Agree	7	8	15
	% within gender	43.8%	50%	46.9%
	Strongly agree	5	2	7
	%within gender	31.3%	12.5%	21.9%
	Total	16	16	32
	% within gender	100%	100%	100%
Elderly (60+)	Agree	2	3	5
	% within gender	25%	66.7%	38.5%
	Strongly agree	6	2	8
	% within gender	75%	33.3%	61.5%
	Total	8	5	13
	%within gender	100%	100%	100%
Total	Strongly disagree	0	1	1
	% within gender	0%	3.3%	1.6%
	Disagree	1	2	3
	% within gender	3%	6.7%	4.8%
	Neutral	3	3	6
	% within gender	9%	10%	9.5%
	Agree	16	20	36
	% within gender	48.5%	66.7%	57.1%
	Strongly agree	13	4	17
	% within gender	39.4%	13.3%	27%
	Total	33	30	63
	% within gender	100%	100%	100%

Table 24: Cross tabulation of climate change perception statement 2, gender and age groups

Spearman's Rho determined a positive correlation between the statement that climate change is a problem that deserves attention and age ($R_s=0.31$, $n=63$, $p < 0.014$). The correlation coefficient is higher than the one for the first statement with age ($=0.26$), both show a small positive correlation. With the highest level of education, statement two also shows a small positive correlation ($R_s=0.29$, $n=63$, $p < 0.020$), this is a slightly smaller correlation than the one with statement one (0.33). Again, no significant correlation can be found between the statement and wealth categorization.

The respondent thinks climate change is influencing his/her daily life

Scoring for the third statement was mostly based on the consequences of and adaptations to climate change that they mentioned. For example, when people complained about the weather having become too hot, that showed a slight influence. One respondent said that the weather has become so hot nowadays that he even had to take little shower before he dared to come speak to us. The majority of the respondents was interpreted to view climate change as influencing their daily life (agree: 66.7%, strongly agree: 17.5%).

Table 25 shows that overall, both a majority of the men (57.6%) and of the women (76.7%) agreed that climate change is influencing their daily life. A higher relative percentage of men (27.3%) agreed strongly as compared to the relative percentage of the women (6.7%). In the youth category, there was only one male who was interpreted to strongly agree and there were no females who received this score. For both youth males and females, a majority was interpreted to agree. In the adult group, the relative percentages of respondents who strongly agreed, are a bit higher than the overall average (25% for males; 12.5% for females). For the elderly, all women agreed with climate change perception statement three, whereas 25% of the men agreed and 62.5% agreed strongly. With regards to the age groups, the elderly group had the highest percentage of respondents who strongly agreed that climate change was influencing their daily life.

Spearman's Rho showed a significant correlation between statement three and age ($R_s=0.31$, $n=63$, $p < 0.014$). It also shows a positive correlation between statement three and the highest level of education. Again, wealth categorization does not correlate significantly with statement three.

Climate Change Perception Statement		Male	Female	Total
3				
Youth (0-29)	Disagree	1	2	3
	% within gender	11.1%	22.2%	16.7%
	Neutral	1	0	1
	% within gender	11.1%	0%	5.6%
	Agree	6	7	13
	%within gender	66.7%	77.8%	72.2%
	Strongly agree	1	0	1
	%within gender	11.1%	0%	5.6%
Total	9	9	18	
% within gender	100%	100%	100%	
Adult (30-59)	Disagree	1	3	4
	% within gender	6.3%	18.8%	12.5%
	Neutral	1	0	1
	% within gender	6.3%	0%	3.1%
	Agree	10	11	21
	% within gender	62.5%	68.8%	65.6%
	Strongly agree	4	2	6
	%within gender	25%	12.5%	18.8%
Total	16	16	32	
% within gender	100%	100%	100%	
Elderly (60+)	Disagree	1	0	1
	% within gender	12.5%	0%	7.7%
	Agree	2	5	8
	% within gender	25%	100%	61.5%
	Strongly agree	5	0	4
	% within gender	62.5%	0%	30.8%
	Total	8	5	13
	%within gender	100%	100%	100%
Total	Disagree	3	5	8
	% within gender	9.1%	16.7%	12.7%
	Neutral	2	0	2
	% within gender	6.1%	0%	3.2%
	Agree	19	23	42
	% within gender	57.6%	76.7%	66.7%
	Strongly agree	9	2	11
	% within gender	27.3%	6.7%	17.5%
Total	33	30	63	
% within gender	100%	100%	100%	

Table 25: Cross tabulation of climate change perception statement 3, gender and age groups

The most visible proof of respondents experiencing an influence of climate change in their daily life, was for the farmers who told about their unpredictable planting season because of the changes in rainfall. As opposed to the earlier mentioned farmers who have simply changed the months of sowing, these respondents said they could not predict anymore when it is a good time to sow. Where in the past they had fixed months for weeding, planting and yielding, the adaptation they have made is that they now wait for rain until they start preparing the land. A farmer described: *“That climate change, it lets... we are lacking behind.. If the year begins and we want to make*

something on the farm, we shall be looking round that rain will fall, but no". Another farmer has also experienced delay in his farming activities: *"Comparing past rainfall to current rainfall, there is a vast difference and this causes delay in farming activities since I have to wait until it rains before I can start my activities"*. The respondents who were positive on the rainfall for the past year(s), have also adapted their sowing and planting period: A woman explained: *"it didn't rain very well for the previous years and this year it has been very good, we have gotten good yields from our crops. The changes that I have made, the way the rains are good now, so I have also changed my planting period"*. This example of some people adjusting their planting period because of the absence of rain and others adjusting it because of good rainfall, shows how their different previous experiences have influenced their perception (Bunting & Guelke, 1979).

Another adaptation method that showed an influence of climate change in farming activities, was the need for shade because of the intense sun. A respondent said: *"One of the changes is that in my farm, I don't fell the trees, I leave them to provide shade for me"*. Another respondent expressed the same: *"I decided, at my cacao farm, we left some of the trees. We don't cut all. We leave them so that they can give more shade to the crops"*.

An influence on the daily lives of the respondents that often passed in review, is the either not growing or spoiling of the crops. One woman explained: *"Between March and April, there used to be lots of rain, but now it is not like that. So if you make the mistake of planting at that time, everything dies"*. Another farmer agrees: *"When it rains too much, most of our crops get rotten and when it doesn't rain when it should, we also lose some crops"*. One respondent had even experienced very specific daily influences: *"Answer (A): Climate change has brought in a lot of imitative changes. One diet, what we eat, we no longer take our local foods. When you are watching the tv, they say Indomie, they say that. Question (Q): And that is because of climate change? A: yes may I tell you, we have lost certain local diets, mushrooms are no longer common, the snail and certain animals, contumeri, baobab. Because those things are no more there, people have to eat Indomie. And eat plenty rice and you develop diabetes"*. This answer does agree with the loss of certain animals and vegetation as mentioned in paragraph 4.5. The question has to be posed though whether this is a consequence of climate change. Often the concepts of environmental degradation and climate change seemed to be interchangeable for the respondents.

There were also respondents who acknowledged that climate change was happening in their environment, but did not seem to view it as influencing their daily life (disagree: 12.7%). A respondent expressed: *"when the weather changes, we continue farming, so whether the weather is hot or not, it doesn't affect anything"*. Another had resorted to waiting until the rain fell: *"A: They used to check the weather before they farm, if the rain is falling heavily they cannot farm, so they have to wait. Q: And that was before or is that now? A: They used to do that and they are still doing it now. Q: So there hasn't been a change in that? A: No"*. Putting respondents who have experienced extensive influences of climate change next to those who claim the opposite, emphasizes the importance of individual interpretation as part of perception. It shows that different experiences and interpretations translate into different adaptation strategies (Bryant et al., 2000).

A number of causes and consequences have been discussed as these helped to determine the scores for the various statements. However, there is an important remark that has to be made about the respondents' perceptions and knowledge on the causes of climate change. Many respondents seemed to see only a single reason for climate change: the cutting of trees. One respondent described: *"If we cut down trees, we are not planting any again, the young ones to grow, so it is affecting the weather"*. Another agreed: *"Because without forest, the weather will never be good"*. This is what many of them have been hearing through training and awareness activities; that they should plant trees. One respondent even mentioned the process of photosynthesis. No one mentioned anything about rich countries having a much bigger share in the contribution to causes of climate change, or the emission of greenhouse gasses. This way, degradation of the forest and climate change seem to be interchangeable for some respondents. Often consequences of environmental degradation were mentioned as consequences of climate change and vice versa. For example, the changes in the wind are mostly due to the reduction of the forest. This reduces the breaking of the winds and this impacts upon the settlements. Stronger winds are actually a consequence of forest degradation, but many respondents often see it as a consequence of climate change.

In paragraph 4.5 it was established that there has been an incredible reduction in forest cover since 1975. Most of the examples provided by the respondents referred to felling of the trees. A respondent explained: *"A: I will say is that burning of the bush causes part of this climate change and the cutting of trees and overgrazing, sand winning all these things cause this thing, that is my understanding. And if there is more than that, you have to educate me on it. Q: Those are causes that you are mentioning, what is climate change itself? A: degrading of the land and the soil. and the environment"*. Another respondent also mentioned the felling of trees: *"He says some years back and now he will say that the temperature is hot and the reason is, there has been so much felling of trees here and that brings so much heat in the weather"*. There was also a case where a claimed adaptation method to climate change actually seemed to possibly contribute to degradation in the environment: *" But people are making changes and some of the changes that I have seen is because the rain doesn't come for you to get the amount of yield you want, people have resorted to the use of fertilizer or chemical that can help their yield to do well because the rain is not enough. So I think that is what people are doing but I haven't done anything"*.

A critical note has to be made here, as education cannot solely be appointed as the cause for the confusions of the concepts of environmental degradation and climate change. It can also be based on pure logic and experience. The respondents who perceived that temperature had risen and rainfall had decreased, might have also seen that a lot of trees have been cut and they could have provided a reasoning that the two processes are linked. Thereby felling of trees indeed can contribute to changes in the (micro) climate, it is just not the only contribution.

In sum, male respondents had more knowledge on the concept of climate change. The elderly had relatively the most respondents with extensive accurate knowledge and the older one gets, the more likely he or she is to have more accurate knowledge. Despite the overall limited knowledge on the definition of the concept of climate change, the majority of the respondents had seen changes in temperature, rainfall and even in some cases wind. Overall, men agreed more strongly than women. The perceptions on what these changes look like, were very far apart. Thereby the changes were also perceived to have quite the impact on the daily lives of people, mostly with regards to farming practises. Again, men agreed more strongly than women. The most frequently mentioned cause for

the changes in the weather, was the felling of trees, whereas consequences mostly brought us back to farming practises, crops growth in particular. Especially because of accounts of severe consequences and impacts such as spoiling roofs and unpredictable planting periods, the majority of the respondents seemed to perceive climate change as a problem that deserves attention. On this statement, of both males and females a majority agreed. Overall, the elderly age group agreed more strongly on all statements. The knowledge score and the three perception scores all show a significant positive correlation with age and the highest level of education but no correlation with wealth categorization.

5.1.3 Meaning of- and adaptation to environmental degradation

For degradation, there is no word in the Ewe language, however, there is a word for land degradation: 'ayhi gba fe nyinyi', which literally means 'the wearing out of the land'. Therefore most of the respondents who had knowledge of degradation, focused their answers on the land. A farmer described: *"it's like reducing the land from its fertility state to a poorer state that is degrading the land. So that is what I understand by land degradation"*. With only knowledge of land degradation people were given the score of little accurate knowledge of degradation (24.2%), whereas people who gave more examples received the score of extensive accurate knowledge (9.7%). This group mostly also included degradation of the forest in their answers. A woman explained: *"My understanding is that for instance felling of trees in the forest will make it so that the land will not have the living organisms in the soil, let me say the fertility of the soil will not be the same. Nutrients. So the felling of the trees will make it so that the soil will not have the nutrients that it used to have"*. However, a majority of 66.1% had never heard of the word degradation in English or Ewe.

When cross tabulating the knowledge score on environmental degradation with gender and age groups (Table 26), it shows that overall females had less accurate knowledge on environmental degradation. In the youth group, both a relative majority of the men (66.7%) and women (77.8%) did not have any accurate knowledge. This also accounts for the adult group with percentages of 50% and 87.5% and for the elderly (50%) and (50%). With regards to age groups, the elderly group had the relative highest percentage of respondents with extensive accurate knowledge.

Spearman's Rho does not show any significant correlation between the knowledge score of environmental degradation and age. With regards to the highest level of education however, it does show a positive significant correlation ($R_s=0.5$, $n=62$, $p. <0.001$). As was the case for all scores that are discussed so far, the knowledge score of environmental degradation does not show any significant correlation with the wealth categories of the respondents.

Knowledge score of env. degradation		Male	Female	Total
Youth (0-29)	Has no accurate knowledge	6	7	13
	%within gender	66.7%	77.8%	72.2%
	Has little accurate knowledge	2	1	3
	% within gender	22.2%	11.1%	16.7%
	Has extensive accurate knowledge	1	1	2
	% within gender	11.1%	11.1%	11.1%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Has no accurate knowledge	8	14	22
	% within gender	50%	87.5%	68.8%
	Has little accurate knowledge	6	2	8
	%within gender	37.5%	12.5%	25%
	Has extensive accurate knowledge	2	0	2
	% within gender	12.5%	0%	6.3%
	Total	16	16	32
	%within gender	100%	100%	100%
Elderly (60+)	Has no accurate knowledge	4	2	6
	% within gender	50%	50%	50%
	Has little accurate knowledge	2	2	4
	% within gender	25%	50%	33.3%
	Has extensive accurate knowledge	2	0	2
	% within gender	25%	0%	16.7%
	Total	8	4	12
	% within gender	100%	100%	100%
Total	Has no accurate knowledge	18	23	41
	%within gender	54.5%	79.5%	66.1%
	Has little accurate knowledge	10	5	15
	%within gender	30.3%	17.2%	24.2%
	Has extensive accurate knowledge	5	1	6
	% within gender	15.2%	3.4%	9.7%
	Total	33	29	62
	% within gender	100%	100%	100%

Table 26: Cross tabulation of knowledge score of environmental degradation with gender and age groups

For the respondents that did give a definition of degradation, education and awareness activities seemed to show in their answers. A man told enthusiastically: *“There have been a few community gatherings where they have provided us with training or talk or awareness on what land degradation is. And my understanding of land degradation is that felling of the trees in the forest, charcoal burning and all other activities that are happening around him that is how I understand it”*. One woman did not use chemicals because of this: *“I have made changes that is based on what I have heard about the use of chemicals, I have heard that it makes the crops rot. So for me I decided not to use it on my land .I have been hearing it from the community”*. A farmer stopped cutting trees and burning his land: *“When I was farming, I used to fell the trees and burn and do all that, but we had education that that was not good for the land and so the changes that I made in that is that instead of burning, I will leave the weed to become mulch and where I want to plant at that period, I will clear the place so I will plant the cassava and leave the weed around it so that it will become manure and at another place I will also go and do the same thing. The Agric people taught him that”*. There were more respondents who mentioned the example of leaving cut weeds to serve as mulch or manure

and they all had stopped burning after they experienced positive consequences for their crops. This provides opportunities for both awareness raising and convincing locals of new ways of farming. These are two important aspects of local ownership as identified in the theoretical framework.

Nevertheless, it does seem like the education has been mainly focused on the planting of the trees and changes in the climate. Not many respondents who were using chemicals or burning trees or continuously farming on the same piece of land, seemed to understand that due to these practices they contribute to a reduction of the fertility of the soil.

The respondent thinks environmental degradation is happening in his or her own environment

Even if people did not know the definition of the concept of degradation, either in English or Ewe, the majority had seen changes in the natural environment, in the forest and in the land use. A man said: *"the changes that I have had, the land is no more fertile as it used to be in the olden days. The forest used to be very dense, you get there and you would even get scared"*. For the first statement, 52.4% was interpreted to agree, compared to 42.9% who were interpreted to strongly agree. Moreover, a lot of people had at least seen changes in the density of the forest that is when they received the score "agree". A villager looked back at his childhood: *"I would say there is a difference, because the first time of my childhood I can see that the town was so decorated with the trees. But when growing up I could see they have cut some of them. So the town is not like how it was"*. Those respondents that mentioned 'erosion' or drying up of the water bodies or other forms of degradation such as reduction in availability and diversity of animals, were assigned the score "strongly agree": *"In terms of our community, we depend on a reservoir for water and that reservoir is from a stream, but because of the cutting down of trees, the shade over the water is not there anymore because the sun is shining on the water, the water is running dry. And we are not getting so much. And in terms of the forest itself, because they are cutting down the trees, the coolness is not there like it used to be, so there are no animals like there used to be"*. Only three respondents (4.8%) did not show any recognition of degradation in their environment.

Table 27 shows that overall men (60.6%) agreed more strongly to the statement whether environmental degradation is happening in their environment, whereas for the women the majority just agreed (66.7%). Within the youth group, relative percentages of the males for the scores of "agree" and "disagree" lie close to each other (55.6% and 44.4%), while for females, a strong relative majority of 88.9% agreed with statement one. In the adult group, the majority of the men agreed more strongly 68.8%, and the majority of the women agreed with the statement. In the elderly group both males and females had a higher relative percentage for the score of "strongly agree" (62.5% and 60%). With regards to age groups, the elderly group had the highest relative percentage of respondents who agreed strongly.

Spearman's Rho did not show any significant correlation between the first statement and age and the highest level of education. However, in this case, the wealth categories of the respondents did show significant positive correlation with the first statement ($R_s=0.25$, $n=63$, $p. <0.048$).

Env. Degradation perception 1		Male	Female	Total
Youth (0-29)	Agree	5	8	13
	%within gender	55.6%	88.9%	72.2%
	Strongly agree	4	1	5
	%within gender	44.4%	11.1%	27.8%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Disagree	0	3	3
	% within gender	0%	18.8%	9.4%
	Agree	5	10	15
	% within gender	31.3%	62.5%	46.9%
	Strongly agree	11	3	14
	%within gender	68.8%	18.8%	43.8%
	Total	16	16	32
	% within gender	100%	100%	100%
Elderly (60+)	Agree	3	2	5
	% within gender	37.5%	40%	38.5%
	Strongly agree	5	3	8
	% within gender	62.5%	60%	61.5%
	Total	8	5	13
	%within gender	100%	100%	100%
Total	Disagree	0	3	3
	% within gender	0%	10%	4.8%
	Agree	13	20	33
	% within gender	39.4%	66.7%	52.4%
	Strongly agree	20	7	27
	% within gender	60.6%	23.3%	42.9%
	Total	33	30	63
	% within gender	100%	100%	100%

Table 27: Cross tabulation of environmental degradation perception statement 1 with gender and age groups

Some respondents believed that environmental degradation had decreased and was less severe than in the past. "A: I have noticed that there are more trees now than they used to be and because we are not really disturbing the forest so much now, there are more animals too than there used to be. Q: Do you know why you are disturbing the forest less now than you used to? A: We are not more disturbing the forest because we have been educated that we should leave the forest to grow and so that there will be more trees and animals." Again, education and awareness activities become apparent.

The respondent thinks environmental degradation is a problem that deserves attention

For the second statement 44.4% was interpreted to agree, whereas 33.3% was interpreted to "strongly agree". This mainly depended on how far respondents emphasized the processes of degradation, such as how severe consequences were mentioned and whether any adaptations have been made. When a respondent talked very passionately about the changes and the fact that they need to replant for example, he or she received the score "strongly agree. A respondent has seen a lot of changes: "A: There are a lot of changes. Because those times when I'm coming back I am happy because I am coming home but now. I used to find more things but now the surrounding does not more look like that. Q: How did it look then and how does it look now? A: When you were coming and you look up to the hill you see green, the trees and their leaves. Now, when you are coming, you can

even see the house from the west. So then you would like it but now”. Not for all respondents it could be interpreted whether they think attention for the problem of degradation is important. They either talked in a neutral way about changes in the environment and did not seem to perceive it as influencing their daily life, or they did not recognize degradation happening in their environment which says nothing about whether they would find it an important problem if they recognized it. Therefore 22.2% of the respondents were given a neutral score.

Table 28 shows that again, overall, males (48.5%) agreed more strongly. The majority of the females agreed with 53.3%. Within the youth group the relative percentage of males that agree with the statement, is the highest. The females in this group show equal percentages for the “neutral” and “agree” score (44.4%). The adult group complies with the overall trend of men agreeing more strongly (56.3%) and the majority of women ‘just’ agreeing (62.5%). In the elderly group, both a relative majority of males and females agreed strongly with the statement (62.5% and 60%). Again, overall, the elderly group had the highest relative percentage of respondents who agreed strongly that degradation deserves attention.

Env. Degradation perception 2		Male	Female	Total
Youth (0-29)	Neutral	1	4	5
	%within gender	11.1%	44.4%	27.8%
	Agree	6	4	20
	%within gender	66.7%	44.4%	55.6%
	Strongly agree	2	1	3
	%within gender	22.2%	11.1%	16.7%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Neutral	4	5	9
	% within gender	25%	31.3%	28.1%
	Agree	3	10	13
	% within gender	18.8%	62.5%	40.6%
	Strongly agree	9	1	10
	%within gender	56.3%	6.3%	31.3%
	Total	16	16	32
	% within gender	100%	100%	100%
Elderly (60+)	Agree	3	2	5
	% within gender	37.5%	40%	38.5%
	Strongly agree	5	3	8
	% within gender	62.5%	60%	61.5%
	Total	8	5	13
	%within gender	100%	100%	100%
Total	Neutral	5	9	14
	% within gender	15.2%	30%	22.2%
	Agree	12	16	28
	% within gender	36.4%	53.3%	44.4%
	Strongly agree	16	5	21
	% within gender	48.5%	16.7%	33.3%
	Total	33	30	63
	% within gender	100%	100%	100%

Table 28: Cross tabulation of environmental degradation perception statement 2 with gender and age groups

Spearman's Rho test for this statement showed a significant positive correlation with age ($R_s=0.37$, $n=63$, $P<0.003$). There is no significant correlation between statement two and the highest level of education. Like the first environmental degradation perception statement, there is a significant positive correlation with wealth categorization ($R_s=0.30$, $n=63$, $p<0.019$).

The respondent thinks he or she is contributing to environmental degradation

As discussed in chapter 4, the main manner in which inhabitants are contributing to environmental degradation in the Weto Mountain Range, is through overuse of the land, the misuse of chemicals, the felling of trees, burning of the forest and refuse and pollution of the land and water. As mentioned before, not many respondents who were using chemicals, burning trees or farming on the same piece of land over and over, were interpreted to recognize that they themselves contributed to the reducing fertility of the soil. For the third statement, 69.8% was interpreted to disagree, 27% was interpreted to agree and 3.2% was interpreted to strongly agree. Every respondent who used chemicals, was asked whether he or she thought that it would impact influence on the soil, the crops or the land. Most of the respondents who did not think they were contributing to environmental degradation, answered no to this question. Ane respondent does not think the using of weedicide has any effect on the soil or the environment: *"no no no. They rather develop the crops"*. Another farmer says: *"weedicide drowns into the soil and makes it fertile"*. There were also respondents who never had the option of using chemicals and thus did not contribute to environmental degradation in their view: *"In my time there wasn't anything like chemicals in farming"*.

It must be emphasized that the use of chemicals does not necessarily degrade the soil, it is the over use or indiscriminate use that causes harm to the environment. In paragraph 4.5, several studies were shown that state that this misuse of chemicals is taking place in large numbers in Ghana. In reports from local government entities and NGOs it becomes apparent that this is also the case for the Weto Mountain Range. There was only one respondent who recognized that whether chemical use contributes to degradation depends on the amount that is used: *"Yes it does influence the soil, if improperly applied, there are a lot of farmers who are ignorant, they just buy it, and they don't read and understand its application. So somebody can give overdose, just to kill the weed quickly, but that is not it and eventually you will see it weakens the soils fertility, there are proper ways. When you are educated and you apply it well, the grass dries gradually"*.

Table 29 shows that overall, both a majority of males (60.6%) and of females (80%) were interpreted to disagree with the statement that they are contributing to environmental degradation. The distribution of the score for the youth group is in line with this overall average with 66.7% of the men and 88.9% of the women disagreeing to the statement. This also accounts for the adult group, however for the men this majority is not as large because there is also a relative percentage of 37.5 that agreed. This is also the case for the elderly, even with the same percentage. Again, the elderly group had the highest relative percentage of respondents who agreed strongly. However, this represents only one respondent. For age, the highest level of education and the wealth categories, there are no significant correlations with the score for the statement according to Spearman's Rho.

Env. Degradation perception 3		Male	Female	Total
Youth (0-29)	Disagree	6	8	14
	%within gender	66.7%	88.9%	77.8%
	Agree	3	1	4
	%within gender	33.3%	11.1%	22.2%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Disagree	9	12	21
	% within gender	56.3%	75%	65.6%
	Agree	6	4	10
	% within gender	37.5%	25%	31.3%
	Strongly agree	1	0	1
	%within gender	6.3%	0%	3.1%
Elderly (60+)	Disagree	5	4	9
	% within gender	62.5%	80%	69.2%
	Agree	3	0	3
	% within gender	37.5%	0%	23.1%
	Strongly agree	0	1	1
	% within gender	0%	20%	7.7%
Total	Disagree	20	24	44
	% within gender	60.6%	80%	69.8%
	Agree	12	5	17
	% within gender	36.4%	16.7%	27%
	Strongly agree	1	1	2
	% within gender	3.0%	3.3%	3.2%
	Total	33	30	63
	% within gender	100%	100%	100%

Table 29: Cross tabulation of environmental degradation perception statement 3 with gender and age groups

Some of the respondents who agreed mentioned negative consequences of chemical misuse. Different influences passed in review such as rotting crops, disappearing of mushrooms and snails and new resistant weeds coming up: A woman explained: *“Yeah, I think the chemicals are destroying the land. In the sense that first when we grew cassava, it can take three years in the land and nothing will happen. But now within the year, if you don't uproot the cassava or harvest it, it will get rotten”*. Another farmer described: *“yes. In the negative way, like using agrochemicals, spray is beating the land degradation, erosion is taking place. And also in the olden days, here you can get fresh mushrooms, but due to the spray I think it has reduced the mushrooms and also we had a lot of snails here, but due to the use of the agrochemicals, we are killing the living organisms. Also, the fertility of the land, it has reduced, because we are killing the natural organisms”*. According to another respondent it also influences the weeds; *“The first thing that the chemical does on the land is that when you spray there are some places that are a particular kind of weed that goes there, but when I start spraying, those kind of weeds germinate there and they become resistant so it is difficult to get rid of them. The second thing is that it destroys the fertility of the soil and when we grow our crops, we don't get the same yields as before”*. In these answers it seems like there is a strong idea that the

use of chemicals is the sole explanation for the decreased quality of the soil. As with the earlier mentioned view of the felling of trees as a sole reason for climate change, this partly can be attributed to education and awareness education activities in the area. These mostly focus on what the inhabitants should change and not on what other factors are at stake. Reducing soil quality can also be a consequence of other processes but that barely seems to be in the mindset of people.

Next to the use of chemicals, in some cases, respondents practising 'slash and burn' did recognize their contribution: *"there are living organisms in the soil that fertilizes the land, naturally. So when you burn it, you destroy everything so you are taking away the fertility"*. In the theoretical framework, it was established that in the case of the Weto Mountain Range inhabitants, practises of 'slash and burn' are harmful because of their dependence on the soil and forest for their livelihoods. Through consequences of carbon loss and soil exhaustion, it has a negative effect on crop yield in the long term (Boakye-Danquah et al., 2014). Respondents also acknowledged that felling of trees has negative consequences for the environment, but stated that it was necessary nevertheless. A woman explained: *"in my view I think my daily practises certainly have effect on the trees. We have to fell the trees to do the farming. That happens, but we have to clear small portions to farm on"*. Among the respondents there was one person who admitted that he was an illegal chainsaw operator. He seemed to be conscious about the negative effects of his practises, but he was not very talkative: *"Q: Do you feel that your work as a chainsaw operator and all the construction work that you are doing, do you think that it has any influence on the natural environment? A: Yeah. Q: Can you please tell us? A: No"*. Over-cultivation of the land was also mentioned as a contribution to environmental degradation. A respondent explained: *"At first the land was very fertile, but because we have been cultivating it continuously without leaving it to fallow, it has now lost its fertility and so fertilizer application is one of the things that we have been using to regain its fertility"*.

In addition, there were also respondents who did not seem to think that they themselves were contributing to degradation, but they did mention the contribution of others. The most common example of this is the felling of the trees by the chainsaw operators as well as the use of chemicals in some cases. A farmer expressed: *"n the time I was actively farming, our method of farming as compared to now, I think was the best, because when we were farming then, we would go to the farm, we use a cutlass to weed and every three years we leave the land to fallow, before another time we come and farm. But now I have heard that, there is something you can use to kill the weeds and people are just using that indiscriminately and it is really destroying the land. So to me the way we were farming then, that should have been the way farming should continue"*. Another elderly man agreed: *"since these unauthorized chainsaw operators are cutting those big trees, the rainfall pattern in the environment has changed due to the degradation of the forest, deforestation"*. In paragraph 4.5 it was established that it are mainly locals who are directly involved in chainsaw operations. They are not working on request, but rather locally sell timber to carpenters and markets and on a bigger scale to commercial and outside actors such as furniture companies and even government projects (Obiri & Damnyag, 2011; M. Agba, personal communication, June 25, 2015).

The respondent thinks environmental degradation is influencing his/her daily life

An indication of the influence of environmental degradation in the daily lives of the respondents turned out to be the fact that the forest no longer provides the windbreak as it used to. For this statement, 47.6% was interpreted to agree, whereas 12.7% was interpreted to strongly agree. The latter score was given to respondents who gave accounts of severe consequences and adaptation methods. One respondent highlighted: *“but now there is so much felling of trees in the forest and the function that the forest performs, it is no more performing that function. I know that when the forest was here at first as it used to be, when it rained and there was so much rain and wind storm, we still did not feel it. But now any time it rains and the windstorm is so hard. Even our roofing feels as though it wants to fall off”*. Several respondents complained that due to the felling of the trees, more rain was coming down the mountain and washing the topsoil away. This was pointed out by a respondent claiming that: *“at the mountain side we have been told that, at the mountain crest we shouldn't fell trees there, but people are doing that, so because of that when it rains, the rain runs all the way down and washes the topsoil. Because of that effect farming there is not very good”*. One man had found a simple way to adapt to this problem (see photo 16):



Photo 16: Adaptation method: studding of a plantain tree

“ When I get to know that this washing is what is happening, I take four sticks, in case plantain bears fruit, I use them to stud it. I use the stick that has two ends and I use it to block the tree”.

Another influence on the daily lives of respondents that passed in review several times was the lack of shadow these days because of the excessive felling of trees. A farmer described his grievance as: *“what I will say that when I go to farm, I don't want to be burned by the heat of the sun, but at the place that I am farming now, they have been felling the trees and so there is so much sunlight and the sunlight even burns the crops and it dies out. The trees are not there to provide shade for our crops, they are just in the open”*.

Table 30 shows that overall, both a majority of men (48.5%) and of women (46.7%) was interpreted to agree with the statement about the influences on respondents’ daily lives. The relative percentage of men that strongly agreed is higher (21.2%) than that of the women (3.3%). In contrast with the overall average, in the youth group both males and females have the (same) highest relative percentage (55.6%) for the score of “disagree”. The distribution of the scores in the adult group is in line with the overall average with the highest relative percentage of 62.5 for men and 43.8 for women for the score of “agree”. For the elderly this is also the case with relative percentages of 50 and 60. Overall the elderly group relatively had the most respondents who strongly agreed that degradation is influencing their daily life. For the fourth statement there was no significant correlation with age, the highest level of education or wealth categorization.

Env. Degradation perception 4		Male	Female	Total
Youth (0-29)	Disagree	5	5	10
	%within gender	55.6%	55.6%	55.6%
	Agree	2	4	6
	%within gender	22.2%	44.4%	33.3%
	Strongly agree	2	0	2
	%within gender	22.2%	0%	11.1%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Strongly disagree	0	2	2
	% within gender	0%	12.5%	6.3%
	Disagree	3	7	10
	% within gender	18.8%	43.8%	31.3%
	Agree	10	7	17
	% within gender	62.5%	43.8	53.1%
	Strongly agree	3	0	3
%within gender	18.8%	0%	9.4%	
	Total	16	16	32
	% within gender	100%	100%	100%
Elderly (60+)	Disagree	2	1	3
	% within gender	25%	20%	23.1%
	Agree	4	3	7
	% within gender	50%	60%	53.8%
	Strongly agree	2	1	3
	% within gender	25%	20%	23.1%
	Total	8	5	13
	%within gender	100%	100%	100%
Total	Strongly disagree	0	2	2
	% within gender	0%	6.7%	3.2%
	Disagree	10	13	23
	% within gender	30.3%	43.3%	36.5%
	Agree	16	14	30
	% within gender	48.5%	46.7%	47.6%
	Strongly agree	7	1	8
	% within gender	21.2%	3.3%	12.7%
	Total	33	30	63
	% within gender	100%	100%	100%

Table 30: Cross tabulation of environmental degradation perception statement 4 with gender and age groups

Many perceived that the causes and consequences of environmental degradation have already served as justification for the scoring of the different statements. The main perceived cause of deforestation was the felling of trees, but another event that has had its impact in history was the bushfires of 1983. Yet, only a few of the respondents mentioned this event. One old man that remembered the event, explained: *“in the eighties, when the bushfires happened, our forest got deforested”*.

Sand winning was also mentioned a few times as a cause of degradation. A young man described: *“no one really cares about what happens and sometimes there is so much sand winning and people will go and excavate the place, when it rains, water piles up in it and there are so many mosquitoes around just because of one persons activity.”* Sand winning is mostly driven by companies, locals are only involved in helping to excavate the sand or carry it to the truck for a bit of money.

As a consequence of environmental degradation, the disappearing of animals was also mentioned a few times. An elderly man explained: *“it is important because, if we keep felling the trees, the animals in the forest, they will all run away to a place where the forest is thick. Then next time if you get to that place too and we fell the trees there, they will also run away”*. Another respondent agreed: *“A: For some time now we are experiencing some sort of poor livelihoods as a result of deforestation and bush fires. Q:How are poor livelihoods a result of deforestation or bushfires? A: Some animals like parrot and other birds they live in tall trees so when the trees are not there they go to another location”*.

Erosion and washing away of the topsoil also passed in review as a consequence of degradation. A farmer expressed: *“I am farming close to where the mountain is and any time it rains heavily, the water washes from the top down to his farm so the speed of the water actually can wash the crops that I have planted. And even sometimes when the plantains are maturing to some point and they don't have their roots deep, the water can wash it and when the wind blows it can just go away. So he thinks that that is a form of erosion that is occurring on his farm”*. Another respondent explained degradation as *“that is destroying our own soil, we don't plant grass enough to hold the soil, which is not good for us. Because when the top soil is loose and the rains come, they just wash the topsoil away, which is the food for plants and trees. Which is very bad degradation for us”*. Examples of erosion also referred to the settlements in some cases. One respondents pointed at several houses of which only ruins remained (see photo 17): *“In land use she says she has realized that there is a lot of erosion, because all these places, they used to be buildings, and now it is not evident that they used to be”*



Photo 17: Remains of a house

Another respondent pointed out that more of the foundations of buildings is exposed, as the soil wears off (see photo 18): *“The land wasn't as high this, but now our buildings are going up, because the land is degrading, an example is, do you see this place, the level is now different from this level. So you go to your house at the point where it is a level ground but you get to a point where the building now gets up and then the land, it is low now”*.



Photo 18: Erosion in compound of a respondent

A perceived consequence that should be emphasized once more is the depletion of local water bodies (which is in itself also a form of degradation). Several respondents mentioned the lack of shade from trees over the water bodies as a cause for this, thus it is viewed as a consequence of forest degradation. An elderly farmer explained: *“at that time we had a stream, we didn't even had pipe that is where we fetched their water and then we still had a continuous flow of water, but now because they have felled all the trees along the streams, the streams are all drying. Unlike how it used to be in our days, this community has so grown it is no longer like that. And one of the things that I really feel is causing this is the human beings themselves. They are making it that the way everything used to be at first it is no longer like that. Now if the sun shines a little, the streams are all drying.”*

In sum, in line with the ratio knowledge-perception of climate change, despite the overall little knowledge of meaning of the concept of environmental degradation, many have seen changes that have happened in their environment. In general females had less accurate knowledge on the concept than men. Again, the elderly age group overall had more knowledge on degradation, however there was no significant correlation with age. Knowledge of environmental degradation and the highest levels of education of the respondents correlate significantly and positively. More men than women strongly agreed that environmental degradation has been taking place. Striking is that the scoring for this first perception statement significantly shows a positive correlation with the wealth categories of the respondents. Perceptions on what the changes look like are closer than for climate change, with the main change being the decreasing density of the forest. This is due to the severe consequences such as roofs blowing away and adaptations such as the replanting of trees. The majority of the respondents was interpreted to view environmental degradation as a problem that deserves attention. Again, more men agreed strongly on this. The latter statement also showed a significant positive correlation with both age and the wealth categories of the respondents. The majority of the respondents did not seem to perceive themselves as contributing to degradation in the area, but those who did, mainly focused on chemical use, burning and over cultivation. Both a majority of men and women did not agree with the statement of them contributing to degradation in the area. The main perceived influences on the daily lives of the respondents, turned out to be the changes in the windbreak, the washing away of crops and the lack of shade. Both a majority of males and of females perceived environmental degradation as having influence. Overall, the elderly age group had the most respondents who agreed strongly on all four statements. Other important causes of environmental degradation were mainly perceived to be the cutting of trees by chainsaw operators, the bushfires of 1983 and sand winning by companies. Overall, erosion and the depletion of local water bodies were perceived as the key consequences.

5.1.4 Meaning and implementation of sustainable development

In some cases, respondents claimed to know the concepts they were asked about and seemed to try to self explain. This may have been so, because they did not want to show a lack of knowledge. Although, this lead to some special definitions of sustainable development. A traditional Chief explained: *“the example I can give to support this is, if I want to marry you I go to your fathers, take the list of the marriage than I perform everything that I have to do. So when you come to me, it means you are there forever”*. When looking at the Ewe translation, this answer can very well be understood. Sustainability was explained in Ewe as ‘wa lebe ne nade ne walike’ which when directly translated means ‘to take care of something so it lasts longer’ and this sentence could also mean ‘to maintain something’. In some cases understanding of the Ewe words came very close to the

definition used in this thesis: a woman described: *“my understanding of it (the Ewe version) is something you would do, so it will be there forever and it wouldn't spoil that is sustainability. My understanding of sustainable development, the first example is in terms of the forest, I mentioned that the felling of the trees is no longer providing wind break and so if those things are happening and the forest can no longer provide that service to us. Then it means that the forest is not sustained and then the other one, is the land. In the sense that, now there is so much use of chemicals. The land is not sustained, the second thing is that even though the use of the chemicals is reducing our effort and our work. I still think that it will not help the land to be sustained, so for me, that is how I would be able to explain in it in my two sentences”.*

This respondent received the knowledge score of “extensive accurate knowledge”, while the score of “little accurate knowledge” was for respondents who answered in the line of maintaining for future generations and did not have any further examples. Of the respondents, 30.6% had little accurate knowledge, whereas 3.2% had extensive accurate knowledge. To make sure less talkative respondents also showed all of their knowledge, several specific questions about causes and consequences were asked when a person did not mention this initially. Two respondents only knew the English word of sustainable development. One of the respondents demonstrated to explain: *“ I have an idea about sustainability. It is to sustain the land, like we have in our environment here, we have the natural resources over here. Like timber, like odum, mahogany and so forth. But we used to cut them and destroy them, but we did not sustain them. To sustain something, to let it live long. I think that is the word by my little knowledge. What I want us to do, as I have said, we have to go into new technology of farming, so that we can sustain the land. So that we can destroy degradation. Also we have natural resources like timber and other things, we have to develop some technology or some plan to sustain them, so that our children that will be coming will also use it”.*

A majority of 66.1% had did not show knowledge of sustainability and sustainable development at the time of the interview.

Table 31 shows that in general, both men (60.6%) and women (72.4%) had the highest relative percentage for “no accurate knowledge” on sustainable development. The youth group shows an equal distribution of knowledge among gender with both having a relative percentage of 77.8% that had no accurate knowledge and of 22.2% that had little accurate knowledge. In the adult group the males were more divided among the different categories with 43.8% having no and little accurate knowledge and 12.5% having extensive accurate knowledge. The females had a majority of 75% that did not have accurate knowledge. In the elderly group the males have the highest relative percentage representing those with no accurate knowledge (75%), whereas the females have an equal distribution of 50%-50% for no and little accurate knowledge. Overall, the adult age group had the highest relative percentage with respondents who had extensive accurate knowledge. Spearman’s Rho showed no significant correlation between knowledge score and age, but it did show correlation with the highest levels of education of the inhabitants ($R_s=0.42$, $n=62$, $p<0.001$). There was no significant correlation with the wealth categories of the respondents.

		Male	Female	Total
Knowledge score of sustainable development				
Youth (0-29)	Has no accurate knowledge	7	7	14
	%within gender	77.8%	77.8%	77.8%
	Has little accurate knowledge	2	2	4
	% within gender	22.2%	22.2%	22.2%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Has no accurate knowledge	7	12	19
	% within gender	43.8%	75%	59.5%
	Has little accurate knowledge	7	4	11
	%within gender	43.8%	25%	34.4%
	Has extensive accurate knowledge	2	0	2
	% within gender	12.5%	0%	6.3%
	Total	16	16	32
	%within gender	100%	100%	100%
Elderly (60+)	Has no accurate knowledge	6	2	8
	% within gender	75%	50%	66.7%
	Has little accurate knowledge	2	2	4
	% within gender	25%	50%	33.3%
	Total	8	4	12
	% within gender	100%	100%	100%
Total	Has no accurate knowledge	20	21	41
	%within gender	60.6%	72.4%	66.1%
	Has little accurate knowledge	11	8	19
	%within gender	33.3%	27.6%	30.6%
	Has extensive accurate knowledge	2	0	2
	% within gender	6.1%	0%	3.7%
	Total	33	29	62
	% within gender	100%	100%	100%

Table 31: Cross tabulation of knowledge score of sustainable development with gender and age groups

The respondent thinks that sustainable development deserves attention

Whether or not after explanation of the concept of sustainability, 39.7% was interpreted to agree with the statement, whereas even 55.6% was interpreted to strongly agree. There was only one respondent who did not really seem to care, she received the score of disagree. She said: *“because I am farming I wouldn’t have time to learn”*. After giving their definition, or after receiving explanation, respondents were asked whether they think sustainable development is important. If they answered yes, they were asked why. The score was mostly based on the reasons that they gave and the passion and tone they used to convey their message. When not giving any reason or little reason, they received the score of “agree”, whereas extensive reasoning and passion led to the score of “strongly agree”. There was one respondent who had quite extreme reasoning has compared to the others: *“the reason why it is important is, without that, our people haven't got any future. Let's say the Sahara desert, in millions of years back that vast land was a farming land, but because of such practises, it has become waste land. And if we want our land to be sustained, than we have to practice good business to maintain it”*. There was also a farmer who formulated his reason for why he thinks cacao is sustainable in a poetic way: *“The cassava will finish, the plantain will finish, but the cacao will be there”*.

Ensuring natural resources for children or new generations were often mentioned as a reason for the importance of sustainable development: A respondent argued: *“it is important because generations after me can also benefit from what is existing now. In planting cacao, it will stay for a longer time and I will benefit, and my children too will come and benefit”*. A young man explained: *“those who are living right now, by all means they will give birth, and if they give birth, they will take care of their children, so how their children are growing, and maybe the time they will grow, those people too will get old, so the children too will feed on those things, so they will be continuing those 'still”*.

Table 32 shows that a majority of the males was interpreted to agree strongly (66.7%) and a majority of the females was interpreted to ‘just’ agree (46.7%) that sustainable development deserves attention. In the youth group both men and women have the highest relative percentage representing the category of “strongly agree” (66.7% and 55.6%). The adult group is distributed in line with the overall average, with 68.8% of the men who agreed strongly and 56.3% of the women who ‘just’ agreed. Like with the youth, in the elderly group both men and women have the highest relative percentage representing the category of “strongly agree”. Overall, the elderly age group had the highest relative percentage of respondents who strongly agreed, closely followed by the youth age group. Spearman’s Rho does not show any significant correlation between the first statement and age, the highest levels of education or the wealth categories of the respondents.

Sust. development perception 1		Male	Female	Total
Youth (0-29)	Agree	3	4	7
	%within gender	33.3%	44.4%	38.9%
	Strongly agree	6	5	11
	%within gender	66.7%	55.6%	61.1%
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Disagree	0	1	1
	% within gender	0%	6.3%	3.1%
	Agree	5	9	14
	% within gender	31.3%	56.3%	43.8%
	Strongly agree	11	6	17
	%within gender	68.8%	37.5%	53.1%
	Total	16	16	32
	% within gender	100%	100%	100%
Elderly (60+)	Agree	3	1	4
	% within gender	37.5%	20%	36.4%
	Strongly agree	5	2	7
	% within gender	62.5%	40%	64.6%
	Total	8	3	11
	%within gender	100%	100%	100%
Total	Disagree	0	1	1
	% within gender	0%	3.3%	1.6%
	Agree	11	14	25
	% within gender	33.3%	46.7%	41%
	Strongly agree	22	13	35
	% within gender	66.7%	43.3%	57.4%
	Total	33	28	61
	% within gender	100%	100%	100%

Table 32: Sustainable development perception statement 1 cross tabulation with gender and age groups a g e

The respondent thinks he or she is already practising sustainable development

Answers to this statement showed a majority perceiving themselves as practising sustainable development (whether or not after explanation of the concept). 41.3% was interpreted to agree and 12.7% was interpreted to strongly agree. The latter score was given to respondents who gave extensive examples on their practises of sustainable development as compared to answers given by respondents who received the score of agree. A few common examples given was the fact that the respondent didn't use any chemicals. A woman explained how she is practising sustainable development in her garden *"I am practising it in my garden, my small garden, I have decided not to use any chemicals on the land, so that my crops will not be destroyed and the land will still maintain its fertility, so I can constantly use it"*. Another respondent used both the non use of chemicals and shifting cultivation as an example: *"the fertility, I don't apply fertilizer, so when I farm here I leave it for another five, six years, so it will gain its fertility, than I will shift to another place"*.

Next to that, the planting of trees was also mentioned several times. A respondent said: *"there is a tree planting exercise going on in the community and because of the future when I cannot be working, I have decided to partake in the planting"*. A member of the CREMA committee told about his activities: *"We are trying to create regeneration of the trees. We realized that for our stream, for the portions that were in the community, we didn't really have water flowing there, but for other areas where there were trees, the water was there. So we realized that if we would create that environment for the water body in our community than it would be restored"*. In addition to the planting, respondents claimed they were practising sustainable development by not felling trees or by protecting trees in their farm. One respondent explained: *"I have some small trees in my farm and I leave them so that they will grow for me for future"*. Another respondent points out how his activities have a positive impact on the environment: *"I think it affects it positively because when we farm and we see a tree species on the land, we protect it and we let it grow, we don't cut it down"*.

Moreover, there were also some examples of practises of sustainable development that were only mentioned once or twice, such as maintenance of a sewing machine: *"I have been lubricating my machine. So I think that is a sustainable way of maintaining my machine"*; irrigation: *"I am practising sustainable development in my farm because there is a portion of my farm, where I have dug and I store the stream there as a reservoir, that I use for irrigation"*; fire belts: *"In the Harmattan season we set fire belts so that if there is wildfire it will not burn our farms"*; blocking erosion: *"yes, for instance we farm on the mountain crest, at a point in time, we realized that there was erosion, when it rains, it washes the farm and so we blocked the way for erosion not to occur"* and shifting cultivation: *"the way I am doing my farming, I think it is sustainable because I don't farm the entire land at the same time. I farm a small portion and then I leave the other portion. And then she will go to the other portion and then leave that one"*.

Also, it is expected that some of the respondents who claimed to practice sustainable development, but couldn't mention any examples, just claimed so, because they thought that was an answer we wanted to hear. They still received the score of agree, as that is their perception. A woman could not explain how, but she said she was practising sustainable development *"Q: Do you think that you are already carrying out sustainable development in your farming? A: yes. Q: Can you give an example? A: I don't have any reason why, but I am practising it"*. This was only the case for a few respondents.

However, there were also some respondents who acknowledged that they were not practising any form of sustainable development (yet). Namely, 39.7% was interpreted to disagree, whereas 3.2% was interpreted to strongly disagree. Mostly, the answer was just a short no, upon which the score of “disagree” was assigned, this was also the case for short reasoning. A woman explained: *“I don’t think I am practising it because of the weedicide I am using in my farm”*. Extensive reasoning led to the score of “strongly disagree”, like was the case for this respondent: *“I have identified that on my own I want to practise sustainable development, but the challenges of money to invest in my work so that it can reap benefits for my family is what I am handicapped with”*. Another respondent who also received the score of “strongly disagree” explained: *“Let me say, the case of using the chemicals is not good. Because when the time should come and then the soil will be not be fertile for someone to farm”*.

With regards to the statement of the inhabitants themselves practising sustainable development, table 33 shows that for both men and women a small majority agreed (42.4% and 50%). Again the youth displays an even distribution amongst gender, with both having a relative percentage of 77.8 representing the category of “disagree” and a relative percentage of 22.2% in the category of “agree”. Also, the adult group is again distributed in line with the overall average. A majority of 43.8% males agreed with the statement and this is also the case for 50% of the adult females. The elderly have their majorities in the same category, with 62.5% of the elderly males and 66.7% of the elderly females who agreed. Overall, the adult age group had the most respondents who agreed strongly that they are practising sustainable development. Spearman’s Rho showed that the second statement positively correlates with age ($R_s=0.44$, $n=63$, $p<0.001$) but not with the highest levels of education or the wealth categories of the respondents. The positive correlation of practises of sustainable development with age could be explained by the fact that most of the examples of sustainable practises were done by farmers. And that most of the farmers are either in the adult or elderly age group.

Sust. development perception 2		Male	Female	Total
Youth (0-29)	Disagree	7	7	14
	% within gender	77.8%	77.8%	77.8%
	Agree	2	2	4
	%within gender	22.2%	22.2%	22.2 %
	Total	9	9	18
	% within gender	100%	100%	100%
Adult (30-59)	Strongly disagree	1	1	2
	% within gender	6.3%	6.3%	6.3%
	Disagree	4	4	8
	% within gender	25%	25%	25%
	Agree	7	8	15
	% within gender	43.8%	50%	46.9%
	Strongly agree	4	3	7
	%within gender	25%	18.8%	21.9%
	Total	16	16	32
	% within gender	100%	100%	100%
Elderly (60+)	Disagree	3	0	3
	% within gender	37.5%	0%	33.3%
	Agree	5	2	7
	% within gender	62.5%	66.7%	77.8%
	Strongly agree	0	1	1
	% within gender	0%	33.3%	11.1%
	Total	8	3	9
	%within gender	100%	100%	100%
Total	Strongly disagree	1	1	2
	% within gender	3%	3.6%	3.3%
	Disagree	14	11	25
	% within gender	42.4%	39.3%	41%
	Agree	14	12	26
	% within gender	42.4%	42.9%	42.6%
	Strongly agree	4	4	8
	% within gender	12.1%	14.3%	13.1%
	Total	33	28	61
	% within gender	100%	100%	100%

Table 33: Sustainable development perception statement 2 cross tabulated with gender and age groups

In sum, despite the overall limited knowledge among both men and women on the concepts of sustainability and sustainable development, many respondents deemed it to be important. Overall, the adult age group had the highest relative percentage with respondents who had extensive accurate knowledge on sustainable development. The highest levels of education of the respondents correlate positively and significantly with the knowledge score of sustainable development. More men were interpreted to agree strongly that development deserves attention, whereas more women interpreted to ‘just’ agree. Overall, the elderly age group had the highest relative percentage of respondents who strongly agreed, closely followed by the youth age group. In line with the definition given in this thesis, a common reason was about the acknowledgement of the children and future generations. A majority perceived themselves as practising sustainable development (both a majority of the men and women), mostly by planting, not felling and protecting trees, but other examples passed in review as well. The rest acknowledged that they were not (yet) practising sustainable development, for which the most common reason was due to the use of chemicals in farming.

Overall, the adult age group had the most respondents who agreed strongly that they are practising sustainable development. There was a positive correlation of practises of sustainable development with age, which could be explained by the fact that most of the examples of sustainable practises were done by farmers.

5.2 FUTURE (GENERATIONS)

As discussed in chapter 2, when looking at the locals' perceptions towards climate change, environmental degradation and sustainable development, decision-making plays an important role. In order to get more insights into the perceptions among the respondents towards sustainable development, it is important to investigate their vision for the future. Many youth have been leaving the rural areas to go to the cities, what are the reasons behind this? What changes are necessary for the future? What would a better or sustainable future look like? In chapter 2, for the dimension of 'Future (generations)' the following indicators were discussed: (1) 'Are youngster planning on staying'; (2) 'What changes are necessary' and (3) 'What would a sustainable future look like?'.

5.2.1 Youngsters staying or going

Each young respondent was asked whether they were planning to stay within the community after finishing school and whether they thought their friends would. Older respondents were asked about their (grand) children and about the youth of the community in general. Overall, the youngsters indicated they wanted to leave. A young girl explained: *"I want to go and work. Any place but not this town. Because we don't have any work here"*. Even several parents did not want their children to stay. *"Q: And after they supposedly finish university, do you think, they themselves want to come back or do they want to go somewhere else? A: No I would not like that. Q: Why not? I believe they might be working too. So that work is not here, because we are farmers and traders"*. It happened several times that respondents laughed when answering whether youth wanted to stay or go into farming, as if the question was strange. The main reason for the youth leaving was in search for job opportunities. A young man described: *"okay now, those who are in my age, my age mates, I may say almost all of them, they are planning to leave this place because there is no job here. So it is only that if you travel that you will get a job to do. They will travel to cities because, we move from chop box (trunk) to briefcase"*. Respondents claimed there was hardly an opportunity to find a job in the communities. *"Q: This hanging out, do you do this every day? Or is it sometimes during the working days? A: We meet here almost all the time. It is because most of them do not have something going"*. This creates difficult situations for the youth that are at home, increasing the need to leave: *"There are a few ones who are staying in the community, but even those ones they are having it difficult to make ends meet"* *"She says it is because if the child comes here, the father won't be able to take care of her"*.

The only thing that is perceived to be available in the communities is farming, which is not something most of them want to pursue. A young woman explained that farming does not provide social security: *"Q: Would you be interested to go into farming? A: (laughs) no. Q: Why not? A: I think if I should start farming now, I will become a farmer and I don't want to become a farmer. I think that if I become a farmer and it gets to a point where my strength can no longer take me to the farm, I wouldn't have the resources to support myself, but if I am doing the white collar job, then I can get pension and social security"*. A group of girls also laughed when they explained their answer: *"(laughing) How can you complete school and be farming? We would like to do a white collar job,*

because in terms of farming, it is not all the time that when you go into farming, that you can get what you really want. Because if you think about how much you have invested into your education, and you go into farming, you feel it doesn't pay that much".

While the youth claimed not wanting to farm because of the more money and other advantages that come with a white collar job, the elderly seemed to mostly view the youngsters as undisciplined or spoiled. An old man explained: *"no no no they would not like to stay here o, because there is no work. They don't like farming! They are very lazy".* Another respondent gave the same answer: *"and the work here is farming, but most of them don't want to go into farming because of laziness. And the big man there added they don't listen to their parents".*

Some respondents did think that if it would be possible to do farming in a more modern way, more youth would be willing to stay. However, the elder respondents only mentioned this. A respondent expressed: *"I think that if there are modern ways of farming, besides our cutlass and hoe and the manual one, they might want to stay. But now with the current way that we are farming, I don't think that they would want to go into farming".* A woman mentioned mechanization: *"With the current system of man power, I don't think they will go into farming. But if there could be any support so that we will have the mechanized way of farming, they will be willing to go into work, so they wouldn't have to use so much manpower".*

According to this, it was perceived that the creation of (other) job opportunities in the rural areas would make more people want to stay. A man explained: *"They would like to stay, if the help and the opportunities that they want, that they are seeking outside, is available for them in the community".* Another respondent pointed out what kind of job opportunities would be good: *"I think that if there is job opportunities, a lot of changes will come. For the women, sowing and hairdressing is mainly their work and so they travel and they realize they get pregnant, so if there is any kind of entrepreneurship or any business that the young ladies can go into, that will help them".* Some youth even said that they wanted to stay if there would be work in the community, however only a minority seemed to share the same thoughts: *"if an opportunity should come, I would like to stay, because I like this village".*

The situation in the city is not perceived to be a good one by everybody. Elderly respondents often had critical opinions: *"And then at the end they become thieves and the reason is that if they go, the jobs are already choked so they are not employing them. So if they find themselves in scattered clothes and they want the best for themselves so they have to find every possible means to get what they want. So at the end they will end up stealing".* But according to the youngsters themselves there is more to the city than white collar jobs: *"to feel comfortable with these, our modern gadgets. Fridges, the cars, the gas cookers, those things which they feel makes life more comfortable".* Another young man explained: *"if we talk about social life, maybe we work from Monday to Friday, Saturday we really need to enjoy ourselves, maybe we go to the beach, we go to the drinking spot, we go to clubs, those things makes it difficult for people who are there to come back".*

Another important influence in the decision-making of the youth, seemed to be status. Even if the situation in the city does not turn out to be all that great, people don't want to return. In the focus group with a youth drumming and dancing group, people stated that it was only jobs luring youth to the city, that apart from that they have everything they need and that youth even would prefer to make them stay. A villager emphasized this as, *"we also have them here, electricity we have it here, water we have it here, if we want to have entertainment, we have cultural groups displaced here that*

we can use to entertain ourselves, we can just sit here and entertain ourselves like the life you can have in the city". However my interpreter told me afterwards, that there had been an intense discussion when I asked why people were not coming back if things did not work out in the city. Apparently, one man started telling that indeed it is because of the image and status, and that even sometimes parents had to go to the city to chase their kid and bring it back to the village. A statement made by that man is often a sensitive topic for the communities, when being asked. Several people protested and urged the interpreter to not translate such topics because it depicts them as not having an image and status. A Queen Mother from a different village was more honest about the importance of status: *"if somebody will be reluctant to come back, because they will ask me, hey you were in Accra, how come you have now come back to live in the village? Because people will laugh at him. So because of status, because of the image that you will have, you prefer staying there and be hungry, not able to make it".* Another respondent was also very honest: *"in terms of you asking maybe whether they would be mocked, is it the status. I think yes, because you claim you are going to the city, and now you are coming back with empty hands, you have nothing to show for leaving. So certainly people will mock you and they wouldn't want to go through that kind of humiliation".*

In conclusion there are several factors influencing the youngsters' decisions to leave for the urban areas. Perceived absence of job opportunities in the rural areas and perceived benefits of white collar jobs form the most important pull factors. The only perceived job in the rural area is farming and that is not something they want to be involved in. In addition, clubs and other facilities attract the youth to the city. With regards to not returning when things do not work out in the city, status loss seems to play an important role.

5.2.2 Changes & Sustainable future

Respondents were asked about two factors concerning the changes and sustainable future: one, for changes necessary for their future, and two, for the future of the entire community . Better futures ranged from more money to better health and good education for children. The support in the form of money was asked most frequently, like this respondent explained: *"Everything that you can do requires money. Even if I have to take care of my children I need to put money into my children. And right now I don't think that that money is there so I feel that if there could be any money from somewhere".* Thereby opportunities for entrepreneurship for making more money were also a popular answer: *"I think I can say that my future is bright if I am able to engage in any business that will yield more money for me that will take care of my child in school".* In line with this, opportunities for developments in farming frequently passed in review. People were willing to move to new crops and they often preferred cacao: *"she says she would like to do cacao farming".*

Support in farming was also often mentioned with regard to the changes necessary for a better future for the entire community: *" if an NGO can come in and give us money to invest into our farming and expand the farm that would also help the community".* A woman suggested the introduction of irrigation: *"In terms of farming, if we can have irrigation farming, which will help our work".* In addition, as discussed frequently in the former paragraph, the creation of job opportunities was mentioned often, as was the support for business:*"I feel this community would have a better future, if we could get support from an NGO, support that could provide us with the resources to expand their businesses".* One respondent came up with a solution for both unemployment and the problems of farmers not getting enough money for their crops because they are in abundance in

some periods. He described his vision as: *"I want to go into the processing, so that if I have my own small factory. When the season is bad and there is no market. So with this my objection is that when the season becomes like this, we can still grow the fruits and process it"*.

Next to money and support, the improvement or creation of basic facilities were also viewed to be important. Especially schools (on different levels) were often mentioned: *"The first and foremost for me is education, there is no senior high school in this community and I feel that, if there is senior high school where people can go. Even if you go to your farm you get cocoyam you roast it, you eat and you just run to the classroom and go and learn and come"*. Another respondent pointed at technical schools: *"we will need people who are interested in helping the youth, training them vocationally"*.

Improvement of water resources was also often emphasized: *"There is no water in the community. Sometimes the streams dry and the pipe also doesn't flow, so we really don't have any resources to depend on. So I feel that if there is water that can flow continuously that will help"*. Besides access to water, access to proper healthcare, fire service and roads passed in review. One respondent expressed: *"there should be a hospital, access to water and a fire service"*. Another respondent mentioned: *"we have a community at the down there, so we want to build a road that will connect us to that community"*.

A striking factor perceived by the communities for necessary change, was the change in mindsets of people. Some respondents mentioned that the 'unity' that characterized the communities in the olden days, is no longer around. A young man said: *"because if you are hard working and you are united. I hope anything you want to do you can do it easily. They need unity and hard work"*. An elderly man added respect to this: *for the community, all the time, they need to listen, respect their parents, all of us have to be one, united"*.

Only a few respondents mentioned anything about sustainable development and environmental degradation in their answers about a better future. One respondent explained: *"This one, as I said earlier on that the streams are dry. So we have to replant other trees and some other plants, so that it can change the environment"*. Another respondent focussed on cacao: *"when we can all establish better cacao farms, it will fetch enough water for their households and also if they are able to plant more trees for the future"*. This is logical, because when one feels like not having enough money to ensure basic needs, the first thing to come to is not the replanting of trees or similar activities.

Overall, the most mentioned necessary change for a better personal future, was money. This was followed by development opportunities for entrepreneurship and farming, which were also mentioned for the future of the entire community. In addition, a better future for the community would mean more and better basic facilities and a change in the mindset of people. Sustainability or concerns about environmental degradation were barely mentioned.

5.3 PAST LEARNING

In the theoretical framework it was stated that previous experience or past learning is an important concept in perception. *“Man reacts to his environment as he perceives and interprets it through previous experience and knowledge”* (Bunting & Guelke, 1979, p. 449). Past learning and knowledge emphasize the need to research the history of the subjects that the perception is examined of, whereas for this case about climate change, environmental degradation and sustainable development. For climate change, adaptations to changes in the climate over time can point at the influences of past experiences. Regarding to environmental degradation, the tradition of subsistence farming is of great importance, as land use has a big impact on degradation. How did people conserve resources in the past? For how long have they been dealing with the consequences of degradation? What lessons have they learned in the past and how have they adapted to this? These questions will be answered in 5.3.1.

Next to past learning through experience, insights into how and where people obtained their knowledge of climate change, environmental degradation and sustainable development are important. The former paragraphs showed that overall there was limited accurate knowledge of the concepts. However for those who did have accurate knowledge, it can be expected it does influence their perception on the concepts. As mentioned before, many answers showed awareness and education activities, especially with regards to the call for not burning of trees and the planting of trees. This will be further discussed in 5.3.2.

5.3.1 History of climate change, environmental degradation and adaptations

The perceptions of the history of climate change have been handled extensively in the first paragraph of this chapter. In what adaptations did learning from the past become apparent? An example is those farmers who shifted their period of planting one or two months ahead, as they experienced that the rainfall had changed over the years. Also there were farmers who decided to take a wait and see until it rains before planting, because they experienced that the rainfall had become unpredictable. One farmer adjusted his farming to the flowering of a mango tree and described his experience as: *“Nature has made some response, which corresponds with the weather. I per se, I base my farming activities on this mango; when it flowers you have to begin clearing, in two or three weeks time, the flowers will fall and the fruits will be shooting and in three months before the surviving fruits will stiff or stick, there will be a big rainfall after that, three months before they get matured and drop as ripe mangos, it will rain again. So it is my personal experience”*.

Another adaptation method showed that respondents have learned from the influence of the exposure of their crops to sunshine: the not felling of trees, because they can provide shade. A villager emphasized: *“because of the weather, I decided, at my cacao farm, we left some of the trees. We don't cut all. We leave them so that they can give more shade to the crops”*.

The main perceived change in the environment that was discussed in paragraph 5.2, is the decreasing density of the forest over the years. The main reason mentioned for this, was due to deforestation caused by human activities. However, as discussed in chapter 4, there was one event in history that caused major deforestation: the bushfires of 1983 as a result of extreme droughts. The fires caused vast changes in resource and land use as many farmers were forced to move away from cacao farming. An elderly villager vividly described his experience as: *“we had the first fire outbreak 1972 and then 1983, which has made the community poor”*. It is only today that some respondents claimed cacao is finding its way back again to the Weto Mountain Range (see photo 19): *“she says she has seen change in land use. The crops that they are planting now, they are planting cacao”*. This is partly being attributed to awareness raising about dealing with bushfires, the training of fire volunteers and a cacao pod distribution project by DI. Not only the diminishing of cacao was mentioned when respondents talked about the changes in crops over time. A farmer asserted his experience over the years as: *“we have some yam inside it is yellow, it is very nutritious, but today even when we are looking for them, they are scarce today to get it. Even the rice that I was talking about, we have the brown rice, it is very nutritious, but for about twenty years back they have stopped rice farming, because some time ago they did not encourage the youth to go into farming. You see that it’s only the old men that are in the community. So their strength has gone so they cannot continue with what they are doing”*. Another farmer mentioned plantain: *“the kind of crops people planted previously, they have changed their way of farming. Most people don’t plant plantains, they plant cassava and maize, but now most people are planting plantain”*. However, there is not a general change in crop production that can be deduced from the all the respondents’ answers.



Photo 19: A respondent filling bags with cacao seeds

People have not only seen changes in crop production on the farms, as new weeds have also developed according to some. Past learning experience shows that they attribute that to the coming of a new trend: the use of chemicals. A farmer explained: *“when they use it (weedicide) initially, it kills the weeds on their land, but the next year before you realize, there are more resistant weeds that grows. Even taller or faster than it used to be”*. Another farmer also mentioned the coming of new types of weeds: *“some places you go and weed after you finish farming there and you leave there for another place. The type of weeds which will cover the area, have not been seen here before. We don’t know where those weeds are coming from, though I know there is seed dispersal and all. There are some types of weeds and grasses which we have never seen in our area here before. But they are now*

here, because of the weedicides”.

Answers by respondents mentioning the history of the local water bodies, showed past learning experience by comparing the past to the present situation: *“as there was thick forest, there was the same stream, we call it Redi, but now because of the forest, by December or January the water will finish, but before it would be around throughout the year. It is my own experience, because from my childhood, the water was there all the time, but as the forest has been cut down, there was a shortage of water”.* Another respondent also mentioned the cutting of trees: *“because of the climate change you will see an operator cutting the tree along the stream, the bamboos, so during the rainy season you see that the stream dries very quickly. If not because of these boreholes, we wouldn’t have had water today, because in our time there were no boreholes, but the streams never dried”.*

The majority of the respondents perceived the land they are farming on as fertile.. Those who did not perceive so, talked about history of the fertility in a way that also shows past learning experience by mentioning causes. Mostly elderly people claimed that the ways of farming were better in ‘their days’: *“I feel that then, the land was very good, it was very fertile, but now we human beings, we think that pesticides and all those things and we are using that to destroy the fertility of the land. Meanwhile in my time, the land was okay, the way we farmed was okay. But now we are using our own farming practises to spoil the land”.* An old man mentioned that laws were better obeyed in the past; *“in his days, in the olden days, there were so much laws, in relation to when you go to the forest, how you should fell a tree and when you can fell a tree. But now there is a lot of lawlessness, people go into the forest at any time and fell trees. The forest used to be very thick and there are so many things that you can get in the forest, but now the forest has become a savannah”.*

Another trend that has developed over time, is over-cultivation, which was also sometimes used by respondents to compare the past and present situations: *“she says there have been changes in land use, the times that they had more land, they didn't cultivate the land for so long, but now the land is being cultivated over and over, so continuously and she thinks that there have been some changes”.* Another respondent told how people have stopped farming on the mountain: *“For the forest many people are not farming along the mountain, that is in terms of land use. And most people have moved from there to the savannah land, so we are farming there all the time and the land is being over-cultivated”.*

Furthermore, next to stories about the history of environmental degradation and resource use, adaptation methods to environmental degradation show indications of past learning. The main indicator that became apparent in the former paragraphs, are the answers that refer to the need for the replanting of trees. People have seen trees being felled extensively and they have also seen changes in weather, land and water bodies, changes that have had negative consequences for them , which therefore, need to be undone: *“he says they are trying to restore the forest into its previous condition”.* Another respondent pointed out a community tree planting exercise: *“the change that they have done, together with other people in the community is that they are planting trees so that the vegetation will be restored to its former state”.*

Apart from replanting, there were some technical adaptations mentioned in paragraph 5.2, such as studding of trees, digging a water reservoir and blocking erosion. All of these adaptation methods showed a response to experiences from the past.

In conclusion, past learning experience by the respondents showed in adaptation methods to climate change such as shifting of the planting season, or waiting with planting until it starts raining. With regards to the history of environmental changes, next to the most mentioned change of the density of the forest, the changing of crops production was mentioned. Apart from the moving away of cacao after the bushfires of 1983, there is no general change in crops that can be deduced from the respondents' answers. People have also seen changes in the weeds on their farms and attribute this to the use in chemicals. The drying up of their water bodies, they attribute to the felling of trees, because they saw that in the past when there were more trees, there was more water. Elderly often pointed out that agricultural practises 'in the olden days' were better, because they thought the fertility and quality of the soil was also better back then. The main indicator of past learning in adaptation methods to environmental degradation, was the perceived need for the replanting of trees, in order to get the weather, land and water bodies back to how they used to be in the past.

5.3.2 Access to knowledge

Knowledge of the definitions of the concepts of climate change, environmental degradation and sustainable development was low overall. However those who did have accurate knowledge, mentioned several sources through which they obtained this knowledge. School was mentioned most often, with different levels passing in review. According to middle aged respondent, he claimed: *“well, when we were in secondary school, I did science, I did chemistry and biology. And climate change too with physics”*. A young man explained: *“when I was in school, we were taught that the forest brings rain, so we were encouraged to grow trees”*. Another popular source was the radio, or among the respondents often referred to as the ‘wireless’: *“this climate change, I have been listening to radios, when I am in the farm, I have got my earpiece, so I listen to how programmes are going on”* In some cases television was mentioned as well: *“and she has also learned from listening to the radio and on TV, that it is not good, in terms of erosion, it is not good to sweep around your house to much”*. Internet was only mentioned by one respondent. Books, however, were mentioned quite a few times. A middle aged respondent explained: *“I go to the library, sometimes when I go to Accra I go there, because I decided to be a great farmer that is one of my goals. So sometimes I read books, especially about agriculture. And then I read a lot about climate change and all these things”*.

Mouth to mouth also passed in review, as respondents had heard about the concepts from friends, and other farmers or community members. A woman learned from other farmers: *“the farmers here, usually when they buy the pesticides, they tell them the application and all that and I have never been to any of their trainings or their meetings, but I always hear them talk about it, so I heard it from them”*. Another respondent discussed it with his friends: *“Sometimes when I am chatting with my friends, based on the things we are seeing around it comes into our discussion”*.

As mentioned before, education and awareness activities by NGOs, companies and government entities such as the Agric department and the Forestry Commission also became apparent. A farmer explained why he has stopped using slash and burn in his farm: *“Because we have been going to workshops about farming this thing, so the workshops we have been going to, we have been learning a lot from that. Relating to the burning of the ground before you plant your crops is not any good”*.

It is safe to say that there is no lack of opportunities to obtain knowledge in the rural communities. How was it possible then, that the definitions the respondents gave me were so far apart? Definitions of climate change ranged from a solar eclipse to very accurate technical descriptions, whereas the use of chemicals was perceived not to have any consequences by some and caused aversion by others. The former paragraphs mostly showed an unequal knowledge distribution among gender, age and the level of education. Overall, more men had accurate knowledge on the concepts than women. The older a respondent was, the more likely he or she was to have accurate knowledge and the higher a respondent was educated, the more likely he or she was to have accurate knowledge. The more people I spoke to, the more the unequal distribution of knowledge amazed me and above all worried me. With regards to knowledge distribution in the communities, on one hand there were very promising stories about education coming from different actors, such as the CREMA (Community Resources Management) project: *“Q: did you tell the whole community about CREMA? A: Yes, we tell them that there is no pay for that. Q: How did you tell them, did you go to everyone? A: We gathered in a community gathering before we started house to house. Q: So you also did house to house? A: Yes. Me and my chairman, we are serious about this”*. Another respondent told about the Unit Committee (local government entity): *“there has been a community gathering or people*

assembly where we were given education and awareness about climate change. And our Unit Committee members were also talking about climate change as well as we have a group of people that we usually send for workshops, who also come to tell us about climate change". The church was also mentioned: *"I am a presbyter in our church I organize money devotion. We do preach them that they shouldn't involve in bush burning and all these activities".*

On the other hand, there were a few respondents who claimed no such activities are done in their community: *"I have heard it (climate change) on the radio before, but there hasn't been any kind of education like that in the community".* However, there were more respondents who acknowledged activities being there, but referred to reasons as to why information does not find its way to every community member: *"many people think that going to community gatherings is irrelevant, so they don't get information well, and at times too, we don't disseminate information well to them, but a prophet is never accepted by its own people".* Another respondent expressed: *"there have been situations where opportunities have come, but the community has not made use of it, so I can't decide for them. There have been tree planting exercises and the community hasn't used that knowledge".* A man also said that people don't come to listen: *"when the education is going on, they are not interested. They don't like it even when we do our community gathering they don't come to listen. Well they don't care".* These answers mostly point at ignorance and a lackadaisical perception by the respondents. This was confirmed by a very well educated Queen Mother, responsible for a complete traditional area in addition to her own community, she explained: *"ignorance leads people to destruction. In the Weto range we are not really sure of what is good for us. All that we know is what will go into our mouth, what we live on daily. That is all. You have to continue telling them, educating them".*

Moreover, the Queen Mother is the paragon of having the community's interest at heart. In each community I have met one or more members of the traditional authority. I have had this positive experience with several passionate leaders at one hand but on the other hand I came across stories that made me wonder if in some cases the traditional authority has (unconsciously) anything to do with the unequal knowledge distribution. When bringing a project to a community, the first contact has to go through the chief. Often the community members that visit a training are selected by the traditional authority. However, the knowledge that they receive is said to be shared at a gathering (see photo 20). Nevertheless, I got the feeling that in some villages, family and friends of the authority had better access to information. There was one village where due to miscommunication the traditional authority had preselected respondents for me to interview. Out of respect, we went along with it for the first respondents. After having spoken to four respondents who were very well educated on the concepts of climate change and environmental degradation, we went on to randomly select the rest of the respondents. It was then that I met a woman who barely had any knowledge, had not been to any training and was really motivated to learn more about climate change and degradation.



Photo 20: Community gathering with the villagers and the traditional authority

In another village, the traditional authority was somewhat dissatisfied with our random selection of villagers: *“I am his regent, and we all have an arrangement that we will find some people for you to interview and so it would have been good for us to meet in the community we would have selected those people who can speak on behalf of the community. There is some council of elders. They are all involved and that would have been better”*. From local traditions and customs, it is understandable that the council of elders is seen as the most suitable to talk to the white woman. However, they will not represent the view of the whole village. Not everyone in a village recognises the traditional authority.

As Francis Bacon said, *“Knowledge itself is power”*, there is not enough proof to conclude whether that is the case. The fact is that the fieldwork showed an unequal knowledge distribution within each village and it is something that can seriously hamper the development of a community. Presumably it is a combination of ignorance, a lackadaisical perception and power struggles.

5.4 MOTIVATION

In the theoretical framework, the importance of motivation for one’s perception was emphasized. Vedwan (2006) concludes that the perception of climate change is structured by activities in terms of the knowledge and intentions actors possess. What motives do respondents have, for example, about the use of chemicals on the land? Are they willing to make changes to move towards more sustainable development? Logical motivators are the perceived benefits of, for example, a change in crops. In paragraph 4.6 it was pointed out that cacao offers possibilities for sustainable development. A farmer mentioned why he has chosen to plant cacao: *“cacao is a good crop in Ghana as of now. And*

it yields money very quickly, that can also help you to pay your children's school fees". In line with benefits, there is the motivator not to do something because of perceived consequences. An elderly villager explained why he does not use chemicals: "It is because it is chemical, and because we are also using it and we would like not to make use of chemicals, eating chemicals, so we don't like that. So you get it in your crops". Another respondent had a different reason: "there are some people on the farm who use the fertilizer and the pesticide. I don't use it, because sometimes it destroys the crops".

All respondents said to be motivated to make changes, some more drastic changes than others. Most farmers were also motivated to change their ways of farming, for instance in crops, but also in other practises. A woman explained why she would be willing to get her cacao certified: *"I would like to do such thing, I would want the best for myself, so anything that will enhance that".* It can be expected that this is an 'open door' question, as everyone would want their situation to improve. This also accounts for the motivation to invest to ensure a sustainable future. However, the reasons as to why respondents want to invest provide more insight into their willingness. A middle aged man explained: *"as for that one, I will use it to build up my business, because if I spend it now I will not get anything like profit out from it. But if I invest it in my business, it will grow up with profit and others that I will get".*

The willingness or lack thereof to learn about CDS among the locals could provide insights into whether their perceptions are determined by a lack of knowledge due to the fact that they had no motivation to be more aware of these issues and progress in their well-being: A respondent explained why he would want to learn new farming practises: *"I want to learn because in existing years what we used to do is now past, now the times have changed and there are new practises. So in order to progress they need to learn what is ongoing now".*

Those are all promising answers, but it can be one thing to claim in an interview that you are willing to make changes and to invest money and to learn better practises. But to do when the opportunity arises, is another. An example are the different priorities determining the spending patterns of the respondents that were mentioned in chapter 4. It became apparent that priorities can cause a person to have a phone and a business, but not to further a child's education. This earlier shown quote illustrates this perfectly: *"most of us, we don't handle our money well, we don't take good records. So we need a basic education, because when you give me 10 million now old GHC, probably I am just praying for your departure, after that I am going for two bottles of beer".*

In addition, it showed that with some answers, the ignorance and lackadaisical perception mentioned in the former paragraph was caused by lack of motivation. A farmer explained: *"illiteracy, ignorance and unawareness, so many of us, we fail to form farmer based groups or other based groups, because we cannot yield direct benefit from their work. So they don't want to put in their efforts".* Another respondent expressed: *"when we do our community gatherings they don't come to listen. They don't care".*

This depicts that lack of motivation mostly hampers change; for example, there are also motivators that indirectly contribute to environmental degradation. An important motivator turned out to be tradition. Subsistence farming and its practises have a strong history, dating back many generations: A farmer explained why he uses slash and burn in his farming: *“so we need to burn it, before they can plant. From time memorial, as far as I know, that is what my ancestors or generations before, they used to do it”*.

In some cases it was shown how strong a certain motivation can be. It can be so strong that it can overrule education for instance. Even though people are being told about consequences of chemical use, they can see more important benefits, or simply not agree, like the following farmer who explained why she uses chemicals: *“in my view it helps me to do my work faster, but there is education around that the weedicide destroys the fertility of the soil. I haven't detected that there is anything wrong, when I grow my crops”* Another farmer agreed: *“I feel every day we are being taught not to use chemicals, but when we spray it goes deep into the ground and the crops brings it up for us to eat”*.

Nevertheless, there exist positive examples of motivators that are contributing to dealing with the environmental threats in the Weto Mountain Range. The best example is the preservation and planting of trees, people are motivated, because they want to change their circumstances and, again, because of perceived benefits. A respondent explained why he participated in a tree planting exercise: *“because of the future when I cannot be working, I have decided to partake in the planting, so that in the future when I cannot work, I can depend on that as income”*. Another respondent pointed out why he was preserving the trees on his farm: *“Because if in the future, me and my children will need timber resources for development, they can use it”*.

In sum, perceived benefits and consequences were the most important motivators in peoples' decision-making on adaptation to the changing climate and environment. Respondents said to be willing to make changes in order to employ more sustainable development and to learn more about CDS. Next to these promising answers, it showed that lack of motivation caused ignorance and a lackadaisical perception and thus hampers change. In some cases motivation was so strong that it overruled education for example. Fortunately, preservation and planting of trees represent positive examples of motivators to deal with environmental degradation.



6. OPTIONS FOR LOCAL OWNERSHIP OF SUSTAINABLE DEVELOPMENT

*Ati deka me woa ave o
(One tree does not make a forest)
- Ewe Proverb*

6. OPTIONS FOR LOCAL OWNERSHIP OF SUSTAINABLE DEVELOPMENT

The perceptions as discussed in the previous chapter were translated into the decision-making of the respondents with regards to adaptations to the changing climate and environment. How can current practises and adaptations be moved towards more sustainable development? In chapters 1 and 2 the need for sustainable development in the Weto Mountain Range was emphasized. Sustainable development was defined in chapter 2 as: *Development that ensures the basic rights of the present without compromising the ability of future generations to meet theirs*. An important concept that was brought forward in line with this, was ‘local ownership’ of sustainable development, which was defined in chapter 2 as: *The extent to which the local community is aware of, believes in, controls, is responsible for and implements sustainable development*. The latter definition is used to map out the exploration of options for local ownership in this chapter. For this chapter, both the in-depth interviews with the respondents and the interviews with experts working in the area were analysed.

6.1 AWARENESS AND BELIEF

In chapter 4 it was pointed out that several awareness activities have taken place in the past years in the Weto Mountain Range by different actors such as NGOs and government entities such as the Forestry Commission. Popular means of disseminations are community gatherings and the use of vans with video screens showing messages and documentaries that go into the community (see photo 20). What can we learn from their experience? According to Mr. Amaglo from the Forestry Commission, overall, people are willing to receive education, the problem is that nothing is done with it. He continued to explain: *“they participate in our programme very well and understand what we are saying, but when it comes to practice there is a very big gap. Otherwise we shouldn't have to talk about bush fires, otherwise we would see people undertaking plantations on their own. But they are still waiting for somebody to come and tell them “* (Personal Communication, T. Amaglo, 19 December, 2014). As previously highlighted, radio is an important mean through which the respondents have received knowledge; for example in Ghana there are special programmes about farming practises.



Photo 21: Education van of the Ministry of Food and Agriculture (agrivisual, 2015)

In order to move towards more sustainable development, people have to change their current practises that they have known for so long. Awareness must be raised and people have to be convinced to believe in the importance of sustainable development in order to persuade them to new practises. The former chapter showed that people are willing to make changes to ensure improvement in their situation. Mr. Amaglo confirmed this: *"They are willing to adopt innovations .If you look at the crops that are growing in this area. There have been a lot of variations or maybe adopting a new variety of the old crops that they grow. When you move along the range you also see that all of them have adopted the use of chemicals, which has not been the issue in the past. So they are willing to adopt innovations"* (T. Amaglo, Personal Communication, 19 December, 2014).

A promising method to ensure this persuasion, is when information is being brought by persons that the locals can identify themselves with. A Queen Mother working for the Ministry of Agriculture in Accra had made a documentary that featured farmers doing agro forestry, a method where tree planting is integrated in the farming of other crops. This documentary was shown in villages where vans promoted awareness campaigns. People saw their colleague farmers doing well and became enthusiastic about agro forestry: *"when they saw the video, made them see their own colleague farmers doing very well in agro forestry, they were harvesting the trees, making charcoal and selling. And the farmer said, because of this agro forestry that I have done, my son or my daughter has now moved from the public schools to international schools"* (Personal Communication, Happy, 22 December, 2014).

Also, important for convincing people to adapt new methodologies, is through the involvement of influential persons within a community who can have an important role in peoples' decision-making. Respondents as whose opinion is important to them often mentioned traditional authority. A respondent explained: *"the community leader. The reason is that if he says something and you do not take it seriously, the community law can deal with you"*. As discussed before, out of custom and respect all initial contact for a project has to go through the chief. Next to the power over knowledge presented in the former chapter, there is something else that should be taken into account. Mr. Amaglo points out that locally, it is often not clear who has the authority. In chapter 2 it was explained that traditional Chiefs are supported by the government through the Ministry of Chieftaincy and Traditional affairs. They are educated and supported administratively and financially. The traditional Chiefs, District Assemblies, Unity Committees all represent local government. Mr. Amaglo expressed: *"I still have the reservation about the traditional Chiefs really promoting development. Because as I already said, they are confused. Within the powers the government has, their influence on the population is not very strong"* (Personal Communication, T. Amaglo, 19 December, 2014).

Traditional and Christian priests were also mentioned quite a few times. A woman mentioned why she values the opinion of the traditional priest: *"The traditional priest.He is very keen about the development of the community"*. In addition, several respondents mentioned hard-working or knowledgeable community members and family members. Also the Assembly man or Unit Committee (both local government entities) were highlighted several times. At last, leaders of other groups were pointed out. One young woman valued the opinion of her youth leader: *"I am part of the youth group and we have a leader and he is someone whose opinion I value greatly"*.

Another important factor in decision-making, turned out to be status quo, or a communal opinion. Many respondents stated that it was important to them that other community members agree with

their vision on the discussed concepts. A respondent explained why he thought it was important that other community members agree: *“I think that is important because most of the things, there are certain things that are not happening in the best way and so if someone says something that I think would help then it would be important that people would support my view”*. In addition, like the way farmers could identify themselves with the farmers from the documentaries from the Ministry of Agriculture, respondents seemed to copy others. This mostly showed in what crops people have decided to grow. A woman explained: *“Because of the changes that I have seen, what people are growing so I have also decided to go into that”*.

Important factors in the unequal distribution of knowledge, as mentioned before, are ignorance and a lackadaisical perception. How can this be avoided when trying to create local ownership of sustainable development through awareness and belief? Many stories showed how education had already convinced respondents in the past to adjust their practises. A farmer mentioned why he has stopped felling trees and using slash and burn: *“When I was farming, I used to fell the trees and burn and do all that, but we had education that it was not good for the land and so the changes that I have made in that is that instead of burning, I will leave the weed to become mulch and where I want to plant at that period, I will clear the place so I will plant the cassava and leave the weed around it so that it will become manure”*.

It seems that it is very well able to convince local inhabitants to move away from their traditional ways. However, there is one thing that goes above all in the decision-making process and that is survival. This is also a cause of the earlier mentioned gap between education and practice, as Mr. Amaglo pointed out: *“that is typically survivor strategy. You know that you are fetching water from this source and the water is getting finished, you don't have anywhere else to fetch water. So you will fetch the water until it finishes. Even though they are aware of the outcome of their activities, they will still keep those activities alive. I know that the matter of farming I am doing, that it causes degradation, but I am still doing it. They don't have the resources to go into tree planting”*. (T. Amaglo, Personal Communication, 19 December, 2014). This was also emphasized by Mr. Ken Kinney, director of the Development Institute: *“main environmental challenges are degradation, deforestation, but if you talk about the underlying causes of deforestation it is poverty, if you look at underlying causes of poverty is ignorance. Ignorance of peoples own potential to be able to develop. Ignorance and poverty feeds into the degradation of the environment because people want money now, people want to live their life now”* (K. Kinney, Personal Communication, 9 January, 2015).

Queen mother Happy also emphasized that the poverty in her village is the main factor in decision-making processes: *“then poverty makes them unable to buy the inputs as we are saying to be able to do a reasonable work on the farm. So even if they are able to cultivate a small plot, they will not get anything from it, so they can't survive”* (Happy, Personal Communication, 22 December, 2014). In comparison to farming, being a chainsaw operator is in that light much more attractive. One young respondent said: *“ours is quick money, the one that we will eat today is our aim”*, therefore youth that is staying behind in the village is often tempted to go about chainsaw operations. As pointed out in paragraph 4.5, it are mainly locals that cut the trees, they don't work on request but both sell it locally on markets and to carpenters and on a larger scale to bigger actors such as multinationals and even government projects (Obiri & Damnyag, 2009).

Following this, awareness and believe should maybe be more focused on educating people about the fact that they have more potential to develop than they might think, Mr. Kinney stated:

“empowering people basically means that you are helping them to understand the essence of their existence. And opening their eyes to know that they have the power in their hands to be able to develop” (K. Kinney, Personal Communication, 9 January, 2015). He also has an idea on how this can be done: *“for me, people will change if they have a repeated exposure, they can easily change their paradigm. But for most of the projects we implement, the maximum is three terms, so your continuous relationship with the target groups is short. So the process is not able to go to the end”* (K. Kinney, Personal Communication, 9 January, 2015).

In conclusion, with regards to raising awareness and making people believe in order to create local ownership of sustainable development, there are different ways forward. In order to tackle the unequal knowledge distribution, another way of education has to be found next to community gatherings and through the traditional authority. House to house would be preferable, however, it is very costly in time and money. Influential persons within the community are mainly the traditional authority members, priests and representatives of local government entities. Next to the traditional authority’s power over knowledge, the confusion of authority between them and other local government entities has to be taken into account. Communal opinion turned out to be important in respondents’ decision-making as was propensity to copy others, for example in crops use. People are willing to learn and make changes, but survival is the number one factor in decision-making. Poverty turned out to be the underlying reason for unsustainable practises by the inhabitants. Following this, awareness and believe should be more focused on educating people about the fact that they have more potential to develop than they might think. When educating, alternatives to current livelihood practises have to be offered, instead of urging them to stop felling trees because it is wrong. A promising method to ensure this persuasion, is when information is being brought by persons that the locals can identify themselves with.

6.2 RESPONSIBILITY AND CONTROL

Following the mind shift or empowerment that was emphasized in previously. The locals have to take responsibility over and control their own practises of sustainable development. How capable are local governance structures, like farmer groups, CREMA committees, the traditional authority or a church group for example? Several stories by respondents showed that local governance structures indeed can be capable:

“When CREMA and this NGO came to alert all the communities around this Weto area. That this is what has been going on, so we should form groups in our communities, so we started forming the groups. We our group, I just used this group last year. So to let the people in our community know something about this climate change. So we gathered the community and then started preaching what we went to learn”.

“The chief is working with the forestry commission to ensure that anyone engaging in chainsaw operation is brought to book, so that is one of the things that they are doing to ensure that there isn't chainsaw activity going on”.

“EP church. I am in a group, a youth group, called United We stand and anytime I need help we pay dues so anytime something happens right now and you need help, you can access that”.

“Traditionally our place, you don't have the right to go and set the farm or the bush under wildfire. The traditional council or we the chiefs and elders, we have a law on that. So when you do that, you will be punished, to serve as an example to others”.

“ For the past we go to them and they supported our work with some small grant. By the District Assembly. I myself wrote a letter to them. We are in a farmers group”.

Also, without an economic incentive: *“And in our CREMA, we are telling them, there is no money, nothing is being paid to anybody as a payment for everybody. But if you like, come and assist us or come and join our group, so we got many people, about twenty in our group right now”.*

Furthermore, the youth showed their willingness and capability to take matters into their own hands. A young man explained: *“Some of the youth of in the community identified that trees are reducing in number, so we took it upon ourselves to start planting trees. Anybody at all can join, but there is a group there”.* This is something that should be encouraged not only because of environmental degradation, but it should also be used to address the lack of opportunities they have in the rural areas.

It can be concluded that there are possibilities to ensure that the local inhabitants have a responsibility for and to control over their own sustainable development. However, it should not be forgotten that next to the above promising examples, there were also many examples of less effective local governance structures. It is important to examine where that lack of effectiveness originates. With regards to traditional authority and local government, we turn back to Mr. Amaglo’s earlier statement about the confusion of authority:

“The communities are also not able to take it into their own hands, because of the confused kind of management we have. The traditional authority, government authority, government policy, local customs and assembly by-laws. So the people are really confused as to who has the authority. Even when you are talking about forestry issues, at a point you realize that these environmental issues come with this assembly and therefore there is a small fund within this assembly to promote environmental issues. We talk about tree tenure, ownership, that says that the forestry commission, or the government has the control. But at certain points, we are also expecting the communities to protect those resources. So at one time they feel that oh what you have asked me to do, the government has employers to do those things. So it is not my duty and so, when you also implement programmes, they look at you as if you are implementing the programme. So they are not empowered enough to believe the project can be sustained” (T. Amaglo, Personal Communication, 19 December, 2014).

On the other hand, he mentions other community groups, next to the traditional authority, that have potential, like youth and women groups. He emphasized that a lot of youth can be found in the churches. In line with the earlier mentioned targeting of the youth, youth church groups seem a good place to initiate sustainable development. Also, as long as other groups are targeted in combination, so that development does not depend on religion.

In conclusion, several forms of local governance structures showed that they can be capable of taking control over and responsibility for the sustainable management of natural resources. The youth also showed that they can take matters into own hands, which can be used for addressing the lack of opportunities for them in the rural areas. On the other hand, there were many examples of less effective local governance structures. This can partly be attributed to the confusion of authority with regards to the management of natural resources.

6.3 OPTIONS FOR IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT

The empowerment, and the new ways of education and strengthening or setting up of local governance structures as mentioned in the former paragraphs are all options for the implementation of sustainable development. The socio-economic inventory in chapter 4 also showed a lot of room for (sustainable) development. The amount of farmers using chemicals is concerning, especially because misuse has had a major impact on the land in the Weto Mountain Range. The highest level of education that is completed by the majority of the respondents being Junior High also shows another obstacle to development. As does the overall poor quality of basic services that in line with the definition of sustainable development should be ensured without comprising this for future generations. At last, the often mentioned abundance of particular crops that was mentioned as the main reason why farmers were not getting good prices on the markets, also houses an opportunity for improvement. Thereby, different projects with the goal to move towards more sustainable development in the Weto Mountain range have been handled. The main focus areas are

reforestation, forest friendly alternative livelihood activities such as beekeeping, spices and Non Timber Forest Products. Sustainable tourism is also another sector that is on the rise in the area. Mr. Amaglo mentioned several examples: *“all these things I mentioned, the animals and the fruits of the Weto Range, they should cultivate it in such a way to promote tourism. The beekeeping too. And if you also look at the natural features that we have, some of them are already enjoying the tourism potential like the Wli waterfalls, the Afadatjo mountain, the Tagbo falls (see photo 22), there are a whole lot of waterfalls along the range. Hiking trails can promote tourism”* (T. Amaglo, Personal Communication, 19 December, 2014). In order to generate income from tourism, an area has to stay beautiful, providing incentive for conversation. In addition of course several awareness and education activities have taken place. These are all promising projects that offer great options for more implementation of sustainable development. Both, respondents’ and experts’ answers showed some more promising possibilities for the implementation of sustainable development. A great number of respondents, for example, have started to leave weeds that they cut as manure in their farm instead of burning because of awareness activities. Also, several times there was the plea for the need for more modern ways of farming, to increase their yields, to make it more sustainable and to make it more attractive to the new generation. As a respondent said: *“not the olden type of farming, we need the technology and innovation”*.

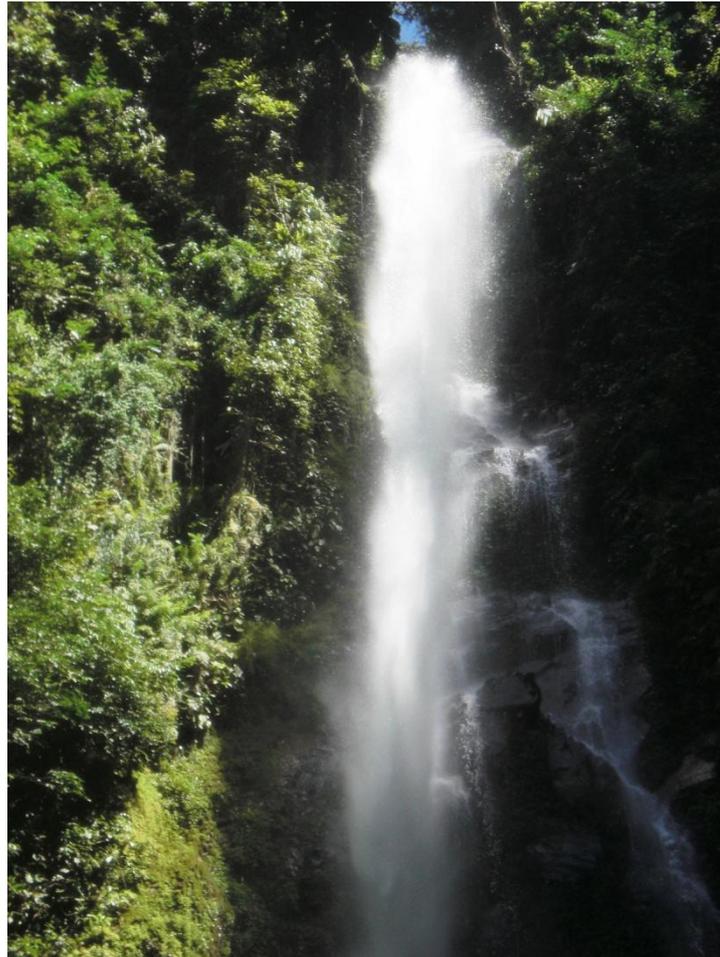


Photo 22: Tagbo falls in the Weto Mountain Range

A development that showed promising outcomes is the recent renewed focus on cacao. Before the bushfires in 1983, the Weto Mountain Range had a well developed cacao industry. After the disasters, people moved to different crops. For instance, cacao yields more than cassava and contributes very well to re-forestation. The cacao nurseries from the CREMA project by DI had made many inhabitants enthusiastic. In addition, people have discovered the advantages of moving towards tree crops, such as monodeira, zailopea and others, a positive development for reforestation. A farmer described: *"In my farm I have been planting trees: afram"*.

Moreover, there are some important aspects that should be taken into account when thinking of options for the implementation of sustainable development. A demographic process that was also mentioned in chapter 1, is the fact that the farmer population is aging. More and more farming land is being abandoned, contributing to forestalment of the development of the rural communities. An elderly villager explained: *"Most of the youth are not interested in farming, a few of them are in farming, but the majority of the people that are farming are the older people. And most of the youth have been going out to look for better jobs"*.

Also, the need for a paradigm shift through longer exposure, so long-term monitoring of projects, was emphasized. Short-term monitoring of projects hampers the communities to get to a level of complete transformation, as Mr. Kinney pointed out: *"for NGOs most of the interventions are project nature. Then the project ends and now the fact is that when people are not going to the final empowerment stage, where the project stops. They degress rather than progress. The other major fact is the thing that our government institutions, they should be doing this and what NGOs bring should be a complement. But they are virtually not doing it because they do not have the resources to do it"* (K. Kinney, Personal Communication, 9 January, 2015). Mr. Kinney's last reason for hampering of development, is the lack of capacity and resources of government institutions. Something that has been acknowledged in literature as well. Government agencies in Ghana often do not have adequate capacity to enforce legislation concerning illegal use of natural resources nor to create an enabling environment for sustainable development (Asscher, 1999; Atta-Mills et al., 2004; Dietz et al., 2014; Yelibora, 2014).

In sum, there are several options for the implementation of sustainable development in the Weto Mountain Range, but the most important will be to get the local inhabitants on board. This can be achieved by enhancing their knowledge on their own abilities and alternative options, to make them responsible for their own development and to make sure that they have the time to transform and to change their mindset.

7. CONCLUSIONS & RECOMMENDATIONS



7. CONCLUSIONS & RECOMMENDATIONS

In this research, examination of the perceptions of the local inhabitants towards climate change, environmental degradation and sustainable development, was combined with an exploration of options for the creation of local ownership of sustainable development. Chapter 4 showed that the Volta Region is predicted to continue experience increasing temperature and decreasing rainfall (Kunstmann & Jung, 2005). In addition, the practises of mining, sand winning and chainsaw operations will continue to contribute to environmental degradation as those practises will not be stopped or mitigated from one day to another. Also, current methods by locals to adapt to the changing climate and environment are mostly unsustainable. Therefore, the research objective was:

To contribute to a more complete understanding of locals' perceptions towards climate change, environmental degradation and sustainable development in order to explore options for the creation of local ownership of sustainable development

The following research question was set up to achieve this goal:

Which are the perceptions of the rural inhabitants of the Weto Mountain Range towards climate change, environmental degradation and sustainable development?

7.1 CONCLUSIONS

The main focus of this research was on examining the locals' perceptions, which was done by using a theoretical framework that was based on different conceptualizations of perception. In addition, options for the creation of local ownership were explored, also by using a combined theoretical framework.

7.1.1 Locals' perceptions towards climate change, environmental degradation and sustainable development

The locals' perceptions of the different concepts were examined using several dimensions of the theoretical framework. At first sight people mostly did not think there was a relation between them and the environment except for the crops that grow on the land. In some cases felling of trees and bushfires were mentioned. For the sub dimensions of 'meaning of- and adaptation to climate change'; 'meaning of- and adaptation to environmental degradation' and 'meaning and implementation of sustainable development', different statements were developed to score the perceptions of the respondents. Next to scores for perception, respondents also received a score for their knowledge on each concept. In general, men had more knowledge on the concepts than women, which can be linked to the fact that on average, the men in the respondent population were higher educated than women. In line with this, in general men agreed more strongly on the perception statements. Also, relatively, the elderly age group (60+), had more accurate knowledge and agreed more strongly on the concepts, followed closely by the adult age group (30—59). As was expected, the knowledge scores for all three concepts significantly and positively correlated with the highest levels of education. Nevertheless, overall, the knowledge on the concepts was limited.

The majority of the respondents has seen changes in temperature, rainfall and even in some cases wind (statement 1). The perceptions on what these changes look like, were very different. Thereby the changes were also perceived to have quite the impact on the daily lives of people,

mostly with regards to farming practises (statement 3). The most frequently mentioned cause for the changes in the weather, was the felling of trees, whereas consequences mostly brought us back to farming practises, crops growth in particular. Especially because of accounts of severe consequences and impacts such as spoiling roofs and unpredictable planting periods, the majority of the respondents seemed to perceive climate change as a problem that deserves attention (statement 3). Overall, the elderly age group received higher perception scores than the other age groups, they agreed more strongly that climate change has been taking place, deserves attention and has been influencing their daily lives. Also, age correlated positively with the knowledge and all perception statements. This can be attributed to the fact that the older a person gets, the longer the period is that he or she compares the climate over. The highest level of education also correlated positively with all perception statements, which meets up to the expectation that knowledge influences perception.

Furthermore, many respondents have seen changes that have happened in their environment (statement 1). Striking is that the scoring for this first perception statement significantly shows a positive correlation with the wealth categories of the respondents. The higher the wealth category of a respondent, the more likely he or she is to perceive that degradation is happening in their environment. Perceptions on what the changes look like are closer than for climate change, with the main change being the decreasing density of the forest. This is due to the severe consequences such as roofs blowing away and adaptations such as the replanting of trees. The majority of the respondents was interpreted to view environmental degradation as a problem that deserves attention (statement 2). This statement also showed a significant positive correlation with both age and the wealth categories of the respondents. The majority of the respondents did not seem to perceive themselves as contributing to degradation in the area (statement 3), but those who did, mainly focused on chemical use, burning and over cultivation. The main perceived influences on the daily lives of the respondents (statement 4), turned out to be the changes in the windbreak, the washing away of crops and the lack of shade. Overall, the elderly age group relatively had the most respondents who agreed strongly on all four statements. Other important causes of environmental degradation were mainly perceived to be the cutting of trees by chainsaw operators, the bushfires of 1983 and sand winning by companies. Erosion and the depletion of local water bodies were perceived as the key consequences.

At last, many respondents deemed sustainable development to be important (statement 1). Different from the other concepts, the adult age group had the highest relative percentage with respondents who had extensive accurate knowledge on sustainable development. Overall, the elderly age group had the highest relative percentage of respondents who strongly agreed, closely followed by the youth age group. In line with the definition given in this thesis, a common reason was about the acknowledgement of the children and future generations. A majority perceived themselves as practising sustainable development (statement 2), mostly by planting, not felling and protecting trees. The rest acknowledged that they were not (yet) practising sustainable development, for which the most common reason was due to the use of chemicals in farming. Overall, the adult age group had the most respondents who agreed strongly that they are practising sustainable development. There was a positive correlation of this statement with age, which could be explained by the fact that most of the examples of sustainable practises were done by farmers and that there is an aged farmer population.

Examination of respondents' views on a better personal future and a better future for the entire community showed that money and development opportunities were perceived to be the most important. In addition, several reasons became apparent as to why youngsters are leaving the rural areas, with the most important being the perceived absence of job opportunities. Past learning experience that has influenced respondents' perceptions, showed in adaptation methods to climate change, in the stories about the history of climate and environmental changes such as the drying up of the water bodies because of the decreasing density of trees, and in adaptation methods to environmental degradation such as the replanting of trees. Next to past learning through experience, there turned out to be enough opportunities to obtain knowledge in the rural communities. Nevertheless, the fieldwork showed an unequal distribution of knowledge among gender, age and the level of education. Main reasons for this are ignorance, a lackadaisical perception by the respondents and in some cases the power of the traditional authority over knowledge dissemination. In addition, motives in decision-making are important for perception, of this, the most important turned out to be perceived benefits and consequences. It also showed that respondents were willing to make changes, but that survival was more important. A lack of motivation causes the earlier mentioned ignorance and lackadaisical perception. Also, despite motivations to invest, it showed that priorities can cause difficulties as well despite an average high enough income to maintain ones livelihood. Nevertheless, the most important motivator was the preservation and planting of trees in order to restore the environment to its former state.

In conclusion, people are very much aware and experiencing influences of the changes in climate and the environment in their own way. Not everyone is as conscious about their contribution, but people are willing to change. The current situation is not the best and therefore they will do everything to move out of it. Many have seen in the past when the forest was so dense, that water was flowing, the land used to be much more fertile and more animals and products like mushrooms were in the forest for them, and they want to get back to that situation. Nevertheless, decision-making is still largely based on what is important today, on survival.

7.1.2 Options for local ownership of sustainable development

With regards to raising awareness and making people believe in order to create local ownership of sustainable development, there are different ways forward. In order to tackle the unequal knowledge distribution, another way of education has to be found next to community gatherings and through the traditional authority. Influential persons within the community are mainly the traditional authority members, priests and representatives of local government entities. Communal opinion was also important in respondents' decision-making as was propensity to copy others. Again, survival seemed to be the underlying reason for unsustainable practises by the inhabitants. Following this, awareness and believe should be more focused on educating people about the fact that they have more potential to develop than they might think. When educating, alternatives to current livelihood practises have to be offered. A promising method to ensure this persuasion, is when information is being brought by persons that the locals can identify themselves with. In addition, there was looked at options for responsibility and control of sustainable development by the local inhabitants. Several forms of local governance structures showed that they can be capable of taking control over and responsibility for the sustainable management of natural resources. The youth also showed that they can take matters into own hands, which can be used for addressing the lack of opportunities for

them in the rural areas. On the other hand, there were many examples of less effective local governance structures. This can partly be attributed to the confusion of authority with regards to the management of natural resources.

There are several more options for implementation of sustainable development in the Weto Mountain Range. The main source for these findings were experts working in the area. The socio-economic inventory showed several opportunities for more sustainable development, for example the tackling of the misuse of chemicals. Current development projects in the Weto Mountain Range mainly focus on reforestation, forest friendly livelihood activities, sustainable tourism, and on cacao and tree crops. However, it will be the most important to get the local inhabitants on board by empowering them. This can be achieved by enhancing their knowledge on their own abilities and alternative options, to make them responsible for their own development and to make sure that they have the time to transform and to change their mindset.

7.2 RECOMMENDATIONS

Based on the provided conclusions, both scientific and societal recommendations can be made. The scientific recommendations are in addition based on a reflection of the used research methods and strategy that showed room for improvement. The societal recommendations mostly focus on part of the research objective of this thesis: *to explore options for the creation of local ownership of sustainable development* and provide opportunities for future policy making and projects that have the goal to help locals adapt in a more sustainable way to the changing climate and environment.

7.2.1 Scientific recommendations

The most important critical note that was made in this research, is with regards to the methodological triangulation that exists of combining the qualitative method of coding with the quantitative method of scaling. Triangulation has its shortcomings. Replication, often considered an important step in scientific progress, is hard, especially for qualitative methods (Jick, 1979). In this research, replication is hard due to the subjective factor of interpretation of the scores by the researcher based on the answers of the in-depth interviews. In order to respond to this, in future research that makes use of this method, more than one researcher should interpret the score, to be able to compare the scores for each respondent. This comparative factor will complement the subjective factor of interpretation. In addition, due to practical constraints, for this research there was not made use of the scoring of perception by the respondents themselves. For further research on local perceptions, this could be useful, provided that it is done on a large scale to be able to draw significant conclusions.

In addition, the scores derived through this method of scaling, were used for a Spearman's Rho correlation test. This was possible because of the research population of 63 people, and because it was only used to make statements about the respondent population. Nevertheless, a larger research population would incredibly contribute to the significance of the conclusions.

An improvement for scientific research of perceptions towards climate change, would be the possibility to compare the respondents' stories about changes in the climate, with climate data of the exact same area over a longer period of time. For this research, no adequate data was available, which made it hard to either underline or counter the respondents statements about changes in rainfall and temperature for example. Data from the same demarcated area is important, because

microclimate can play an important role in the local changes in environment. For instance, the felling of trees can have large impacts locally, through the disappearance of windbreak, shade and opportunities for photosynthesis.

Examination of the knowledge on the concepts of climate change, environmental degradation and sustainable development, showed that overall women had less knowledge on the concepts than men. Linked with this is the outcome that overall men were interpreted to agree more strongly on the perception statements than women. The combination of this can partly be attributed to the fact that overall, women are less higher educated than men. But in addition, a gender focus in examining local perception, could provide more extensive insights into this phenomenon. From Ghanaian tradition, the man played a more important role in households and in traditional authority. For example also leading the boy of a household to be send to school instead of a girl. However, in current policy and projects, girls are targeted to lift this stigma. How are these processes influencing the women's perceptions?

In line with this, the fieldwork showed that overall, adults and elderly had more knowledge of the concepts and in addition were interpreted to agree more strongly on the perception statements. Answers by the respondents showed gaps between the elderly and the youth, mostly in reasons given by elderly as to why the youth is not willing to go into farming, such as laziness. Main reasons of lack of job opportunities and luxury facilities in the rural areas and status loss became clear from the fieldwork. It would be recommended to more elaborately research perceptions from a youth perspective, to gain more insights into the underlying processes.

Exploration of the options for the implementation of sustainable development, showed that a complete transformation of mindsets of people, can only take place when a long enough period is ensured for this transformation or paradigm shift. It has happened several times in the Weto Mountain Range, that locals returned to their old ways after the completion of a project. This research has shown that this is mainly due to decisions that are made with survival as most important factor in mind. For future research with the goal to contribute to interventions that try to achieve such a transformation, it will be important to also take into account this longer period when making recommendations. It will be important to make people believe that the changes as proposed by the interventions, can also be done with survival in mind.

The last scientific recommendation is with regards to theory on perception of climate change. Definitions of perception are influenced by subjectivity and different viewpoints. In the theoretical framework, several theories of perception were used in operationalisation of the concept. Also, several researches about perceptions of climate change and the role in adaptation to this, were discussed. It should be more emphasized in future research that the processes that people experience, are not mainly or only due to climate change. This makes it that consequences of other processes such as environmental degradation can be experienced as consequences of climate change and vice versa. The fieldwork showed for example how people attributed increasing wind in the settlement to climate change, while it is also a consequence of the extensive felling of trees that has been taking place. This research has tried to emphasize this link by looking at the combination of concepts of climate change, environmental degradation and sustainable development. Because of the outcomes of the fieldwork, it is recommended that this is more elaborately done in the future.

7.2.2 Societal recommendations

It is important to help locals adapt to the changing climate and environment in a more sustainable way, because of the predicted continuation of the changes in climate and of processes that cause environmental degradation. Thereby the unsustainable (subsistence) practises of the inhabitants are becoming less fruitful due to the dependence on rain fed farming and thus on the unpredictability of the weather, and the decreasing favourable environmental circumstances. Therefore the overall recommendation for policy makers, NGOs, companies and other actors working in the area, is to (continue) develop(ing) policy, projects and interventions that have the goal to move towards more sustainable development, with a strong focus on the views, ideas and wishes of the locals themselves. Throughout the research, several opportunities for such projects have been mentioned, leading to the following list of recommendations:

- The socio-economic inventory showed that tackling the misuse of chemicals, the overall poor quality of basic services such as school and health, and the ups and downs of crops productivity due to rain fed farming, all offer opportunities for more sustainable development.
- Empowerment of the locals is important. Following this, awareness raising about sustainable development should be more focused on educating people about the fact that they have more potential to develop than they might think. This can be achieved by enhancing their knowledge on their own abilities and alternative options, to make them responsible for their own development and to make sure that they have the time to transform and to change their mindset.
- In order to tackle the unequal knowledge distribution, another way of education has to be found next to community gatherings and through the traditional authority. House to house would be preferable, however, it is very costly in time and money.
- The overall low education levels of the respondents form an important factor in the unequal knowledge distribution. In tackling this, a gender component should be taken into account, as it showed that in general, men were higher educated than women.
- Several forms of local governance structures showed that they can be capable of taking control over and responsibility for the sustainable management of natural resources. On the other hand, there were many examples of less effective local governance structures. This leads to the recommendation that local governance structures should be strengthened or that new structures should be set up.
- Stories of the youth also showed that they can take matters into own hands, which makes them an important target in interventions that have the goal to sustainably manage natural resources. This can also be used for addressing the lack of opportunities for them in the rural areas.

- Current development projects in the Weto Mountain Range mainly focus on reforestation, forest friendly livelihood activities, sustainable tourism, and the re-introduction of cacao. Many of these developments show promise, meaning that there can be learned from their experiences. In addition, they offer potential opportunities for up-scaling of successful interventions.
- Respondents often pointed out that more modern ways of farming could increase yield, make it more sustainable and more attractive to youth to go into farming. It is also believed that more modern ways of farming can make people move away from current unsustainable practises such as excessive harvesting and thereby decreasing the impact on the quality of the soil. It will be important to take into account that more modern ways of farming also should always be affordable to the farmers themselves, and not only during the implementation of a project that introduces new farming techniques.
- Despite motivations to invest, it showed that priorities can cause difficulties as well despite an average high enough income to maintain ones livelihood. Therefore it will be important in projects that have the goal to move towards more sustainable development, to rather create more opportunities for creating income and improving livelihoods than to simply give them budget to improve this themselves.
- Many farmers mentioned that they do not receive a good price for their crops. This is mostly attributed to the fact that at some periods they are in abundance, which makes competition hard. That these crops are in abundance in some periods, is due to the fact that farming in the area is mostly rain fed, making crops yield at the same time. Thereby the unpredictability of the rain makes it harder for farmers to plan ahead. Therefore it is recommended that a market, for instance in the form of storage or processing, is created for these crops, so that they can continue to generate income during times in which there is no harvest. Thereby demands for sustainable farming practises can be set as a condition for buying the crops from the farmers.

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APPENDIX 1: INTERVIEW GUIDE

Introduction

Check for preference of language

My name is Anna Smits, I am 22 years old and a master student from the Netherlands specializing in development and currently doing my internship with the Development Institute. With this interview I would like to find out more about your view on the development situation in your area and about what you think is important for your future and those of your/ the communities' children. I believe it is important that development work takes into account how local people see their own situation in relation with their environment. I am not promising any direct action, but I want to create an overview of the opinions of people from different communities in the Ghanaian Weto Mountain Range to help DI with their work in your area. Thereby I would like to start with asking about some general social and economic information to get an overview/ profile of the different people I talk to. Your name will not be used in the research. If there are any questions you do not feel comfortable answering, please tell us and we will skip them. I greatly appreciate your cooperation. Before we start I would like to ask your permission to **record** this interview, this recording will not be made publicly, I will only use it for my research as I don't want to forget any of the valuable information you will be providing me with.

Socio-economic data and other factors influencing the decision-making process

We will start with some basic social and economic questions to create a profile of you (and your community) for the research, in which your name will not be used.

Gender, age, marital status, household composition, ethnicity, highest education completed

Do you have a job/ Do you study? If yes, what kind of job/study? And/or what (other) activities do you carry out during the week to support yourself (and your family)? (e.g. NTFP, gathering wood, hunting, fishing, fetching water, farming cash crops etc.) Is it enough for food security for your household? What accessories /tools/ machines (e.g. chainsaw, gun) do you use for these activities?

(*In case of farmers:* How big is the land you farm on? What do you farm on the land? (Is it for own use? Do you make profit, Who do you sell it to? Happy with the price you get for it?) Is the land your property? Is the land in a good condition? Do you use fertilizers or pesticides? If yes what kind?)

- ➔ Have there been any changes in these activities in the past? If yes, could you please describe the history of your activities to support yourself (and your family)?
- ➔ Has law or restrictions by the government ever withheld you from carrying out these activities? Do you feel supported by the government in carrying out these activities?

What are your biggest expenditures?

If you would have more money, what would you like to spend it on?

What energy source do you use in your house? (Charcoal, electricity, gas etc.)

Does your family have access to healthcare (NHIS registration or enough money to pay), good education for children, water (what type?), toilet, electricity?

Is there proper police & fire service in your community in your opinion?

What relationships with family/friends within the community are the most important to you? → Can you rely on each other when times are bad? If yes, please describe them.

Are there any formal relationships/structures in the community, like groups, committees and traditional structures, that can help you when times are bad? (this help can be anything). If yes, please describe them.

Can you tell me something about your traditional leader and about your communities history with traditional leaders? How do they get chosen/selected?

Are there any traditions important for your community? (such as taboos for instance) If yes, please describe them.

Perception on climate change, degradation and sustainable development and options for local ownership of sustainable development

We will now ask questions about your opinion on your development situation in relation with your environment and about what you think is important for the future. Feel free to talk about anything that comes to mind while answering the questions, I am mostly interested in what you think is important.

We will start with questions about the past and current situation in relation with the environment.

We started this interview with asking about the activities that you carry out to support yourself and your family, how do you feel about this (development) situation?

Do these activities influence the natural environment in your area or does the natural environment in your area influence these activities in your opinion? If yes, please describe how. *(If not mentioned by themselves, ask about influence of fertilizers and pesticides, evt. Slash & burn, burning of waste material)*

Have you heard of the word climate change? If yes, what does it mean in your opinion? Can you tell me what you remember of changes in weather, temperature, rainfall and droughts in the past? Have you made any changes/adaptations because of that? Do you know anything about the causes or consequences?

Can you tell me what you remember of other changes in the natural environment in your area and changes in the use of the land and the resources in the past? Have you made any changes in the earlier mentioned activities in the past because of these changes?

Have you heard of the word (environmental) degradation? If yes, what does it mean in your opinion? Can you give examples of it in your environment? What do you think causes degradation?

Have you heard of the word sustainability? If yes, what does it mean in your opinion? If yes, what does sustainable development mean in your opinion? If yes, Do you think that is important? If yes, do you, in your opinion, (partly) carry out sustainable development? If yes, can you give examples?

The actual use of the words sustainability, climate change, degradation in further questions will depend on the respondents knowledge/opinion on these subjects

Where/how did you learn about climate change, degradation and sustainability? *(If not mentioned by themselves, ask about MOFA, Caca0 board officer, NGO's)*

What would you like to learn more about in order to improve your activities supporting yourself and your family?

The following questions are about the future.

Do you think your kids/ the community youth is planning on staying in the community? Do you know why?

*(If respondent knows about sustainability)*What does a sustainable future mean in your opinion? What activities to support yourself and your family would you prefer for the future? *(if applicable, still subsistence or move to cash crops?)*

What changes are necessary in your opinion to improve your future and those of your/ the communities' kids?

Are you willing to make changes yourself to ensure a (sustainable/ good) future? *(Give examples of specific change depending on livelihood activities, e.g. cacao, hunting permits etc.)*

Are you willing to invest (spending money for the long term) to ensure a sustainable future? *(Emphasize that we are not asking for money)*

The last two questions are on other people's opinions

Are there any persons in the community whose opinion you value greatly, why?

Do you think other community members agree with your opinion? Is that important to you?

Is there anything you want to add?

APPENDIX 2: SPSS DATA SET

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	Village	Numeric	8	0		{0. Kpale}...	None	8	Right	Nominal	Input
2	Gender	Numeric	2	0		{0. Male}...	None	8	Right	Nominal	Input
3	Age	Numeric	8	0		None	None	8	Right	Scale	Input
4	MaritalStatus	Numeric	2	0		{0. Single}...	None	8	Right	Nominal	Input
5	Ethnicity	Numeric	8	0		{0. Same as village}...	999	8	Right	Nominal	Input
6	Householdnumber	Numeric	8	0	Number of people in the household	None	999	8	Right	Scale	Input
7	Householdhead	Numeric	8	0		{0. Elderly male (60+)}...	999	8	Right	Nominal	Input
8	Education	Numeric	8	0	Highest level of education	{0. No education}...	999	8	Right	Nominal	Input
9	Livelihood	Numeric	8	0		{0. Farmer}...	None	8	Right	Nominal	Input
10	ClaimedFoodSecurity	Numeric	8	0		{0. Yes}...	None	8	Right	Nominal	Input
11	SuspectedFoodSecurity	Numeric	8	0		{0. Yes}...	None	8	Right	Nominal	Input
12	LawRestrictions	Numeric	8	0	Ever withheld by law or restrictions from the government	{0. Yes}...	999	8	Right	Nominal	Input
13	SupportGovernment	Numeric	8	0	Feels supported by the government	{0. Yes}...	999	8	Right	Nominal	Input
14	WealthCategorization	Numeric	8	0		{1. Those who can manage}...	None	8	Right	Ordinal	Input
15	HouseholdHealthInsurance	Numeric	8	0		{0. Whole Household}...	None	8	Right	Nominal	Input
16	PoliceSufficient	Numeric	8	0	Thinks the police service in his/her village is sufficient	{0. Yes}...	999	8	Right	Nominal	Input
17	FireServiceSufficient	Numeric	8	0	Thinks the fire service in his/her village is sufficient	{0. Yes}...	999	8	Right	Nominal	Input
18	InformalRelationships	Numeric	8	0	Relies on informal relationships	{0. Can rely on them}...	999	8	Right	Nominal	Input
19	FormalRelationships	Numeric	8	0	Relies on formal relationships	{0. Can rely on them}...	999	8	Right	Nominal	Input
20	ChemicalUse	Numeric	8	0		{0. Yes}...	999	8	Right	Nominal	Input
21	FarmingOwnUseSelling	Numeric	8	0	Is farming for own use, selling or both	{0. For own use}...	None	8	Right	Nominal	Input
22	HealthcareAccess	Numeric	8	0		{0. Access}...	None	8	Right	Nominal	Input
23	FarmingLand	Numeric	8	1	Farming land in acres	None	999.0	8	Right	Scale	Input
24	LandProperty	Numeric	8	0		{0. Family land}...	None	8	Right	Nominal	Input
25	PerceivedLandCondition	Numeric	8	0		{0. Good}...	None	8	Right	Nominal	Input
26	PriceMarket	Numeric	8	0	Opinion on price and market	{0. No good price for goods}...	999	8	Right	Nominal	Input
27	EnergySourceA	Numeric	1	0	Firewood	{0. Not ticked}...	None	8	Right	Nominal	Input
28	EnergySourceB	Numeric	1	0	Gas	{0. Not ticked}...	None	8	Right	Nominal	Input
29	EnergySourceC	Numeric	1	0	Charcoal	{0. Not ticked}...	None	8	Right	Nominal	Input
30	EnergySourceD	Numeric	1	0	Electricity	{0. Not ticked}...	None	8	Right	Nominal	Input
31	EnergySourceE	Numeric	1	0	Lantern	{0. Not ticked}...	None	8	Right	Nominal	Input
32	EnergySourceF	Numeric	1	0	Torch	{0. Not ticked}...	None	7	Right	Nominal	Input
33	WaterSourceA	Numeric	1	0	Stream	{0. Not ticked}...	999	8	Right	Nominal	Input
34	WaterSourceB	Numeric	1	0	Well in community	{0. Not ticked}...	999	8	Right	Nominal	Input
35	WaterSourceC	Numeric	1	0	Own well	{0. Not ticked}...	999	8	Right	Nominal	Input
36	WaterSourceD	Numeric	1	0	Pipe in the community	{0. Not ticked}...	999	8	Right	Nominal	Input
37	WaterSourceE	Numeric	1	0	Pipe in the house	{0. Not ticked}...	999	8	Right	Nominal	Input
38	WaterSourceF	Numeric	1	0	Rainwater harvesting	{0. Not ticked}...	999	8	Right	Nominal	Input

39	WaterSourceG	Numeric	1	0	Polytank	{0, Not ticked}...	999	8	Right	Nominal	Input
40	Sanitation	Numeric	8	0		{0, Free range}...	999	8	Right	Nominal	Input
41	CropsA	Numeric	8	0	Maize	{0, Not ticked}...	None	8	Right	Nominal	Input
42	CropsB	Numeric	8	0	Cassava	{0, Not ticked}...	None	8	Right	Nominal	Input
43	CropsC	Numeric	8	0	Cocoyam	{0, Not ticked}...	None	8	Right	Nominal	Input
44	CropsD	Numeric	8	0	Spices	{0, Not ticked}...	None	8	Right	Nominal	Input
45	CropsE	Numeric	8	0	Banana	{0, Not ticked}...	None	8	Right	Nominal	Input
46	CropsF	Numeric	8	0	Plantain	{0, Not ticked}...	None	8	Right	Nominal	Input
47	CropsG	Numeric	8	0	Rice	{0, Not ticked}...	None	8	Right	Nominal	Input
48	CropsH	Numeric	8	0	Watermelon	{0, Not ticked}...	None	8	Right	Nominal	Input
49	CropsI	Numeric	8	0	Palmtree	{0, Not ticked}...	None	8	Right	Nominal	Input
50	CropsJ	Numeric	8	0	Monodeira	{0, Not ticked}...	None	8	Right	Nominal	Input
51	CropsK	Numeric	8	0	Pear	{0, Not ticked}...	None	8	Right	Nominal	Input
52	CropsL	Numeric	8	0	Orange	{0, Not ticked}...	None	8	Right	Nominal	Input
53	CropsM	Numeric	8	0	Beans	{0, Not ticked}...	None	8	Right	Nominal	Input
54	CropsN	Numeric	8	0	Yam	{0, Not ticked}...	None	8	Right	Nominal	Input
55	CropsO	Numeric	8	0	Coconut	{0, Not ticked}...	None	8	Right	Nominal	Input
56	CropsP	Numeric	8	0	Garden egg	{0, Not ticked}...	None	8	Right	Nominal	Input
57	CropsQ	Numeric	8	0	Tomato	{0, Not ticked}...	None	8	Right	Nominal	Input
58	CropsR	Numeric	8	0	Coco	{0, Not ticked}...	None	8	Right	Nominal	Input
59	CropsS	Numeric	8	0	Mango	{0, Not ticked}...	None	8	Right	Nominal	Input
60	CropsT	Numeric	8	0	Vegetables	{0, Not ticked}...	None	8	Right	Nominal	Input
61	CropsU	Numeric	8	0	Zailopea	{0, Not ticked}...	None	8	Right	Nominal	Input
62	CropsV	Numeric	8	0	Sweet potatoe	{0, Not ticked}...	None	8	Right	Nominal	Input
63	FarmingToolsA	Numeric	8	0	Cutlass	{0, Not ticked}...	None	8	Right	Nominal	Input
64	FarmingToolsB	Numeric	8	0	Hoe	{0, Not ticked}...	None	8	Right	Nominal	Input
65	FarmingToolsC	Numeric	8	0	Boots	{0, Not ticked}...	None	8	Right	Nominal	Input
66	FarmingToolsD	Numeric	8	0	Spraying Machine	{0, Not ticked}...	None	8	Right	Nominal	Input
67	FarmingToolsE	Numeric	8	0	Picker	{0, Not ticked}...	None	8	Right	Nominal	Input
68	FarmingtoolsF	Numeric	8	0	Axe	{0, Not ticked}...	None	8	Right	Nominal	Input
69	ChemicalsA	Numeric	8	0	Pesticide	{0, Not ticked}...	None	8	Right	Nominal	Input
70	ChemicalsB	Numeric	8	0	Weedicide	{0, Not ticked}...	None	8	Right	Nominal	Input
71	ChemicalsC	Numeric	8	0	Fertilizer	{0, Not ticked}...	None	8	Right	Nominal	Input
72	MarketA	Numeric	8	0	In community	{0, Not ticked}...	None	8	Right	Nominal	Input
73	MarketB	Numeric	8	0	Germani	{0, Not ticked}...	None	8	Right	Nominal	Input
74	MarketC	Numeric	8	0	Kpeve	{0, Not ticked}...	None	8	Right	Nominal	Input
75	MarketD	Numeric	8	0	Ho	{0, Not ticked}...	None	8	Right	Nominal	Input
76	MarketE	Numeric	8	0	Logba	{0, Not ticked}...	None	8	Right	Nominal	Input

77	MarketF	Numeric	8	0	Vane	{0, Not ticked}...	None	8	Right	Nominal	Input
78	MarketG	Numeric	8	0	Amedzope	{0, Not ticked}...	None	8	Right	Nominal	Input
79	Watersource	Numeric	8	0		{0, Pipe in the community}...	None	8	Right	Nominal	Input
80	BiggestExpenditure	Numeric	8	0		{1, Hiring labour}...	999	8	Right	Nominal	Input
81	WishesForSpending	Numeric	8	0		{1, Build a house}...	None	8	Right	Nominal	Input
82	PClimatchange1	Numeric	8	0	The respondent thinks climate change is happening in his or her environ...	{1, Strongly disagree}...	None	8	Right	Nominal	Input
83	PClimatchange	Numeric	8	0	The respondent thinks that climate change is a problem that deserve...	{1, Strongly disagree}...	None	8	Right	Nominal	Input
84	PClimatchange3	Numeric	8	0	The respondent thinks climate change is influencing his/her daily life.	{1, Strongly disagree}...	None	8	Right	Nominal	Input
85	PRainfallTemperature	Numeric	8	0	Respondent's view on the changes in temperature and rainfall	{0, Decrease in rainfall and incre...	999	8	Right	Nominal	Input
86	PDegradation1	Numeric	8	0	The respondent thinks degradation is happening in his or her environ...	{1, Strongly disagree}...	None	8	Right	Nominal	Input
87	PDegradation2	Numeric	7	0	The respondent thinks degradation is a problem that deserves attenti...	{1, Strongly disagree}...	None	8	Right	Nominal	Input
88	PDegradation3	Numeric	8	0	The respondent thinks he or she is contributing to degradation.	{1, Strongly disagree}...	None	8	Right	Nominal	Input
89	PDegradation4	Numeric	8	0	The respondent thinks degradation is influencing his/her daily life	{1, Strongly disagree}...	None	8	Right	Nominal	Input
90	PSustainabledevelopment1	Numeric	8	0	The respondent thinks sustainable development deserves attention.	{1, Strongly disagree}...	None	8	Right	Nominal	Input
91	PSustainabledevelopment	Numeric	8	0	The respondent thinks he or she is already practicing sustainable dev...	{1, Strongly disagree}...	None	8	Right	Nominal	Input
92	KClimatchange	Numeric	8	0	Respondent's knowledge on climate change, its causes and consequ...	{1, Has no accurate knowledge}...	999	8	Right	Nominal	Input
93	KDegradation	Numeric	8	0	Respondent's knowledge on degradation, its causes and consequenc...	{1, Has no accurate knowledge}...	999	8	Right	Nominal	Input
94	KSustainableDevelopment	Numeric	8	0	Respondent's knowledge on sustainable development	{1, Has no accurate knowledge}...	999	8	Right	Nominal	Input
95	ThreeAgeGroups	Numeric	8	0	youth, adult, elderly	{1, Youth}...	None	16	Right	Nominal	Input

HU: Local Respondents
File: [U:\Atlas.ti Masterthesis\Local Respondents.hpr7]
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Date/Time: 2015-06-27 13:21:38

Access to education
Access to electricity
Access to healthcare
Access to knowledge
Access to sanitation
Access to water
Adaptations to changing environment
Adaptations to climate change
Age
Biggest expenditure
Changes in Livelihood activities
Changes necessary for entire community
Chemical use
Claimed Food Security
Crops
Elite Capture
Energy source
Ethnicity
Farming for own use/selling
Farming land
Farming tools
Formal Relationships
Gender
Health insurance
Highest level of education
History of climate change/adaptations
History of degradation / land and resource use
Household Composition
Individuality
Influential persons/ local decision makers
Informal Relationships
Influence on decision-making
Knowledge distribution
Knowledge on Climate Change
Knowledge on Degradation
Knowledge on Sustainable Development
Land property
Law or Restrictions by the government
Livelihood activity
Local governance structures
Marital status
Motivation to change
Motivation to invest
Motivation to learn
Observation of degradation
Options for awareness of sustainable development
Options for believe in sustainable development
Options for control of sustainable development
Options for creation of local ownership of sustainable development
Options for implementation of sustainable development
Options for responsibility of sustainable development
Own sanitation
Perceived land condition

Perception on causes of Climate Change
Perception on causes of Degradation
Perception on climate change
Perception on consequences of Climate Change
Perception on consequences of Degradation
Perception on degradation
Perception on degradation in own environment
Perception on importance of attention for climate change
Perception on importance of problem of degradation
Perception on importance of sustainable development
Perception on influences of climate change on daily life
Perception on influences of degradation on daily life
Perception on own contribution to degradation
Perception on own practises of sustainable development
Perception on sustainable development
Police & Fireservice
Price and Market
Public sanitation
Respondent
Seedlings
Support by the government
Suspected to have food security
Sustainable/ better future
Tools
Traditions
Wealth Categorization
Wishes for spending
Youngsters staying or going