Global challenge, local impact?

A comparative case study on achieving relevant quality climate change education in teacher training colleges in Malawi

Johanna Eliasson

Master of Philosophy in

Comparative and International Education

Institute for Educational Research

University of Oslo

June 2017

Global challenge, local impact?

A comparative case study on achieving relevant quality climate change education in teacher training colleges in Malawi

Master of Philosophy in

Comparative and International Education

Institute for Educational Research

University of Oslo

June 2017

© Johanna Eliasson

2017

Global challenge, local impact? A comparative case study on achieving relevant quality climate change education in teacher training colleges in Malawi

Johanna Eliasson

IV

Abstract

This comparative study addresses the possibility to achieve climate change education (CCE) of good quality in teacher training colleges (TTCs) in Malawi. As one of the poorest countries in the world, together with being heavily reliant on agriculture for both survival and development, Malawi is especially vulnerable to the effects of global warming. There is an urgent need for developing capacity to respond and adapt to these issues, which the educational sector can contribute to. What kind of knowledge and capacity is considered relevant, and how well prepared is the education system for integrating CCE into the teaching? As an education system only is as good as its teachers, this study is set out to explore the possibilities for achieving CCE of good quality in three TTCs. The Government of Malawi is currently implementing climate change learning into the education system, making this study feasible and appropriate.

A qualitative multiple case study has been carried out on three TTCs around Malawi. The primary focus has been teachers' and administrators' knowledge and perceptions on climate change, as well as their perceptions on the current teaching practice. Data was collected through focus group and semi-structured interviews with educators, administrative staff, second year students and key informants, as well as through fieldwork observations and secondary analysis. Data was gathered during a six week fieldwork period. The analysis has been guided by UNESCOs framework for understanding quality, combined with a locally adapted framework for understanding climate change knowledge in the Malawian context.

The main findings indicate that most of the respondents in all three cases share similar views on climate change: displaying knowledge attached to what is considered locally relevant and an urge to expand their teaching practice on the topic. Teachers' perceptions on their classroom practice suggested a gap between the intended and implemented contemporary curriculum. All colleges met the same type of perceived challenges in their current teaching on environmental issues, although they faced different financial prerequisites. Both college and individual level indicate a promising foundation for building CCE capacity, but for quality CCE to be achieved, colleges need to start timely and the topic must be a part of the national assessment.

CCE alone cannot overcome the threats of climate change. A holistical approach is needed, where national contextual issues are tackled simultaneously. In regards to strengthening climate change capacity through the education system, the biggest obstacles are found on primary level.

Acknowledgements

Figures, Tables and Appendices

Acronyms

CCE	Climate Change Education
CCESD	Climate Change Education for Sustainable Development
DESD	Decade of Education for Sustainable Development
EFA	Education for All
EPDC	Education Policy and Data Center
CCP	National Climate Change Programme
GCCA	Global Climate Change Alliance+
GPE	Global Partnership for Education
IPCC	Intergovernmental Panel on Climate Change
IPTE	Initial Primary Teacher Education Curriculum
MDG	Millennium Development Goals
MIE	Malawi Institute for Education
MoEST	Ministry of Education Science and Technology
NORAD	Norwegian Agency for Development Cooperation
SACMEQ	the Southern and Eastern Africa Consortium for Monitoring Education Quality
SDG	Sustainable Development Goals
SSA	Sub-Saharan Africa
TTC	Teacher Training College
TPR	Teacher Pupil Ratio
UIS	UNESCO Institute for Statistics
UN CC:Learn	One UN Climate Change Learning Partnership
UNDP	United Nations Development Programme
UNEP	UNDP Poverty-Environment Initiative
UNESCO	United Nations Educational, Science and Cultural Organization
UNESCO-IBE	UNESCO International Bureau of Education
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
UNITAR	The United Nations Institute for Training and Research
UPE	Universal Primary Education
USAID	U.S. Agency for International Development
WB	World Bank
WBG	World Bank Group

Table of Content

XII

1 Introduction

1.1 Background of the study

Today, after decades of scientific debate on whether climate change is occurring, there is little doubt in that climate change presents a severe global challenge and poses one of the greatest threats to sustainable development (UNESCO, 2015a). The links between anthropogenic emissions of greenhouse gases since the mid-20th century and the successive warming of the Earth's surface over the past decades are strong (IPCC, 2014; NASA, 2017), now causing rising sea levels, shrinking ice sheets, retreating glaciers, more extreme droughts, floods and storms and warming of oceans (ibid). Climate change is a global phenomenon that already has, and will continue to have, large effects on all aspects of society in communities and countries worldwide. Emissions anywhere affect people all over the world, and therefore requires solutions based on international cooperation. As a response to this, countries worldwide adopted the Paris Agreement in 2015, agreeing to keep the rise in global temperature this century below 2 degrees Celsius (World Bank, 2017). This agreement is essential for achieving the Sustainable Development Goals[1], not the least goal 13 that calls for urgent action to combat climate change and its impacts (United Nations, n.d.-b).

Because of its importance to all sustainable development and its disproportionate impact on developing countries, climate change has become a central point on the international development agenda (Bangay & Blum, 2010). Climate change is inherently unfair, disproportionately affecting the most vulnerable groups in society. The countries who have contributed the least to the problems are also the most affected by the consequences, at the same time as they are the least able to adapt (Bryan & Mochizuki, 2015; Corcoran, Scherer, Shubert, & Shanahan, 2013). Global warming is further most threatening to those depending on natural resources for their livelihood (Department of Population and Development, 2012), since developing countries often are warmer, more prone to rainfall and dependent on agriculture, which is the most climate-sensitive sector (Bangay & Blum, 2010). Climate change is already having a significant effect on African agriculture. Changes in rainfall pattern and temperatures are affecting crops, water supply and infrastructure, which is linked to rising food prices, reduced food security and increased malnutrition, trends that are not showing signs of slowing down (Corcoran et al., 2013).

---

[1] A universal call to end poverty, to ensure peace and prosperity to all people and to protect the planet, consisting of a set of 17 *Global Goals* (UNDP, 2017).

This makes Malawi particularly vulnerable to climate change. With a 2016 GDP of $1139, the small and very densely populated Sub-Saharan African country is one of the poorest countries in the world (Gregson, 2017). In 2010, it was estimated more than 70.9 percent of the Malawian population were below $1.90 a day (UNESCO, 2015b). Of the 17.2 million inhabitants, more than 90 percent practice subsistence[2] agriculture, and 98 percent of the population who live in rural areas depend on wood fuel for their energy supply (GCCA, n.d.). Hence, with little or no money to buy food, a large majority of the Malawians are depending on their own crops and the capability to manage their land and surroundings. Adding the issue of rapid population growth, which increases the demand for food, the threats of climate change become even more severe (Department of Population and Development, 2012). In other words, conditions in Malawi are strained already under normal conditions, leaving little room to handle rapidly changing circumstances. Severe drought and extreme rainfall already has devastating effects on the harvest, on which the majority of the population is making its living from (USAID, 2015). In Malawi climate change was during the first part of the decade considered as one of the biggest threats to the attempts to reach the Millennium Development Goals, as it affected so many sectors vital to the country's economic and social development (MIE, 2014). Building understanding and capacity to respond to climate change among the population is therefore not only important, but urgent.

Because of its effects on all parts of society and human development, economic as well as social, fighting climate change is vital for achieving the other 16 SDG's, number 4 on achieving quality education being one of them. Quality education is the foundation for improving sustainable development (United Nations, n.d.-a). In order to address climate change, we need to adapt, anticipate and become resilient to its current and future impacts (United Nations, 2016); capacity which quality education can build. A population that is well-educated is better equipped to recognize and prepare for threats posed by a changing climate (International Council on Human Rights Policy, 2008). At the same time, climate change poses a large threat to quality education. Groups that are especially vulnerable to the effects of climate change also has the most difficulties in accessing education. Educational access, enrolment and provision

---

[2] Self sufficiency farming, where farmers focus on growing enough food to feed their families, with little surplus for marketing (GCCA, n.d.).

2

is affected by climate change, due to the incidents associated with increasing weather events and environmental changes (Bryan & Mochizuki, 2015).

Although education is not, nor will be, the only tool for fighting and responding to climate change, it was mentioned as a crucial instrument for combatting climate change already in 1992, in article 6 of the international environmental treaty United Nations Framework Convention on Climate Change (United Nations, 1992). The article directed countries to consider education as a part of the response to climate change, since it would require transformative shifts in how we think, act and relate to present and future generations (Bryan & Mochizuki, 2015). Since then, education's role in responding to global climate change has been increasingly highlighted at international level (Unitar, 2013), not the least through the UN Decade for Education for Sustainable Development 2005-2014, where the aim was to mobilize educational resources globally to create a more sustainable future (UNESCO, n.d.-a). Since then, UNESCO has promoted climate change education (CCE) within the framework of Education for Sustainable Development (ESD), with the main objective to strengthen climate literacy worldwide. The quality of an education system is important because it affects the value and length of the schooling experience (UNESCO, 2005). To the student, the quality might determine whether parents decide to invest in their children's schooling. In a bigger context, social benefits related to education (economic growth, lower mortality rates, higher personal income, empowerment) are heavily depending on the quality within the schooling processes (ibid). As these benefits all corresponds to the SDGs, it is not surprising one of the key features of ESD is a concern for high quality education (Bangay & Blum, 2010).

The concept of quality is closely related to relevance. UNESCO (2010) has stated that each country must identify its own sustainability priorities and adapt the CCE teaching so it becomes locally relevant. Recalling the above discussion on the global intricacy of climate change, by deciding what is relevant to the local context, one might face a potential tradeoff between teaching what is important to the local environment and what places learners in a more global context. There is often a call for "content that make the curriculum relevant to learners and society" (UNESCO, 2015, p. 82), The question is then; how far is the notion of society expanded and what is considered relevant?

The reason education is considered to be such an effective tool for spreading the message is because of its multiplier effect (Bryan & Mochizuki, 2015). Through the education system,

awareness, skills-development and knowledge on climate change is raised, and from there it can work as a catalyst for the responses (Unitar, 2013). When pupils share their knowledge, whole families and communities' benefit, since the children will pass on what they learn to their parents (Damerell, Howe, & Milner-Gulland, 2013). Furthermore, CCE is important because children are the leaders of tomorrow. They should therefore be equipped with knowledge and tools that will enable their possibility to adapt to climate changes and to reduce emissions in the future (Reinvang, 2013). Malawi has one of the highest percentages of population within school-age in whole Southern Africa; in 2011, 46 percent of the population were under the age of 15 (World Bank, 2011). There lies an enormous potential. CCE aimed at school children can influence both children's and their families' ability to mitigate and adapt to emerging complexities. Thus, it is of outmost importance that these 'catalysts of change' a get climate change education of good quality, so that the impact is as significant as possible. However, as less than 60 percent of the Malawian children who go to school complete the first 4 years (Unicef, 2016) and fewer than 35 percent finish 8th grade (NORAD, 2015), climate change learning needs to be infused as early as possible.

Basic education and literacy are prerequisites for quality environmental learning, which is critical in enabling learners to understand and respond to complex global concerns like climate change (Bryan & Mochizuki, 2015). However, "the quality of an education system is only as good as the quality of its teachers" (UNESCO, 2013, p. 39). IN UNESCO's promotion of CCE in the frame of ESD, one of three targeted priority groups are teachers and teacher educators:

> Before education can foster change, it is first necessary for teachers to understand what such change implies, to recognize the need for it, and to have the competence and confidence to introduce new methods, approaches and attitudes into classroom learning. They will need an accurate understanding of climate change and of how it relates to broader issues of sustainable development (UNESCO, 2015a, p. 12).

Studies have found teacher education to be essential for providing quality climate change education (Allison Anderson, 2010; Dal, Alper, Özdem-Yilmaz, Öztürk, & Sönmez, 2015) In other words, as it is of outmost importance that teachers grasp the concept of climate change, teachers themselves need receive quality CCE in their training, so they are knowledgeable enough to provide the same to their pupils. In Malawi, there is currently an enabling policy environment for equipping future teacher students with climate change knowledge. Recognizing climate change's impact on national development and growth, the Government

with support from UNDP and UN CC:Learn[3] in 2013 launched *Malawi's Strategy on Climate Change Learning* (Ministry of Environment and Climate Change Management, 2013). The overall aim was to mainstream climate change learning within the whole education system. After starting with the primary curriculum, the current Initial Primary Teacher Education Curriculum (IPTE) is now under revision (Kumbani, 2016). The goal is to align the teacher training with the revised primary school curriculum (ibid). When released in September 2017, the hope is that climate change learning will be infused in the IPTE, as those elements already have been incorporated in the primary school teaching. For this reason, there is a need for an exploration of the current climate change knowledge among teacher educators within the colleges, as their climate change knowledge is as important to the teacher students' quality CCE, as theirs will be to their future primary students.

Nevertheless, not only teachers' knowledge affect their classroom practices, so do their perceptions (Pajares, 1992; E. W. Taylor & Caldarelli, 2004; Waters‐Adams, 2006). Teachers tend to choose what and how to teach based not only on their knowledge about the subject, but also on their feelings and values towards it (ibid). The fact that teachers' also are driven by their perceptions has implications for the curriculum implementation; the implemented curricula might not align with the intended curricula (Voogt & Roblin, 2012). The same is true for knowledge and perceptions of the administrative staff, as the governance of resources on a school level influence teaching and learning processes and education quality (UNESCO, 2004). To overcome this "implementation gap" between national policy and the implementation at school level, Tikly (2010) argues it is imperative to engage with views and experiences of teachers and head teachers. Yet, in the context of climate change, Liu et Al. (2015) state that while there is much research exploring the general public's attitudes towards climate change, not many studies are focusing on teachers' perspectives.

The importance of teachers' knowledge and perceptions on climate change in their provision of quality CCE is thus clear. However, even though national policies are in place for equipping teachers with the same in the future, that is not only what matters for achieving quality climate change education. Bangay & Blum (2010) suggest there historically has been a tendency to

---

[3] "UN CC:Learn is a partnership of 33 multilateral organization which supports Member States in designing and implementing results-oriented and sustainable learning to address climate change". During 2012-2013, Malawi was one of five pilot countries to receive support to develop a national strategy for combatting climate change (UN CC:Learn, 2013a).

oversimplify the relationships between learning, education and change; that simply changing the inputs – such as updating the curriculum and teachers' knowledge - will result in significant change. Addressing climate change, they say, do indeed require new knowledge and skills, but the learning process is more complex than that. More factors, both individual and social, affect the learning process (ibid). Further, they state that:

> If the role of education is to help learners of all ages to develop the knowledge, skills and capacities which enable them to think critically, to solve problems, and to address uncertainty, then the focus of climate change interventions should not simply be on new inputs/content (although these are also necessary), but also on more holistic ways of addressing climate change through high quality teaching and learning (p. 363).

Hence, there is a need for exploring other dimensions which affect to possibility to achieve quality CCE. This notion has justified the choice of the analytical framework.

1.2   Purpose of the study

The introduction has pointed out essential points, which have guided the way to the purpose of this study. First and foremost, there is an acute need for infusing climate change education into the current primary education systems across the county, something the Malawian Government in recent years has recognized by launching a national strategy on climate change learning. As the quality of an education system only is as good as its teachers, providing teachers with quality CCE is a prerequisite for achieving the same on primary level. Thus, teacher educators too need to be equipped with knowledge on the topic, so they can transfer the knowledge to the teacher students. Furthermore, understanding teachers' and administrators' perceptions on the topic is essential for bridging the potential implementation gap that can occur when the new primary teacher education curriculum is in place. It is therefore important to investigate perceptions on the current teaching, in which climate change education likely will be infused. Yet there are more dimensions than national strategies and human resources affecting quality in an education system, which this thesis also sets out to explore.

The study is a qualitative comparative multiple case study, carried out on three Malawian teacher training colleges (TTCs). To provide rich information about the cases and context, teachers, administrative staff, second year students and key informants have been interviewed, combined with examination of relevant literature and policy documents. The purpose of the study is to *explore knowledge and perceptions on current climate change-related teaching and the elements affecting the same at the TTCs, to examine the possibility to integrate quality*

climate change education with the new teacher education curriculum. The overall purpose will be examined through the following three more specific research questions:

- What does climate change mean to the respondents?
- How, and to what extent, is climate change issues currently being addressed at the three colleges?
- What contextual possibilities and challenges lies ahead for a successful implementation of quality climate change education within the upcoming primary teacher education curriculum?

For this purpose, a modified version of UNESCOs quality framework is used, merged with a locally adapted framework for understanding climate change knowledge. The latter is based on the sourcebook on climate change learning developed for in-service teachers at primary level. This is justified by the fact that the stated goal of the new curriculum is to better align it to the primary curriculum, hence teacher educators should be able to teach about its content. The analytical framework will be further explained in chapter 5. Only using a framework for understanding respondents' knowledge and beliefs on climate change would surely have provided a good description of the current situation at the colleges. However, the aim is to put the respondents' climate change knowledge and understanding in a larger context, why the UNESCO quality framework is applied. Bray, Adamson, and Manson (2007) provides an explanation of the importance of doing so, which justifies the choice of a more comprehensive framework:

> Lower level studies (individuals, schools) needs to be understood within the broader context of higher levels of the framework (system, state…). Only in this way can studies present a meaningful picture of the relationship between macro and micro level (p. 119).

The quality framework is thus used as an analytical tool to explore the possibilities to achieve quality CCE at the three colleges. By doing so, the levels analyzed are expanded. As the literature review will elaborate on, the are several understandings of the quality concept. UNESCOs notion of quality is chosen based on two facts: firstly, it is a comprehensive framework on quality which aims at merging other notions on quality together. Secondly, UNESCO is the main promoter of CCE and ESD. As international agencies are largely present in Malawi's development, their framing is coloring the structure of CCE in Malawi.

1.3   Limitations and delimitations

The purpose of this study to explore the possibility to achieve quality CCE in the future. It is not seeking to investigate how quality is measured or perceived at teacher training institutions in Malawi, nor to examine the quality of the current teaching on environmental and climate change issues. The chosen framework for understanding quality is thus focusing on inputs and context rather than the outputs. Analyzing the outputs of the teaching currently taking place would not be purposeful for this study as the new teacher education curriculum has not yet been introduced. Yet, such study will be highly relevant a few years in to the new curriculum, when CCE formally has been infused.

The students are not at the core of this study. Notwithstanding the learner characteristics' importance to the quality of an education system, no emphasis is put on that dimension. Doing so would have required a significantly bigger sample, therefore not suited for a study where qualitative methods are being used. A student perspective would have been interesting as it would have provided insight to the *experiential* dimension of the curriculum (see chapter 2). Due to the scope of the study and limited time and resources, this was not feasible. For the same reason, only three colleges are participating in the study. Fewer units of comparison makes going in-depth in each case more feasible, even though including more colleges would have increased the possibility to generalize to other settings.

As the collages are the main units of analysis, no background information about the respondents are provided. The underlying notion is that their characteristics does not matter to the cases, they are in their current positions regardless. What matters is their perceptions and knowledge on the topic. For another study it would have been interesting to understand why these perceptions have come about, yet this lies outside the purpose of this study.

Addressing concerns about the environment through education is not a new phenomenon. Environmental education was established already during the 19060's (Palmer, 1998). Since then, numerous ways of addressing the environment through education have been promoted. Notwithstanding the historical importance of other areas (environmental education, sustainability literacy, environment-based education…), elaborating on them is not purposeful to the study. Hence, they will not be mentioned further. Discussing ESD however, is important for several reasons. First and foremost, UNESCO is together with the World Bank, UNDP and

UNICEF the UN agencies most committed to the development of education. Together they have had significant impact on educational development over the past half-century (Jones & Coleman, 2005). With CCE as an emerging topic of interest worldwide, it is reasonable to believe that their chosen framing will continue to color the international policy agenda on the topic. Furthermore Li-Ching & Seow stated in 2015 that "climate change education tends to fall under broader descriptions and analyses of Education for Sustainable Development (p.317), an understanding supported by Mochizuku & Bryan (2015) and Boon (2016). The UN agencies are of great importance for the Malawian context. The *Malawi's Strategy on Climate Change Learning,* which will be further described in chapter 3, is a part of an UN CC:Learn's project and managed by UNDP, and the strategy is placing itself within the international context of ESD (Ministry of Environment and Climate Change Management, 2013).

A contextual framework is presented in chapter 3, where it will be apparent that Malawi faces other environmental issues than just those relating to climate change. This study does not aim at providing thick descriptions as to why this is occurring or how issues like soil erosion scientifically is relating to climate change. Yet, these factors are important to bring up, as they are essential to the development in Malawi and for comprehending the respondents' notions of climate change.

1.4 Significance of the study

Climate Change Education is an emerging field of research. Less than a decade ago, research showed CCE was still not observable in many governmental strategies, although there was a visible general request for it (Læssøe, Schnack, Breiting, & Rolls, 2009). Established as a part of the wider agenda of Education for Sustainable Development only seven years ago (UNESCO, 2015a) there is still a debate as to what the concept implies and how it should be promoted (see Blum, Nazir, Breiting, Chuan Goh, & Pedretti, 2013; Bryan & Mochizuki, 2015; Læssøe et al., 2009). Furthermore, there is a need for more empirical research on the field. In 2016, Aikens, McKenzie, & Vaughter conducted a systematic literature review on environmental and sustainability education, by using both quantitative and qualitative coding methods and analyzing 215 research articles; representing 71 countries and spanning over four decades. The results showed most existing articles were non-empirical or descriptive reports of national or regional projects/programs and that there was a geographic under-representation of Africa amongst other regions (ibid). While there are many studies focusing on climate

change perceptions and knowledge amongst in-service teachers (Areskoug & Ekborg, 2006; Ching-Ho & Seow, 2015; Liu et al., 2015; Wise, 2010,), pre-service teachers (Bleicher & Lambert, 2013; Boon, 2010) and students (Boon, 2016), not many focus on perceptions of teacher educators. Understanding their point of view is key for improving teaching at TTCs, thereby increasing the possibility to achieve climate change education in primary schools. Nor were studies concerning teacher education or climate change regarding the Malawian context found. Databases such as Google Scholar, ERIC, Google, Science Direct and University of Oslo's search engine, as well as International Journal of Educational Development and International Review of Education were consulted to find literature relating to different combinations of buzzwords like 'teacher education', 'teacher training', 'climate change' in Malawi and the Sub-Saharan region, but results were scarce.

1.5   Definition of the terms

In order to talk about climate change and its related concepts, some terms need to be defined. *Weather* is what we experience from day to day - the conditions of the atmosphere during a shorter period of time, whereas *climate* describes the average conditions in a specific place over a longer period of time (Corcoran et al., 2013). *Climate variability* means natural changes where the conditions differ from the long-term average. Climate change refers to long-term (decades or longer) changes in climate variability, such as the increase in the global average temperature, number of droughts, floods and other extreme events (ibid). *Sustainable development* will in this thesis be defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). Sustainability is in other words closely related to environmental preservation and conservation, commonly mentioned by the respondents in relation to their teaching. *Mitigation* and *adaptation* are the two main strategies for reducing the threats related to climate change and central terms in the climate change debate. Mitigation essentially means trying to stop future warming, whereas adaptation is referring to activities that makes all levels of society less vulnerable to the effects of climate change (Corcoran et al., 2013).

1.6   Structure of the thesis

Following this introductory chapter is chapter 2, which presents the theoretical framework and literature review guiding the thesis. A contextual framework is presented in chapter 3. Here,

Malawi's school system, policy environment and current environmental challenges are briefly outlined. Chapter 4 describes method and methodology, giving more detailed information about the data collection period, research design and trustworthiness of the study. The chapter is ended with an elaboration on limitations of the study. In chapter 5, the analytical framework and the rationale behind it is presented, followed by the results in chapter 6. In the results section, each research question is addressed separately through the application of the analytical framework, followed by a smaller summary and analysis. The results are then discussed more in depth in relation to the research purpose in chapter 7. Finally, chapter 8 provides some concluding remarks, implications for primary school and some recommendations for future research and the way ahead.

2 Literature Review and Theoretical Approaches

This chapter discusses literature and theoretical approaches relevant to the purpose of the study. It starts with an introduction to the field of Education for Sustainable Development (ESD) and the current discussions concerning it. Although this study's primary focus is on Climate Change Education (CCE) rather than ESD, a more thorough description of ESD is essential for understanding the development and framing of CCE, since CCE tends to be understood within this framework (UNESCO, n.d.-a). A discussion on ESD is also necessary to grasp what quality CCE implies. Because of the interconnectedness, empirical findings on merely ESD is considered equally relevant for this study. After a section describing contemporary research on ESD and CCE in a macro-level perspective, a discussion regarding knowledge and beliefs/perceptions on teaching will follow. This study does not attempt to differentiate the respondents' knowledge from beliefs. Yet, acknowledging a distinction between the two is essential since both have implications for their teaching and hence curriculum implementation. Although elaborating on the field of curriculum inquiry could stand as a thesis on its own, in this literature review it will only be covered briefly. The main point is to, in a broader sense, understand what it is the teachers are influencing, rather than providing a thick description of the field. For this purpose, John I Goodlad's (1979) conceptualizations will be used, as he in his book *Curriculum Inquiry* he has summarized more than 20 years of work on curriculum theory. Lastly, the concept of quality will be discussed. The economist and the humanistic approach, the two major strands, will be elaborated upon. This is done to put the discussion in an historical context and to facilitate the understanding of the analytical framework, which builds on a comprehensive understanding of quality that includes both aspects.

2.1 Conceptual overview of climate change education

The introduction described how children through knowledge spreading and a multiplier effect can contribute to change in their societies. This was also true in the context of climate change, where education as a tool for doing so had been a part of the solution since the UNFCCC in 1992 (United Nations, 1992). However, despite the urgency of raising the global awareness and knowledge on the topic, policy makers, educationalists and climate scientists still have little understanding of how to best address climate change through education (Bryan & Mochizuki, 2015). The rise of the average global temperature affects all sectors of society, economic development as well as poverty reduction worldwide (UNESCO, 2010). Hence, from an educational point of view, the issues are crosscutting and could be addressed through various

approaches as well as taught within multiple subjects. Nevertheless, there are different understandings as to what climate change implies. For some, the issue primarily is an environmental or scientific one, hence placed within educational field of science (Bryan & Mochizuki, 2015). Others support a wider agenda, where climate change is seen as a part of the sustainable development challenge; thereby centering around providing students with competences "to participate in debate and practice regarding the sustainable development of society" (Læssøe et al., 2009, p. 21). Under such conditions, climate change education can be addressed through the UNESCO led initiative Education for Sustainable Development (ESD).

ESD is a relatively new phenomenon that became a part of the international and national policy landscape during the initial years of the new millennium, when the United Nations in light of the Millennium Development Goals decided to make 2005-2014 the Decade of Education for Sustainable Development (DESD) (UNESCO, 2009). However, ESD is often considered as a diffuse concept. By 2009, it was still open for interpretation and not clearly defined (Læssøe et al., 2009). According to UNESCO themselves, ESD should be understood a response to present and future global challenges, where learners should be empowered to take informed decisions and actions relating to the environmental, societal and economic spheres (UNESCO, n.d.-b). It has since its establishment been considered as a powerful way of addressing climate change issues, as the aim is to creatively and constructively address present and future challenges, and to create more resilient and sustainable societies (UNFCCC, 2014). The underlying notion is in other words that even if climate change primarily is an environmental or scientific issue, the causes and impacts are wider (Bryan & Mochizuki, 2015) It relates to several aspects of sustainable development such as food security, economic growth and human displacement. Therefore, it needs to be approached holistically, so learners can understand causes, consequences and actions on the same (ibid).

As sustainable development and global warming in recent years has received increased global attention - not the least through the Sustainable Development Goals - the focus on CCE has intensified. During the latter half of the Decade of ESD, at the 15th Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC COP15), UNESCO launched the Climate Change Initiative (UNESCO, 2010). The initiative was built on four areas for fighting climate change, where CCE in the context of ESD was one of them (ibid). Since then, CCE has gained increased significance within organizations across the world (Læssøe & Mochizuki, 2015). The question then is how the actual concept of CCE is defined. A broad

definition on climate change learning is provided by Mochizuku & Bryan (2015), who say it is "a process aimed at improving the degree to which an education system is prepared for, and is responsive to, the challenges of climate change" (Bryan & Mochizuki, 2015, p. 5). UN CC:Learn provides a more exhaustive explanation:

> "CCE promotes learning about the causes and effects of climate change as well as possible responses, providing a cross-curricular and multidisciplinary perspective. It develops competences in the field of climate change mitigation and adaptation, with the aim to promote climate-resilient development and reduce the vulnerability of communities in the face of an uncertain future. Crucially, CCE helps individuals to make informed decisions. Additionally, by preparing learners, communities and education systems to face natural hazards, CCE contributes to disaster risk reduction (DRR) efforts. Finally, CCE highlights the links between consumption patterns and climate change in order to mobilize responsible actions contributing to reduced greenhouse gas emissions through more sustainable lifestyles" (UN CC:Learn, 2013b, p. 4).

Noteworthy, UN CC:Learn's definition does not explicitly place CCE within the frame of ESD, although its member organizations do subscribe to that framing. The above discussion shows UN agencies provide both descriptions of both framing and. However, as the following discussion will show, there is an ongoing debate among researchers and policy makers as how to best conceptualize and place climate change in learning in the educational system. Already in 2002, Rosalyn Mckeown addresses obstacles in relation to ESD implementation, one of them being the difficulty in re-orienting education systems to something that lacks clear-cut goals (Mckeown, 2002). In 2009, a report by the International Alliance of Leading Education Institutes (IALEI) studies policies relating to ESD in 10 countries (Læssøe et al., 2009). The goal is to investigate international response to CCE and ESD, to see if and how CCE is addressed in that policy, and if it is related to ESD policy. The study concludes there is no clear understanding of what the term entails; no consensus on what CCE implies and how it should be promoted (Læssøe et al., 2009). In 2010, Anderson claims the problem is there is no coherent framework on the climate change arena regarding how education can combat climate change. In line with this, Blum et al. (2013) confront what is thought to be one of the biggest challenges for working with education, climate change and sustainable development; namely conceptualization of central ideas such as environmental education, CCE and ESD. Blum et al. (2013), who's work builds on the IALEI report from 2009, state there is broad diversity of understandings of the ESD-concepts and its related terms EE and CCE. They are unable to find consistency in the conceptualization of ESD and CCE; in one country, different actors use various definitions of the same concept and uses the concept differently (ibid). Usage of the terms in national policies are found to be influenced by international, as well as more local

14

cultural and socio-political contexts (ibid).

Aikens et Al. (2016) explain that articles focusing on the implementation of ESD into curriculum often result in pessimistic findings. In 2013, Bagoly-Simo (2013) evaluates ESD policy implementation and implementation approaches in Romania, Mexico and Germany. The findings show Mexico's top down approach to sustainability is leading to a greater incorporation of ESD in the state-level curricula, even though ESD seems to be a specialized add-on in an already overcrowded curriculum in all three countries (ibid). Læssøe et al. (2009) also find this to be true when evaluating the findings from the 2009 IALEI report, and that ESD faces the risk of not getting high priority if it is not a subject that gets examined. One exception in their research is the case of Iceland, where the policy implementation resulted in a widespread incorporation of sustainability issues across subjects (ibid).

Climate change education and local relevance

UNESCO (2009) stress the fact that there is no universal model of ESD – each country must define its own education and sustainability priorities and adopt it so that it becomes locally relevant. This is also true for CCESD (UNESCO, 2010). This lies close to what Orr (1992) refers to as "place-based education", which is focusing on education that can influence the well-being of ecological and social places where the learners live. The underlying notion is that a sustainable lifestyle will come from "careful adaption of people to particular places" and not primarily through top-down approaches (Orr, 1992, as cited in Glasson, Frykholm, Mhango, & Phiri, 2006). Sobel (2004) explains place-based education in a similar way; where concepts in various subjects are taught by using the local environment and community as a starting point for approaching the topics. This is thought to give the learners a 'real world experience'; creating a stronger relationship between the learner and the environment and through that better academic achievements (ibid). The positive correlation between local attachment and sustainability education has been underlined by many scholars, so has the favorable connection between local attachment and understanding of climate change. In 2013, Schweizer, Davis, and Thompson (2013) present a study where they suggest a framework for place-based climate change engagement. After carrying out a mixed method study on the American context, they find that messages about climate change resonate when embedded in the cultural values and beliefs attached to a specific place. Noteworthy, this study is not carried out in an educational context but in national parks and wildlife refuges across the country. Yet it is still relevant, as not all teaching has to be tied to a classroom. Local attachment is important not only to learners

but also to the teachers. In Anderson's (2012) words: "Like with learners, linking climate change and environmental education to relevant and tangible issues improves their own understating of the foundational concepts as well as their value of the subject" (p. 199). As the quote suggests, relevance is often mentioned when discussing CCE, but what the term implies in seldom mentioned. While academics such as the above suggest place-based attachment, contrastingly, some researchers point to the importance of a scientific understanding of earth as a whole system within the climate change field (Dal et al., 2015). Without such understanding, the students' will not have a complete awareness of the topic (ibid).

Summing up, research has underlined the importance of infusing CCE into existing education systems worldwide. If done in a way which promotes quality, CCE can have substantial effects on global sustainable development. Research also has pointed to various macro-level obstacles for integrating CCE and ESD in a successful way. Government inability to infuse CCE into policies, inconsistency in the conceptualization of the term and issues with already overcrowded curriculums were some of the findings that had hampered effective incorporation globally. On a more local level, teachers are of great importance for achieving quality CCE, not the least because they highly influence the implementation of the curriculum, and many calls for climate change learning that is tangible and locally relevant. Following is a brief overview of the area of curriculum implementation, after which the area of teachers' knowledge and perceptions will be addressed more in-depth.

2.2   Curriculum implementation

 John I. Goodlad, Klein, and Tye (1979), one of the major theorist in the field of curriculum inquiry, propose that as just as there is no single definition of the word curriculum, there is no single theory for explaining it. By defining it as "a set of intended learnings" (p. 21), he provides a thick description of the term, as he believes this is a necessity for including all various views of the field. According to Goodlad, the concept can refer to both curriculum content and process; theory and practice; and intentions and experiences (Afdal, 2004). Both formal curriculums prescribed by the state, operational curriculums that are presented at a given moment, and curriculums as experienced by the students are included in the term. Goodlad refers to the content and methods of a curriculum as the substantial elements, where he identifies five different domains: ideal, formal, perceived, operational and experienced.

	Curriculum Domain	Meaning
Intended curricula	Ideal curricula	Original assumptions of the designer.
	Formal curricula	The intentions. Officially approved curricula, but not necessarily the educational reality. Curriculum documents, such as teacher guides.
Implemented curricula	Perceived curricula	The curricula, as interpreted by the teacher, school administrator and parents. Formed not only by formal curricula, but by culture, educational philosophy, colleagues…
	Operational curricula	What goes on in the classroom. A type of perceived curriculum – teachers and students may have differencing experiences.
	Experiential curricula	Students own experiences.

Table 2.1. Explanation of Goodlad's curriculum domains, combined with Van den Akker's conceptualization (compiled by the author).

Through this typology, Goodlad et al. (1979) suggest it is possible to compare how aspects of the curriculum – for example the goals – are interpreted at each level. Some researchers have in adaptations of this typology referred to the *intended* and the *implemented* curricula (Van den Akker, 2003, as cited in Voogt & Roblin, 2012). Such conceptualization is at heart of the curriculum discussion of this thesis, as it answers to a clear, but unavoidable problem relating to curriculum implementation. Læsserø and Mochizuki (2015) explain by pointing to the fact that although national policies regarding a certain matter exist, it does not automatically mean it will be carried out at school and classroom level. Teachers' knowledge and perceptions on classroom practices and subject matter hence influence the curriculum implementation, why the next section will address this area.

2.3   Teachers' Knowledge and Perceptions

UNESCO states one of the core objectives of CCESD is to provide *quality* climate change education, and a precondition for reaching this is strengthening teacher education (UNESCO, 2010). "To promote CCE, it is crucial to strengthen teachers' and educators' capacities to deliver accurate information, integrate local content, promote critical thinking about and take action on climate change mitigation and adaptation" (UN CC:Learn, 2013b, p. 5). Strengthening teachers' knowledge about climate change is in other words of outmost importance. Simply infusing CCE into primary education is not enough, their teachers also need to comprehend what they should be teaching. Therefore, it is equally important to

strengthen teacher educators' capacity on the same. Yet, subject knowledge alone cannot change behaviors (Boon, 2016). It is not the only determining factor for classroom behavior, so are the teachers' beliefs (ibid). Since teachers often choose to teach the content of a course given what values he/she has about the content as such, their beliefs and attitudes influence the judgement and perceptions. Hence, it too will have an impact on how the teacher plans, organizes and approaches the teaching (Nespor, 1987; Pajares, 1992; E. W. Taylor & Caldarelli, 2004; Waters‐Adams, 2006).

The nature of knowledge and beliefs is intertwined and complicated, yet it is essential to try to separate them. Still, studies tend not to distinct the two, although there are many possible definitions available. One of the most common distinction is probably this: knowledge is based on objective facts; belief is based on judgement and evaluation (Pajares, 1992). This division is especially important in the case of climate change, where people often rely on their personal experiences for understanding and discussing it, even though climate change primarily is a statistical phenomenon (Weber, 2010).

While knowledge structures often focus on the cognitive aspects of teaching (ibid), Nespor (1987) argues beliefs are more emotionally loaded than knowledge. Furthermore, beliefs are amongst other factors affected by existential presumptions. These are the greatly personal taken-for-granted beliefs about reality everyone holds, which might as well be formed by intense experiences as by chance (Nespor, 1987, as cited in Pajares, 1992). The difference between knowledge and beliefs has an implication for classroom practice, since two teachers with the same subject knowledge still may choose to teach in various ways. Research have found teachers' beliefs to influence their choice of knowledge transmission in the classroom (Young, 1981, as cited in Stevenson, 2007) and the organization of their teaching (E. W. Taylor & Caldarelli, 2004). However, not all agree on this matter. Lewis (1990) argues the constructs are synonymous, as the origin of all knowledge is rooted in belief (as cited in Pajares, 1992).

Apart from the distinction between knowledge and beliefs, there may be a need of separating *beliefs* from *perceptions*. While some say the beliefs of a person affect the perception and have a strong influence on how new information is processed (Pajares, 1992), *belief* tends to be used interchangeably with *attitudes* and *perceptions*; although the constructs have different meanings. Liu et Al (2015) explain that while beliefs can be understood as individuals

18

propositions that they hold to be true, which can be non-evidential and based on evaluation and personal judgement, attitudes are individuals general feelings about specific situations or things (Liu, Roehrig, Devarati, & Varma, 2015). The central point is not the definition, but that beliefs, perceptions and attitudes all are crucial for understanding people's perspectives, in this case in the context of climate change (ibid). In other words, regardless which term is used and how it is defined, teachers' beliefs/perceptions/attitudes have an impact on what and how they choose to teach. Therefore, little focus is given to elaborating on the characteristics shaping the respondent respondents' attitudes – the essential point is that they are existent. This study is predominantly referring to the term perceptions.

In regards to teaching about climate change, teachers' knowledge and beliefs about the concept is especially important because they can influence children's pro-environmental behavior (Boon, 2016). In the field of environmental studies, knowledge about the environment has shown to be one of the predictors of pro-environmental behavior (Heberlein, 2012, as cited in Boon, 2016). Research also shows this to be true in the context of science education, where teachers' beliefs about science affects students' perspectives toward certain topics (Duschl, 1990). Perceptions also matter for students and their willingness to learn about climate change. A study on pre-service teachers in Australia, Boon (2016) finds that personal interest is vital to the students' engagement with climate change education.

Summing up, teacher education has been said to be essential for providing quality CCE (Allison Anderson, 2010; Dal et al., 2015), as well as for the successful implementation of ESD (Læssøe et al., 2009). To provide CCE of good quality, strengthening teachers' capacities to promote critical thinking, take mitigation- and adaptation action, deliver accurate information and integrate local content is a prerequisite (Dal et al., 2015; Unitar, 2013, p. 5). In the ESD context, teachers play an essential role for the possibility to implement a holistic and interdisciplinary approach to education for sustainability (UNESCO, 2009). Research further shows that teachers' perceptions needs to be taken into consideration, as they influence their practice. Students are affected by those choices and that in an environmental context, but this can have positive effects as it may lead to pro-environmental behavior. The following section will explore contemporary empirical research on teachers' knowledge and perceptions in relation to climate change education.

Empirical findings on knowledge and perceptions on climate change

Given the importance of learning about climate change, teaching and learning about the same

can be conceptually challenging (Shepardson, Niyogi, Roychoudhury, & Hirsch, 2012), not the least because monitoring of the issues requires students to evaluate, interpret and analyze historical data rather than relying on data collected by themselves (ibid). The topic requires knowledgeable teachers, which is why Dal et al. (2015) argue studies on teachers' understanding and attitudes towards climate change is essential. Because of its complex nature, empirical studies on pre-service teachers' ideas on climate change often show students hold misunderstandings and misconceptions about the topic – ranging from failing to differentiate between weather and climate, to misconceptions about causes and consequences of climate change (see Papadimitriou, 2004; Lambert et al., 2012, as cited in Dal et al., 2015). Several studies also point to misconceptions amongst teachers, such as believing global warming is caused by a hole in the ozone layer (Areskoug & Ekborg, 2006; Wise, 2010) or acid rain, and that global warming causes skin cancer (Areskoug & Ekborg, 2006; Michail, Stamou, & Stamou, 2007). Failing to differentiate between weather and climate also is a common misconception amongst the general public (Weber, 2010).

Liu et al. (2015) study on attitudes and knowledge about climate change amongst in-service teachers, a group they have found to be underrepresented in the research literature. The results, sprung from surveys handed out pre- and post-workshop and complemented with in-depth interviews, show most the respondents consider CC to be caused by human activities and that they are concerned about what consequences CC might bring. Nevertheless, their attitudes towards the topic are not found to be strong indicators of their level of knowledge – teachers who were very concerned about climate issues sometimes also held misconceptions about certain aspects of the same (ibid). One study carried out in Singapore (Ho & Seow, 2015), explore 6 geography teachers' understandings of CCE. When asked to describe how they address climate change, teachers have very different descriptions of their teaching practice, despite a highly centralized national context (ibid). A study on Australian pre-service teachers finds the knowledge and understanding of climate change amongst the participants to be very low, also amongst them who are specializing on science and environmental studies in their earlier studies (Boon, 2010). Bleicher and Lambert (2013) let 154 American pre-service teachers participate in an elementary science methods course with the aim to see whether it affected their perceptions and concerns on climate change. The results, where they also measure teachers' beliefs, show the course made the students develop a deeper level of concern of the issue, but also that instruction and curriculum seems to play an important role increasing the understanding of climate change (ibid).

Despite thorough literature review, few studies have been found on climate change or teacher education in Malawi. One study on the Malawian context found that secondary teachers point at human-caused deforestation as one of the major activities affecting the country's sustainability. They emphasize the fact that deforestation leads to soil erosion, and flooding, which in turn affects the agricultural yields (Glasson et al., 2006). A more recent study on agriculture teaching and sustainability highlighted the fact that the teachers were aware of the sustainability-concept, although not with the terminology 'sustainability' (Kretzer, Engler, Gondwe, & Trost, 2016).

The below section will focus on the discourses on education quality, as they guide the way to the analytical framework.

2.4 Discourses on quality and education

Climate change threatens to undo and even reverse the progress made toward meeting the Millennium Development Goals (MDGs) and poses one of the most serious challenges to reducing global poverty for the international community. However, the education sector offers a currently untapped opportunity to combat climate change. There is a clear education agenda in climate change adaptation and mitigation strategies, which require learning new knowledge and skills and changing behaviors in order to reduce the vulnerabilities and manage the risks of climate change. Therefore, investing in quality education to combat climate change is an essential tool in achieving the MDGs. (Allison Anderson, 2010, p. 3)

As the above quote states, investing in quality education to combat climate change is essential in the strive towards sustainable development. Historically, the focus has been on quantitative rather than qualitative aspects of education policy (UNESCO, 2005). The objective of achieving universal primary education (UPE) has been central to the international community since 1948 and the affirmation of the Universal Declaration on Human Rights, and reaffirmed many times since (ibid). For long, the dominant belief was that merely expanding access to education was enough for achieving development of societies and individuals. It was not until the World Declaration on Education for All in 1990 that quality in education was highlighted on the educational arena (ibid). The significance of education quality was re-affirmed ten years later during the Dakar Framework for Action (ibid) and has since then been central to most international and national development strategies such as the MDGs and SDGs (Bangay & Blum, 2010).

One of the biggest challenges when talking about education quality is the fact that there is no universally accepted definition of the term (Tikly, 2010; UNESCO, 2005). Barrett et al. (2006)

argue that what quality means and stands for is value-based, and must be seen in relation to what purpose education plays in relation to development. In other words, what one wishes to achieve with the education system also dictates the definition of education quality. The EFA Global Monitoring Report (2005) suggests that there are two principles, which characterize most attempts of definitions. One which sees learners' cognitive development as the major objective of all education systems, and thus uses systems ability to achieve this as the main quality indicator. The other focuses on education's role in promoting shared values, as well as creative and emotional development, although this is more challenging to assess (UNESCO, 2005). However, regardless of the stance, in most cases the accumulation of specific values, attitudes and skills, combined with cognitive development seem to be the common important objectives. Further, it is suggested that objectives such as equity of learning outcomes and of access, respect for individual rights and increased relevance most of the time are shared, regardless of how you choose one chooses to understand quality. These principles underpin UNESCO's own understanding of the term (ibid).

Barrett et Al. (2006) suggests a division of the dominant quality discourses into two traditions – the economist tradition and the humanist/progressive tradition. In the economist discourse, often centered around the human capital approach, efficiency and effectiveness is at center, and quality is measured through quantitative measurable outputs. The rationale for investing in education is based on the fact that it contributes to economic growth (Tikly, 2010). The discourse has recently gone through a shift from highlighting quantity in education, to acknowledging the importance of quality in education for reaching the goals of economic growth (ibid). Within the human capital approach, measures like enrolment ratios, earnings in terms of rates of return on investment are important for defining education quality. Learning outcomes are often defined in terms of cognitive achievement and measured by looking at national or international tests. Although it does not provide a framework for understanding quality in education, it is often understood through school effectiveness approaches (ibid). Criticism aimed towards the human capital approach is often focused on its assumption of a linear relationship between inputs, processes and outcomes of education. Such understanding overlooks the complex relationships the contributing factors of education quality and tend to lead to an 'one size fits all' approach to quality. Thereby, different groups with special needs are overlooked, as well as different learning environments (ibid). For the humanist/progressive approach, human development, social change and development of the whole child are the major concerns. Measuring outcomes only through tests of cognitive achievements is not enough for

assessing education quality, as it does not say anything about other non-cognitive skills, values or capacities, that are equally important educational aims (UNESCO, 2005). In other words, in relation to the economist view, the humanist approach usually puts more emphasis on the educational processes. What is important is what is happening inside the classroom, rather than indicators measuring outcomes (Barrett et al., 2006).

The human capital approach has shaped many policy discourses of donor agencies across the world, especially within global financial institutions such as the World bank (Tikly, 2010). The humanist approach on the other hand has been strongly advocated by UNESCO (Barrett et al., 2006). The three EFA documents published since 1990 (*World Declaration on Education for All, the Dakar Framework for Action and the Global Monitoring Report 2005: the Quality Imperative)* all have a broad understanding of education quality, much because of the collaboration between the institutions (ibid). Although many of the goals were focusing on embracing a broad range of social and personal learning outcomes - thereby answering to the humanist approach - progresses assessment was mainly restricted to outcomes that are measurable (ibid). The EFA Global Monitoring Report from 2005 specifically focused on education quality, aiming to reconcile different approaches of quality and to create a comprehensive framework for monitoring, understanding and improving quality in education (Barrett et al., 2006). Elements of the framework suggests a human capital approach to education quality – not the least because of inputs and outcomes focus – however some argue it can also be understood as a human rights approach to education quality (Tikly, 2010).

Summary literature review

This chapter has presented theoretical approaches and literature review guiding this study. Research has pointed to the importance of providing teachers with capacities for educating learners about climate change in the strive to achieve quality CCE, the interconnectedness between CCE and ESD, different strands on education quality and difficulties in implementing an intended curriculum. Next, the conceptual framework will be presented, focusing on education quality and, usage of natural resources and environmental policies.

3 Contextual framework

3.1 Unsustainable usage of natural resources

As the introduction indicated, Malawi is a rural country and one of the poorest in the world (Gregson, 2017). Rain-fed agriculture is the backbone of the national economy and more than 80 percent of the population relies on renewable natural resources for their livelihoods (Kazembe et al., 2011). Because of the citizens heavy reliance on natural resources, the country is especially threatened by the effects of global warming (Department of Population and Development, 2012). Besides the fact that Malawi is increasingly experiencing climate variations such as floods and droughts, cultural practices, population growth's effect on available land and unsustainable usage of natural resources are further contributing to long-term negative impacts (ibid). The large majority of the population live in rural areas, where wood fuel is the primary source of energy. In 2012, 84 percent of the households used wood as cooking fuel in their homes and 12 percent charcoal, only 2 percent came from electricity (Department of Population and Development, 2012). High poverty levels, rapid population growth and lack of other energy technologies than wood has led to an intense exploitation of natural resources (ibid) and Malawi is experiencing rapid deforestation, with annual deforestation rates up to 2.2. percent (Carlson & Shumba, 2011). Poor households also turn to charcoal production as a source of income (UNDP-UNEP PEI, 2016). Among other effects, deforestation has an impact on soil fertility, reinforcing the already heavy soil erosion that leads to reduced agricultural yields and causes widespread hunger and poverty (ibid). Soil erosion is further reinforced by other practices, such as the long tradition of burning the fields after harvesting to make way for new crops (Crouch, 2015). The land has historically been given time to recover, but rapid population growth and thus less land per capita had made this impossible. This creates a vicious cycle; when the land is constantly being used, the soil becomes low in nutrients and unable to support the plants (ibid).

Although land-use and deforestation indeed contribute to global emissions, fossil fuel is the biggest contributor and Malawi's ecological footprint is small. In 2011, Malawi were only accounting for 0.02 percent of global GHG emissions, mostly due to land-use change, the forestry sector and followed by the agriculture sector (USAID, 2016).

3.2 Combatting climate change through education

Malawi's Government has in recent years shown increased commitment to addressing climate change and environmental degradation countrywide, by ratifying international agreements such as UNFCCC and the Kyoto Protocol, establishing the Ministry of Environment and Climate Change Management, as well as making the issues part of the Key Priority Areas in the Malawi Growth and Development Strategy (Ministry of Environment and Climate Change Management, 2013). One of the latest steps is the ongoing implementation of the National Climate Change Programme (CCP), aiming at mainstreaming climate change issues in the national development agenda (Mining, 2014). International donors are greatly involved in climate change related support. The UN has established a Climate Change Joint Programme Team and a One UN Fund to facilitate the coordination, funding and reporting of support for climate change activities in Malawi (UN CC:Learn, n.d.). UNDP, FAO, UNICEF, WHO and the World Bank are all active agencies in the area of climate change, although UNDP is responsible for assistance to the Government (ibid). The education systems role in responding to climate change has in recent years increased, as the Malawian Government sees education as a catalyst through which citizens can reach their potential and contribute to national development (MIE, 2014).

Within this frame, the Government in 2013 - supported by the Swiss Government through UN-CC: LEARN[4] and managed by UNDP - launched *Malawi's Strategy on Climate Change Learning* (Ministry of Environment and Climate Change Management, 2013). The strategy is a part of UN-CC: LEARN's pilot project to "strengthen human resources and skills development for advancement of green, low emission and climate resilient development" (ibid, p. X). The goal of the project, which is continuing during 2014-2017, is to mainstream climate change learning within the existing learning system (Unitar, n.d.). Three strategies objectives have been outlined, one aiming to: "develop a critical mass of human resources with requisite understanding, knowledge and skills to respond to impacts of climate change" (Ministry of Environment and Climate Change Management, 2013, p. 40). A priority project during 2013-2016 has been to "develop, reproduce and disseminate CC resources for teachers (primary and secondary) and teacher training institutions (ibid, p. 43). In the project's initial phase, UN

---

[4] UN CC:Learn is a partnership of 33 multilateral organization which supports Member States in designing and implementing results-oriented and sustainable learning to address climate change". During 2012-2013, Malawi was one of five pilot countries to receive support to develop a national strategy for combatting climate change (UN CC:Learn, 2013a).

CC:Learn support has primarily been focusing on providing education materials to primary and secondary level (UN CC:Learn, 2013a, n.d.)As a response to the lack of climate change knowledge among primary school teachers, one of the major initiatives has been the development of a sourcebook on climate change (MIE, 2014). The book is thought to equip teachers with knowledge, skills and attitude on climate change, so they can assist their learners to understand the issue and take actions to mitigate its adverse effects (ibid). Climate change learning has also been incorporated in the new secondary school curriculum (Jennings). As mentioned in the introduction, the IPTE curriculum is now under review, "to make it more relevant and responsive to the needs of the Malawian society" (Kumbani, 2016), and to better align the TTC curriculum with the revised primary school curriculum. The revised version will be ready in September 2017 (ibid).

3.3   Structure of the school system

In Malawi, primary school is free but not compulsory. Primary school lasts eight years and covers the age group 6-13 years, while secondary education lasts 4 years and is divided into a junior and senior cycle (UNESCO-IBE, 2010). The Ministry of Education, Science and Technology (MoEST) has the administrative, financial and academic control of both primary education and training of primary school teachers (UNESCO-IBE, 2010). Besides MoEST, two other influential institutions in the education sector are the Malawi Institute of Education (MIE) and the Malawi National Examination Board. While the latter oversee examinations at the colleges, the former is among other things coordinating curriculum development and assisting with teacher training (SACMEQ, n.d.). The responsibility of providing education is shared among central and local government, voluntary agencies and local communities (UNESCO-IBE, 2010). Malawi is an aid dependent country with a development budget consisting of 60 to 80 % external funding (World Bank, 2013). In the educational sector, aid accounts for 29 % of total spending in the primary sector (UNESCO, 2013).

To be eligible to study at a TTC, students must possess a Malawi School Certificate of Education (MSCE) which one can earn after completing the senior cycle, with at least six credits that include Mathematics, English and one Science subject (Humphreys, 2016). Since the primary curriculum is outcome-based – focusing on student achievement - so is the teacher education curriculum (MoEST, n.d.). The desired outcomes are "description of competencies (behavioral pre-requisites) to be acquired by the student teacher for successful teaching in

primary education" (MoEST, n.d., p. 7). Within the outcome-based teacher education curriculum, assessment to monitor learning is significant (ibid). Ten subjects are taught during the first year of teacher training, where the three below were identified as most closely related to CCE (see chapter 4 for a more thorough explanation). The fact that students only are obliged to have credits in Mathematics, English and one Science subjects to attend teacher training means students can start with various background knowledge on environmental related issues. During teacher training, teachers are not trained to be specialized within a specific subject, but in all various subjects (Kretzer et al., 2016).

Social & environmental science: SES should be "investigating the inter-relationship between Malawi and the world on the one hand, and the individual, family, society and the environment, on the other. This will influence learners to act responsibly on the environment for its sustainable use" (MoEST, n.d., p. 12). Core elements include *environmental protection, inter-dependence between Malawi and the world,* and *people and the environment.* Outcome goals for *environmental protection* is to "enable the primary school learner to make informed decisions considering local, regional and global consequences to maintain a balance between human beings and their environment to ensure its sustained use for present and future generations" (ibid).

Science and technology: core elements which could relate to climate change are *basic science, knowledge, skills and values; nutrition and health, and knowledge for development.* In the latter, the aim is to "enable the primary school learner to interpret and apply scientific, technological and agricultural knowledge with ethical responsibility towards the environment as well as to make improvements in the quality of life and develop respect for vocational work" (MoEST, n.d., p. 14)

Agriculture: the ultimate goal of agriculture education is to make teacher students "able to help the primary learners to learn agriculture effectively and contribute to Malawi's economic development" (MoEST, n.d., p. 15). Core elements include *agricultural environment; crop production* and *agro-forestry.* The goal of agro-forestry is to enable the primary school learners to incorporate "agro-forestry concepts and skills to improve crop and livestock production for environmental sustainability" (ibid). In agricultural environment, the goal is to "demonstrate an awareness of the environmental factors which influence agricultural production with emphasis on conservation of soil and water for sustainability" (ibid).

3.4   Education quality in Malawi

Regardless of the definition, it is fair to say education quality is inadequate in Malawi. The number of pupils attending primary school has increased during the last decade, much because of global enrollment efforts such as the Universal Primary Education initiative in 1994 and population growth (World Bank, 2010). Yet, the school system is struggling to keep pace with increasing enrollment rates the escalating young population, and battle challenges such as shortage of teaching- and learning materials, inadequate classrooms and poor sanitation facilities (Unicef, 2016). A study recently carried out on teaching about sustainability in agriculture in Malawi stated many primary teachers saw the lack of practical aspects in the subject as the main obstacle for their teaching process (Kretzer et al., 2016). With a practical orientation, pupils could learn about "sustainability" in a practical way, but the equipment available for doing so was very limited (ibid). The Global Monitoring Report from 2013 states a third of the children do not manage to reach grade four (UNESCO, 2013). Many are illiterate after 4 years in school (over 70 percent, and 30-40 percent after 5-6 years), although these numbers show large gaps between groups - especially between richest boys and rural girls (ibid). Figures from 2011 indicate that 21.6 percent of the population 6-29 never have attended school (Unicef, 2016) and less than 35 percent of the boys and 28 percent of the girls complete standard 8 (NORAD, 2015). In 2011, survival rate to standard 5 was 56 percent, placing Malawi in the 8th percentile relative to all countries and in the 23 percentile relative to Sub-Saharan Africa (EPDC, 2014).

Like in most African countries (Brock-Utne & Mercer, 2014), classroom instruction in Malawi is given in an exogenous language. English and Chichewa are official languages, although Chichewa is the dominant language of communication in households and around 16 other languages are spoken across the country (Kamwendo, 2016). Malawi recently introduced a new language of instruction policy, where English was appointed the medium of instruction from standard 1 (ibid). The policy is criticized by Kamawendo (2016), who says both students and some of their teachers struggle with English as medium of instruction. A more general critique to the lack of debate on exogenous languages in the larger discussion on education quality is given by Brock-Utne & Mercer (2014). They say that if a language is hardly heard by the children or not spoken at home, classroom practice becomes unproductive, leading to low levels of learning and high levels of repetition and dropout (ibid).

The structure of teacher training in Malawi has varied over the years, spanning from pre-service, distance learning and in-service training with various durations (World Bank, 2010). Regardless of the mode, the goal has been increasing the output of qualified teacher to meet the needs in primary school (ibid). The current Initial Primary Teacher Education curriculum (IPTE) was introduced in 2007, where pre-service consists of one year residential training in college and one year of practice conducted in a primary school (Milner, Mulera, & Chimuzu, 2011). The 1+1 model is responding to the objective of training more teachers within a short amount of time, but researchers have reported that the mode is experiencing challenges relating to quality (DeStefano, 2012). Despite efforts to increase the output, Malawi still faces one of the most dramatic teacher shortages in the world. With an average of 130 students per class in standard 1, children are often squeezed into overcrowded classrooms (UNESCO, 2013). There is an even greater shortage of qualified teachers in primary school across the country. Although the quality teacher-pupil ratio (qTPR) in primary school has improved from 80 to 69 between 2010-2015, Malawi still has one of the highest qTPR in SSA (UIS, 2016b). 2010 estimates displayed roughly 4 000 primary teachers were produced annually (Wolfenden, 2014), which at the time meant the teaching force was only growing with 1 % per year - a number that should have to be closer to 15 percent for global development targets to be reached (UNESCO, 2013). Problems are especially big in rural areas, where teachers are often unwilling to teach (ibid).

On a global level it is suggested 6 percent of GDP, and 20 percent of total expenditure, is spent on education (UNESCO, 2005), and over the last five years, the Malawian government has indicated a continued commitment by yearly allocating over 18 percent of the national budget to the education sector (GPE, 2016). In 2011, 5.5 percent of GDP was spent on education, which accounts for 15 percent of total governmental expenditure (UNESCO, 2013). Public spending rose to 7 percent of GDP in 2015, but the quality of learning remains low (World Bank Group, 2016). Nevertheless, in comparison to other African countries the budget priority for education is still considered low, especially for primary education (UNESCO, n.d. -a). The expenditure on secondary education, measured as percent of total government expenditure on education, measured 27.8 percent in 2015, corresponding number for primary school was 44 percent (UIS, 2016a). However, measured in per pupil spending expenditure (PPE), secondary exceeds primary education. In 2011, PPE as a percentage of GDP was 33 percent in secondary but only 8 percent in primary (EPDC, 2014).

4 Methodology

4.1 Introduction

This chapter will describe the rationale behind the choice of research design and strategy and how data was collected and analyzed. The study, which is placed within the interpretivist paradigm, is considered to be a qualitative embedded multiple case study, carried out on three primary teacher training colleges around Malawi – one public, one private and one grant-aided. For this purpose, a total of 35 educators, administrators, second year students and key informants were interview during the six weeks of fieldwork. The chapter will finish with an elaboration on the trustworthiness and limitations of the study.

4.2 Research strategy and design

At the core of all research is the question concerning how knowledge and reality is understood. This study is based within the interpretivist paradigm, where knowledge is seen as something socially constructed. Within the interpretivist philosophy, the epistemological assumption is that the social world only can be understood from the perspective of the involved individual (E. G. Guba & Lincoln, 1994). Such perspective is suitable for the purpose of this study, as it aims at examining the respondents' knowledge and perceptions on climate change. The interpretivist paradigm does not regard knowledge as something permanent, but relative to studied culture, context and time (E. G. Guba & Lincoln, 1994). A qualitative design has thus been used to give the participants possibility to freely express their beliefs and discuss climate change in their own settings, as qualitative research is concerned with the meaning people attach to things in their lives (S. J. Taylor & Bogdan, 1998). In all essence, such studies aim at providing thick descriptions of a social phenomenon, where the participant point of view is at the core (ibid). The aim to understand the subjective reality of the respondents has guided the construction of the analytical framework, which will be explained in depth in chapter 5.

The fact that case studies are favorable for exploring "how" questions in relation to contemporary phenomena within a real-life context (Yin, 2009) has guided the choice of research strategy. Case studies are especially useful when boundaries between context and then phenomenon are unclear (ibid), which is the case due to the nature of climate change. A case study can be defined as an "intensive study of a single unit for the purpose of understanding a larger class of similar units" (Gerring, 2004, p. 342). Gerring defines *unit* as a spatially bounded phenomenon (p. 342), observed over a delimited period of time. Case studies are in other words

depending on the location – in this case the teacher training colleges – combined with an intensive examination of the setting (Bryman, 2012). As the purpose of the study is to explore the possibility to achieve quality climate change education in the Malawi primary TTCs, the three colleges constitute the main units of analysis. The study is further what Yin (2009) refers to as an 'embedded design', where each case is comprised by several units of analysis within the same study. Such approach is needed to provide more enhanced insights to each case - in order to study the colleges, the individuals which makes up the colleges needs to be studied too. The analysis is moving across three levels of analysis; micro (individual) level, meso (college) level and macro (nation) level.
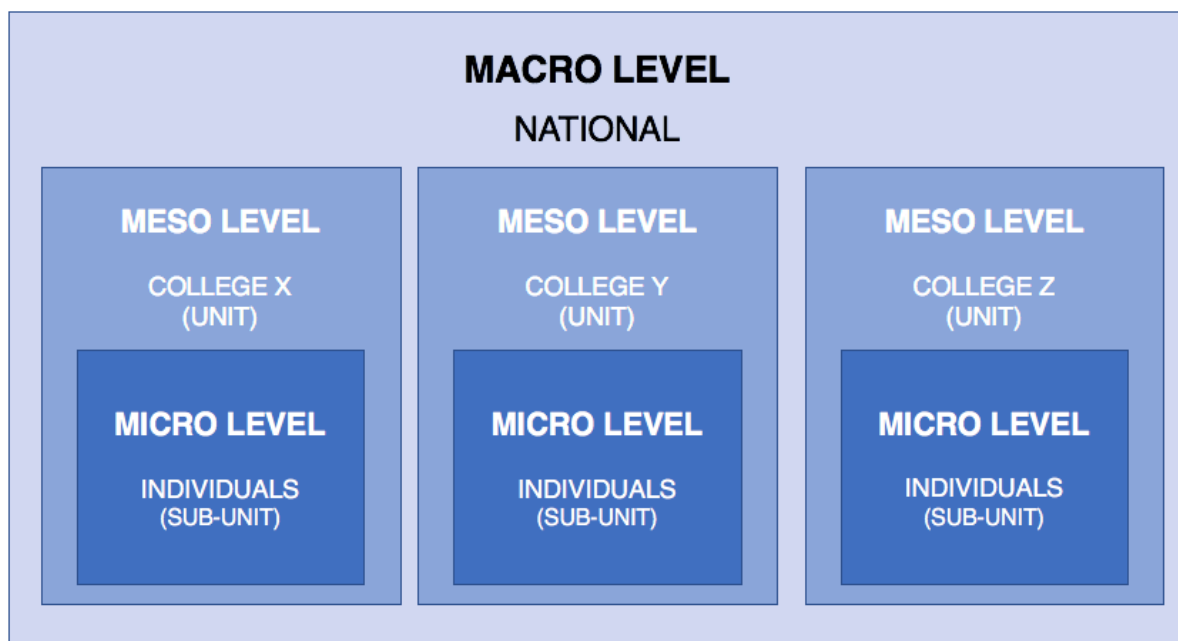
Figure 4.1. illustration of levels and units of comparison (compiled by the author)

Multiple-case studies, or comparative studies, are favorable since they facilitate the understanding of the social phenomena studied, increase generalizability and make results more robust (Bryman, 2012; Yin, 2009). This underpinned the choice of conducting a multiple-case study, carried out on three teacher training colleges in Malawi. Nevertheless, multiple-case studies require careful selection of the cases, where either similar or contrasting results should be anticipated (Yin, 2009). In this case, the latter is expected, since the administration at the colleges differs. At the same time, Bray et al., (2007) state that "for comparison to meaningful, the units of analysis should display sufficient commonalities to make their differences significant" (p. 118). Although the administration of the three colleges do differ,

the cases are embedded in the same larger socio-economic and cultural context and therefore interesting to compare.

4.3　　　Research site – selection of the cases

The choice of Malawi as geographical location for the study was both empirically and theoretically grounded. First and foremost, Malawi is one of the countries in the world that is being most affected by climate change, and due to more extreme weather this is only getting worse. As discussed in the introduction, Malawi is one of the poorest countries in the world, and for many reasons particularly vulnerable to global warming. Raising awareness and understanding of climate change is imperative to the development of the country. The choice of country was further underpinned by the fact that Malawi is one of few countries which in recent years have received support from UN CC:Learn (a partnership of 33 multilateral organizations) to integrate climate change education in their education system (UN CC:Learn, 2013a). As efforts already have been made on primary school level and the IPTE is under revision, it was considered purposeful to explore the teacher education level, as they will need to be able to teach what is already infused at primary level. CCE needs to reach as many Malawians as possible, hence a study relating to the primary level was decided to be more relevant, given that less than 60 percent children reach standard 4 (Unicef, 2016). Thus, it was both purposeful and possible to investigate Malawi's primary teacher education, in comparison to doing so on another level or in a country with no existing policy initiatives on the matter.

The sampling of the schools was purposive, since it was central to the purpose of the study that one of the schools was public and one was private. All colleges follow the same IPTE curriculum; the administrative procedures might differ between the colleges, but the implementation should be the same (MIE, 2008). The underpinning hypothesis was that since funding of the institutions can differ, private and public institutions might have different pre-requisites when it comes to inputs. In other words, while some dimensions of the analytical framework on education quality (like physical infrastructure) can differ depending on the college, others (like national policies) will have the same implications for all three. At the same time, a comparison of the colleges is interesting because it explores the respondents' presumptions on their situation. For example, respondents at different colleges may share the same perceptions in regards to challenges met in their teaching, although the available inputs actually vary. Furthermore, all TTCs in Malawi follow the National Education Sector Plan

(2008-2017), but the private TTCs should specialize in providing qualified teachers to the rural areas of Malawi (MoEST, 2008). Given the rural population's dependency on land and harvest, the hypothesis was that such issues might already been given extended attention in the private institutions. The purpose was therefore to examine colleges from each system, to compare their ability to provide quality climate change education in the future.

Getting hold of the colleges turned out to be a challenge. A report from 2010 (UNESCO-IBE, 2010) stated that in 2008 there were four public teacher training institutions, as well as some private and grant-aided ones, while other said there were up to 16 institutions (MIE, 2008). Such information could not be found at any governmental web pages, neither did the colleges have their own information available online. After rigorous attempts to reach out to the colleges, the German aid agency in Malawi could confirm the information and provide contact information to the principals that was up to date, after which contact was made with the three colleges. The three participating colleges – one public, one private and one public, but grant-aided - are placed in, and around, the largest cities of Malawi. College X is a public, grant-aided school, which is partly financed by the catholic church. College Y is a private teacher training college, mandated by the MoEST. According to the school management, 90 percent of the education is based on government curriculum. College Z is a public college.

4.4 Data collection methods

The fact that the respondents' knowledge and perceptions are at core of the research led to the choice of a qualitative approach. Data collection was carried out through semi-structured interviews, unstructured observations, focus group interviews and review of relevant literature and policy documents. For triangulation purposes and to gain deeper understanding of each case, data was collected from multiple sources. Interviews with TTC educators and administrators were supported by interviews with second year students from each school. Key informants were interviewed as a way of better understanding the macro context.

Semi-structured interviews

Interviews were chosen as data collection tool for the sake of providing rich and thick descriptions about respondents' views on climate change and the teaching. By using qualitative methods, the participants could tell their stories without having to adjust their answers to a questionnaire or a pre-set table. This is the strength of a qualitative research approach; the

researcher has the chance to understand and interpret experiences of the studied individuals, by viewing the world through their eyes (Walter, 2013). With semi-structured interviews, it is possible to re-ask questions if answers are ambiguous, which minimizes the risk of misinterpretation from both respondent and researcher. The possibility to follow up questions and straighten out misunderstandings turned out to be very helpful, as many questions were misunderstood when first asked. At the same time, open-ended interview questions make rationalizing more difficult, and one faces the risk of interpreting the answers differently. When choosing the method, this was taken in to consideration, but in the end the aim of the study guided the choice. Apart from being guided by the methodological approach, my position as a researcher coming from outside the local context made me believe important aspects could have been missed if data collection was carried out through questionnaires. Although a mixed method, where interviews with the students were followed up with a questionnaire that mapped their views on the training would have been favorable, their remote locations made this impossible.

Focus groups

Focus group interview is an interviewing method which involves at least two respondents (Bryman, 2012). Just as with regular interviews, the focus group interview is focusing on how the participants view a certain topic of interest, but the researcher acts as a facilitator (ibid). During these focus group interviews, the aim was to see whether there was coherence in the perceptions on the college-based first year of theory amongst teachers and students, or if their views diverged from those of the educators. In other words, the goal was to triangulate in regards to notions on teaching practices rather than mapping their knowledge on the topic.

Field notes and secondary analysis

In addition to the interviews, data was collected through the collection of field notes and revision of documents. Notes on observations from the fieldwork were taken throughout the data collection period to more easily recall details from the observed social setting and notable experiences which were valuable for understanding the cases. The analyzed documents first and foremost consisted of official document published by the Malawian Government of international agencies such as UNDP and UNESCO and official statistics. Documents were analyzed to inform the purpose and structure of the thesis prior to leaving for fieldwork, and to gain a deeper understanding of structures, systems and context in regards to the three cases.

Interview guides

Four different interview guides were created – key informants, administration, teacher educators and teacher students - each one responding to the respective group of interest (see appendix 10.1). For the latter three, the initial questions concerning knowledge and perceptions on climate change, were similar. Thereafter, each guide was specified to better inform the interviews with the respective group. In the end, the total sample consisted of 35 respondents, interviewed during 28 sessions (table 4.1).

Respondents/TTC	X	Y	Z		Total
Administrators	1	2	1		4
Teachers	5	3	4		12
- Agriculture	1	1	2		4
- SES	4	1	1		6
- S&T	0	1	1		2
Students respondents (interviews)	6(2)	6(4)	2(2)		14 (8)
Key informants				5	5
Total respondents (interviews)	**12(8)**	**11(9)**	**7(5)**	**5**	**35(28)**

Table 4.1. Number of respondents (interviews), as divided by group and college.

4.5   Collection of Data

College staff

Snowball sampling - a method used when there are difficulties in identifying members of a desired population (Saunders, Lewis, & A, 2009) - was used to get in touch with TTC teachers as well as with the second year students. Through initial document review of a framework document of teacher training (MoEST, n.d.), teachers in Agriculture, Social & Environmental Sciences (SES) and Science & Technology (S&T) turned out to be most relevant in relation to the study purpose. As earlier mentioned, CCE is not yet formally introduced as a topic in the IPTE curriculum, but might become either a topic on its own or a cross cutting issue. Hence, interviewing teachers from all subjects for the purpose of mapping climate change knowledge and perceptions amongst all teachers would have been a possibility. Nevertheless, the IPTE

framework revealed SES, agriculture and S&T contained topics which could already be related to climate change, these teachers were considered to be the most information–rich for the cases. This information was passed on to the principals through whom the connections with the teachers were made. However, none of the principals could communicate in advance whom of their teachers would be available for interviews, neither if it would be possible to meet with their teacher training students. This had a rather large impact on the planning of the study, since it was necessary to keep many doors open in regards to sample size and selection. Further, it was the principals who mediated all contacts, choose whom I got to talk to and confirmed who were available. Hence at one of the schools four SES teachers and one from Agriculture participated, whereas in another school it was the other way around.

As for the administrators, the principal at college Y mediated contact at their college. At college Z, the principal said I would be meeting with them but nevertheless but was out of town at time for the interview. As the vice principal was not present, I had to talk to the acting deputy. In the end, the group of administrative staff consisted of one principal (X), one board member (Y), one with responsibility for curriculum issues (Y) and one acting deputy (Z). The implications of this will be discussed under *Limitations*.

Key informants

Key informants were interviewed to create a broader understanding of curriculum processes, to provide information on mechanisms of the education system which could not be found elsewhere, to shed more light on the macro-level of the analysis as well as for triangulation purposes. To get hold of the most information rich respondents, these informants were identified with purposive sampling (Sanders et Al. 2012). A total of 5 semi-structured interviews were carried out with key informants who all worked closely with solid knowledge of the process of infusing climate change education in the curriculum; two respondents working with curriculum issues at the Malawi Institute of Education, one key actor UNDP Malawi working with the implementation of the Climate Change Learning Strategy, one participant from Directorate of Inspection and Advisory Services and one from the German development agency, GIZ. The initial goal was to interview top down, in other words start with the key informants. Yet this was in most cases not possible. Technical issues made communication difficult, and several times meetings got cancelled in the last minute. Because of tight schedules, there were less room for in-depth follow up questions than during the college

interviews. Nevertheless, all sessions lasted between 30-45 minutes, which was satisfying for the purpose.

Interviewing experts can be challenging, as they might have preconceived preferences about how they would like to communicate specific themes (Brinkmann & Kvale, 2009). Bearing this mind, interviewing the experts was a constant consideration of letting them respond freely and trying to keep the focus on the questions which needed to be asked. Nevertheless, the respondents validated each other as they more or less shared the same views on posed questions. All five respondents had good insight of the researched topic and provided rich information.

Second year students

As the aim of interviewing teacher students was to provide more substance and meaning to the semi-structured interviews conducted with the college staff – to verify teachers' responses about their teaching and to better understand their perceptions – it was essential to meet students from the second year, who already been through the theoretical part. Prior to fieldwork it was still uncertain whether this was possible, as the colleges did not communicate how far away the students were situated, or if I would get the consent to meet with them. Well in place all three TTC's were very helpful on this matter. In the end, 14 students were interviewed during 8 sessions – hence both through individual interviews and focus group interviews (see table 4.1). Nevertheless, just as with the sampling of the teachers I was appointed the schools I could visit, and did not have any power over this choice. This is something I have kept in mind when interpreting the data. All interviews with students were conducted after meeting with their educators, so that the appropriate questions could be asked.

Fieldwork notes and document analysis

Besides the notes taken during and after each interview, these notes also include photos of the surroundings and colleges. Following Bryman's (2012) suggestion, I kept a notebook with me at all times where I continuously took notes on everything from conversations with our neighbors about power cuts, to everyday events and visits to primary schools. These notes proved to be very helpful for the analyzing process. In regards to the document analysis, the *limitations* section will elaborate on the difficulties coloring the process.

4.6   Fieldwork

In total, eight weeks were devoted to the field work. According to Marshall & Rossman, the qualitative research design can be flexible both before and during the research (S. J. Taylor & Bogdan, 1998). Planning the data collection went on continuously from April and onwards, yet much was still left to uncertainty when leaving for field work in September. Initial contact had been made with the principals at the colleges already during the summer, however it turned out to be impossible to arrange any actual meetings before arriving in Malawi. The first days in field were therefore assigned to setting up a schedule for the fieldwork period. As it turned out, many interviews needed to be done at the same days, which led to the actual data collection being completed within six weeks time. Although more time in between the meetings would have been ideal, other aspects weight out the rather short time in the field. During the first period of fieldwork, I was staying with a Malawian family outside the capital, an invaluable experience for the contextual understanding of the country and for the trip. Mr. Kalimanjira and his family kindly assisted with the everyday practicalities, but also gave me much greater insights on what it is like to live without electricity and the importance of religion, than I ever would have achieved by myself – even with more time at hand. Through them, I got to visit several primary schools and meet with people who broadened my perspectives on the research. Staying with them functioned as a crash course in understanding the Malawian socio-cultural and economic context, which enhanced interviewing and analyzing procedures significantly.

Because of the remote locations of the schools it was not possible to schedule meetings with the second year students, which often meant arriving when they were in the middle of their teaching. The initial purpose was to conduct individual interviews with the students, to also get a deeper understanding of their knowledge on climate change. In some of the schools I managed to conduct individual interviews, but because of lack of time combined with the students not feeling comfortable with one on one interviews, I also had to conduct the 4 focus group interviews. Due to such time restrictions, these interviews were generally shorter than the average semi-structured interview. Using focus groups as a method may be both a pro and a con. By talking to some of the students individually, there was more time for in-depth queries and asking more follow-up questions. On the other hand, there were eventually more discussion in the focus groups, as they could help each other out and build on the others answers. Additionally, some of the individual interviewees were initially very shy, but became more talkative thanks to the group setting. Although some of the focus group interviews were quite

short, thanks to the insights I got by living with the Kalimanjira family, I found it easier to connect with the students than I would have if I had not had got that opportunity. By being able to relate to their lives and small talk about local issues, we quickly found a good tone where I felt they were comfortable with the situation.

4.7   Analysis of empirical data

The process of collecting and analyzing the data was done through a combination of deductive and inductive techniques. The interview guides were created with inspiration from Bryan and Mochizuki's framework on CCE within the context on ESD. Their understanding of climate change education helped formulating the questions on climate change knowledge, covering issues like climate change science, causes, mitigation and adaptation. However, qualitative data analysis is often a process where new data can influence the research topic, instead of trying to make the data fit into fixed assumptions (Bryman, 2012), so also in this case. First observations and impressions from the field, as well as interaction with respondents, continuously brought up new aspects and topics of interest. Furthermore, when in field, I received a copy of the primary sourcebook on climate change learning, which facilitated the apprehension of the local context. The sourcebook partly guided both data collection and coding, as it provides more locally relevant categories for how climate change knowledge can be understood in the Malawian context. Coding relating to perceptions amongst the respondents were more inductive, although some interview questions relating to thoughts on teaching and importance of the topic were also guiding the process.

All interviews were audio recorded, and during the interviews, notes were taken to highlight emergent questions and to assist future transcribing processes. Straight after completing a session, additional thoughts were scribbled down. These notes were skimmed through before each transcription, which was especially helpful during some of the transcriptions completed back in Oslo. Although notes were taken during the transcription process, the actual analysis of data started after completing all transcription. This was done through a combination of inductive and deductive approaches; some larger themes were already identified through the literature and new themes emerged during the process. Through several re-reads of the transcribed material, data was organized into larger themes, school by school. Data from the key informants and second year students were sorted separately from teachers and administrators, but coded using the same method. All interviewees received code names

indicating school (X/Y/Z) and which group they belonged to (Administrator – A, Teacher – T, Student – S, Key informant – K). The themes were then divided into sub-themes for the sake of better understanding the substance of the transcriptions, and in the end, all interview material was sorted into these themes. Through this thorough coding, some new concepts emerged, which had not been thought of before the data collection.

Themes	Sub-themes	Minor themes
Causes of climate change	Human activities	We have destroyed the systems In my country, we are not following instructions
	Industrial activities	Industrial waste Growth of industries Fumes of cars
	Non-industrial activities	Waste Consumption-behavior Vegetation being destroyed Cur trees for building houses Cut trees for charcoal Deforestation Not planting trees Agricultural waste
	Other, contextual	Unemployment Poverty, no schooling Economic development No coordination between people/government
Enabling inputs	Teaching and Learning materials	Lack resources to do practicalities Do not have sourcebooks yet
	Physical infrastructure and facilities	Enabling school environment No problems in college, only after Have fields but not fertilizer
	Human resources; teachers, principals	Teachers/administration knowledge Teacher/administration perception "Possible resistance from the teachers because curriculum is overloaded" Not enough staff for caring about plants

Table 4.2. Example illustrating the data coding procedure (compiled by the author).

4.8   Quality of the data

Limitations

As elaborated on during the data collection part, the principal at each college chose who would be participating in the study. It is not possible to know if the principals appointed the teachers within each subject who were the most interested in the environmental aspect and therefore the best choice for representing the school on this matter, or if they were randomly chosen because they had time to meet with me. It is imaginable that this can have caused sample bias, however

I believe the teachers who participated were chosen based on availability and their appropriateness to the study. Similarly, it was not feasible to choose the participating administrators. This could be a limitation, as interviewing respondents in the same position, e.g. merely principals, would have been more fruitful for the sake of comparison. Yet, the sample of administrative staff still consists of individuals who all have the possibility to influence the governance at their respective colleges, and are thus still considered as important to the study. Lastly, fewer students than hoped for participated from college Z. The uneven numbers of student participants among the colleges made comparison on the level difficult. However, as this was not the main level of analysis in the study, it did not cause too much damage to the design.

Even though English is the official language in Malawi and the language of instruction in school from standard 1, English was not the mother tongue to any of the respondents, nor to myself. During the data collection, it was notable how the respondents and I used the language differently, and we sometimes struggled with understanding each other. Combined with the complexity of conducting interviews in one's second language, such dissimilarities could have led to nuances in the answers getting lost and misinterpretations of the responses. This too was facilitated by the family who hosted me. They could help me clear out misunderstandings and quickly made me familiar with the flow of the Malawian English. Furthermore, the interview notes were of great help both during and after fieldwork.

There are two possible limitations regarding how the study was presented to the respondents. Firstly, the consent form handed out to all participants (appendix 10.4) explained how the study would be focusing on perceptions on climate change teaching and learning. By instead stating a broader purpose and not revealing the specific focus on climate change, it is possible the respondents would have shown different perceptions on the topic. It was considered more important to explain the purpose of the study to increase the trustworthiness, but one should thus bear in mind the discussion may have led to the importance of climate change being exaggerated. However, I personally do not believe this is the case, due to its actual impacts on their reality. Secondly, I sometimes had to refer to *environmental issues* instead of *climate change* when asking about the current teaching. Climate change issues are not yet infused in the curriculum, and some did not immediately comprehend when they were asked about matters relating to climate change. To handle this, I tried to use probes to direct the interview away from the environment in general towards what was more specifically related to climate

change, as well as re-ask questions for clarification. Nevertheless, it is possible that can have affected the credibility and dependability of the study.

Throughout the process, one of the biggest challenges has been to find up-to-date numbers, figures and facts on education in Malawi. There are several examples; due to inaccessible governmental webpages, some policy documents have been inaccessible; up to date figures on enrollment rates, GDP per capita and government spending on education have often been from around 2011 and earlier; and the teacher training colleges do not have any available information online. Although analysis is possible with older figures, it is a clear limitation of the study.

Trustworthiness of research findings

The most common criteria for evaluating research quality – reliability and validity – are sometimes seen to be more suitable for quantitative, rather than qualitative, research (E. Guba & Lincoln, 1985). Their main objection is towards the positivistic idea of an objective reality the validity concept hold – it does not take into consideration that there can be more than one absolute truth about the social world (ibid). Thus, the verification concept *trustworthiness* will be used instead, which can be verified by providing arguments for the transferability, credibility, dependability and confirmability of the findings.

Credibility refers to if the results of the researcher are credible from the participant's perspective – how believable the findings are. To increase the credibility and dependability of the study, data has been triangulated from multiple sources (Bryman, 2012). By talking not only to the teachers about their teaching, but also to their students and management staff, an additional perspective on climate change education at the colleges was provided. Interviewing various people at the colleges combined with the key informants, also helped in understanding local phenomenon such as deforestation and use of charcoal better. When several respondents talked about the same issues but from slightly different perspectives, I became more certain in that my own understanding of their telling's was correct. Many times, questions were repeated, reformulated and followed up to ensure that I understood their responses correctly. Notes were taken during all interviews and followed up by a short written summary of the session. Although the interviews were transcribed during and straight after fieldwork, it was very helpful to be able to go back and read the immediate thoughts and reflections on the material.

Transferability relates to the possibility to transfer the research to other settings. To enable this, a contextual framework of the research setting will be provided in chapter 3. Transferability also refers to the generalizability of a study. The qualitative research design makes full generalizability difficult, but the number of cases in this study increases the possibility to do so as compared single case studies or to smaller comparisons.

Dependability accounts for the quality of the analysis and the data collection. The interview guide was pilot tested with the assistance of a friend in class before leaving for the field. Through this, useful insights were made, not the least on how to behave as an interviewer. Questions that did not made sense were clarified and others divided into more specific questions, which turned out to be helpful during the actual interviews. A possible shortcoming is the fact that there has only been one researcher in the process. However, my supervisor has been a part of the whole process. I have in this methods chapter attempted to describe the research process, and through that increase the dependability of the study.

All parts of research, from creating interview questions to analyzing the data, will inevitable in some ways be influenced by the researcher, yet one can attempt to minimize such impact. The concept of *confirmability* relates to the fact that although the researcher cannot be fully objective, he or she can act in good faith. As a Scandinavian student, for the first time visiting one of the poorest countries in the world, I might have had presumptions about the context that affected the research, regardless of how hard I have tried to reduce such impact. For a researcher involved in qualitative research, it is important to try to set aside one's own perspectives and views of the world to better understand how the respondents see things (S. J. Taylor & Bogdan, 1998). After having completed some interviews it was clear that this was of outmost importance of the study, but also a very difficult task. For example, I had to step away from my understanding of the climate change concept, as such 'Western' understanding did not match the respondents'. To minimize this type of potential bias, I did extensive reading about the context before traveling, and, more importantly, tried to be open-minded and sensitive at all times when in the field. During the analysis process, I have continuously gone back to the transcribed material to make sure I have not misinterpreted the data.

Ethical Considerations

I am immensely grateful for the time of all the participants of this study, and have throughout the whole process done everything I can to treat them and the collected data with deserved respect and with their best interest in mind. All participant read thorough a consent letter stating the purpose and aim of the study before starting the interview, after which they all verbally agreed to participate. All teacher students were above the age of 18. In all research, there is a consideration between transparency and intersubjectivity. By protecting the names of the respondents and the colleges, the trustworthiness is affected. Yet, as a few participants asked to be anonyms in the study, all participants have been given code names.

5 Analytical Framework

5.1   Introduction

In order to explore the possibility to achieve quality education in the context of climate change learning, this study builds on a modified version of UNESCO's 2005 framework for understanding, monitoring and improving education quality, combined with a local adaptation of Bryan & Mochizuku's (2015) competencies for addressing climate change (which is based on Delors four pillars of education, see page 48). Before elaborating on the analytical framework, it is important to bear in mind that the UNESCO framework generally is intended to address an education system comprehensively, rather than one separated topic as used in this case. However, it is believed that such adaptation is possible, not the least because quality education is a prerequisite for achieving CCE (Anderson, 2010). In many ways, CCE at teacher training colleges will be intertwined with the quality of the whole education system, hence much of what determines the over-all quality of the education also affects the possibility to achieve quality CCE. Yet, some categories might have a distinct effect on CCE, either by facilitating or hampering the possibility of achieving quality education in climate change learning. A contextual category such as *national governance and management strategies,* could demonstrate that rigid policies and support for teacher education in general are in place, but that a willingness to address climate change is lacking.

This chapter will provide an explanation of the modification of the quality framework. Rather than focusing on all five dimensions[5] considered to affect education quality, attention is given to the enabling input, teaching and learning, and contextual dimensions. As the reviewed literature underscored the importance of teachers' knowledge and perception for educational outcomes, the enabling input category concerning human resources has been given extended attention. The teachers' and administrators' role in promoting climate change education in a qualitative way depends on their knowledge and perceptions about the topic. Therefore, it is essential to understand what climate change knowledge means to the respondents. The quality framework, more specifically the human resources category, has thus been combined with a locally adapted framework for understanding climate change knowledge. In this case, Bryan and Mochizuku's understanding of climate change education serves as a bottom line, but has ultimately been developed from the Malawi primary school sourcebook on climate change.

---

[5] Learner characteristics, teaching and learning, enabling inputs, context and outcomes. See section 5.3 for more discussion on this.

The justification for this choice will be discussed in the following section. As Bryan and Mochizuku's view on CCE builds on the Delors report and four pillars of learning from 1996, it works well to combine this framework with the UNESCO quality framework from 2005, which also is strongly attached to the Delors report (UNESCO, 2005).

Perceptions will not be singled out within a specific part of the framework, it is integrated in all parts. Teachers' knowledge on climate change affect their ability to provide accurate and "objective" fact on the topics to their students (as decided by the sourcebook). Respondents' perceptions affect their attitude to the topic and classroom practice, as well as how much emphasis the administrative staff chooses to put on creating an enabling environment. Perceptions hence not only relate to the distinction between knowledge and perceptions about climate change, but also to their teaching situation. Teachers with the same amount of knowledge on climate change might have different understandings on the flexibility in their teaching, hence infusing the topic in various extents.

The interviews have predominantly been guided by the respondents' perceptions. Instead of explicitly asking about all different aspects of the constructed framework, they got to highlight what they believed was important in relation to CCE. The quest has not only been to find what is 'objectively true' in terms of learning time (i.e. the intended curriculum, how much space they have on their hands to address the issues), but also how the respondents perceive the time available, how they implement it. In some instances, largely when discussing the contextual dimension on macro level that affects all cases, responses have been supplemented with observations and findings presented in the contextual framework.

5.2   Climate change knowledge

UNESCO's first position on education quality during the 1970s stressed the importance of relevance and lifelong learning (UNESCO, 2005). In 1996, the Delors report provided a conceptualization of quality which was thought to be an integrated and comprehensive view of learning. The report saw education throughout life as based on four pillars; learning to know; do; be; and live together (Barrett et al., 2006; UNESCO, 2005):

Learning to know	• Concerns "learning to learn" - meaning how to benefit from education throughout life, and acquiring broad knowledge as well as mastering tools of knowledge and understanding
Learning to do	• Relates to the practical application of what one learns
Learning to live together	• Addresses the skills for understanding others and self, and how to take responsibility for contributing and participating in society; both on a local and global level
Learning to be	• Concerns the skills needed for developing ones individual potential.

Figure 5.1. Delors four pillars of education (Barrett, Chawla-Duggen, Lowe, Nikel, & Upko, 2006; UNESCO, 2005)

The report has been important for the development of the concept of *life skills*, which goes beyond the practical and vocational skills and knowledge children need for becoming productive in their work life (Barrett et al., 2006). Such skills tend to focus on the pillars of learning to live together and to do, and have been visible in areas such as peace education and education for sustainability (ibid). Yoko Mochizuku (programme specialist at UNESCO) and Audrey Bryan (2015) have recently suggested Climate Change Education within the Education for Sustainable Development (CCESD) can be addressed based on these four pillars of education, and through that achieving quality in climate change education:

Learning to know

- Basic understanding of causes (who, what and how) and severity om impacts of CC (how is affected and how), available options of mitigation and adaptation measures

- Understanding of multidimensional and interconnected nature of causes and consequences of CC
  - *Understanding how interconnected the world is*
  - *Should be address from an interdisciplinary and systems perspective*

- Knowledge of climate science
  - *Know about earth's climate system*
  - *How to assess information about climate*
  - *Participate in dialogue and debate about CC*
  - *Make informed and responsible decisions for sustainable societies*
  - *Know about scientific concepts like climate, deforestation, habitat loss, water cycle, soil erosion, air pollution*
  - *Know about strategies against it, like reducing carbon consumption, reducing deforestation, improving water and waste management*
  - *Time-space dynamics of CC and history of it*

- Knowledge of mitigation and sustainable consumption and production
  - *Energy consumption, renewable energy, environmental conservation, re-forestation*
  - *Examining economic systems, social structures, consumerism, cultural patterns ...*

- Knowledge of CC adaptation and DRR
  - *Adaptation and DRR is closely related (can use community disaster committees. Rescue plans, local first-aid training)*

- Knowledge of local environmental conditions, associated risks and management strategies

- For example sustainable agricultural methods, strategies for improved water, soil and waste management, forest management, how to manage flood cycle etc.

Learning to do

- CCE should promote skills and capacitates that cut across cognitive and affective domains, like: coping with emotions, adapting to new situations, envisioning alternative futures, developing new values and social transformation skills… To do that you need methods that are participatory, experimental, critical and open-ended to enable learners to engage critically

- Managing information and thinking critically about CC

- Coping with the emotional realities of CC

- Preparing for sudden and slow-onset disasters (how to survive in certain contexts) – survival skills
  - *For example health and hygiene education*

- Preparing for green jobs

Learning to live together and to be

- Creating a sense of belonging to the global community
  - *Understanding global issues and trends, respect for key universal values (peace & human rights, democracy…)*
  - *Cognitive skills for critical, creative and innovative thinking, problem-solving and decision making*
  - *Non-cognitive skills such as empathy, openness to other experiences and perspectives*
  - *Behavioral capacities to engage in proactive action*

Figure 5.2. Illustration of Bryan & Mochizuku's (2015) framework on climate change education.

Bryan & Mochizuku's notion of what CCE should contain serves as a starting point for understanding what climate change knowledge implies. Without a framework for explaining what CCE should constitute, it is not possible to discuss whether the respondents are knowledgeable on the subject. Understanding the respondents' knowledge level on the topic is essential for the larger context of the quality framework, as human resources are a vital part of

the quality framework. Their knowledge and perceptions will affect the students' possibility to receive quality climate change education. As elaborated upon in the literature review, education is a crucial tool for achieving sustainable development. Since development many times is contextual, the education system that supports the development needs to be contextually responsive (UNESCO, n.d. -b). In other words, there is a need for adapting the climate change education to the local context. This can further be justified by the following quote by Leon Tikly: "At heart of a postcolonial analysis is the recognition that dominant understandings of quality are written largely by Western writers working within a western *episteme* (ground base of knowledge)" (Tikly, 2010, p. 7). Based in the interpretivist paradigm, the subject's notion of knowledge is at core. To elude this, the four pillars for climate change learning have been contrasted to the context of the Malawi Primary School Sourcebook on Climate Change. This is what in-service primary teachers are supposed to teach, and will hence serve as a benchmark for what it should mean for teacher training educators to be knowledgeable on climate change issues. Further, when creating the poster on climate change, UN CC:Learn stated that it, in addition to all public primary schools, would be sent to 7 public Teacher Training Colleges around the country (UN CC:Learn, 2013a). Neither administrative staff, nor teacher educators at the three included colleges indicated they had seen these posters. Yet, this fact further justifies the choice to use the primary school sourcebook as reference for the teachers' knowledge, as it is developed together with the poster. It constitutes the climate change knowledge considered locally relevant, and is therefore more important to contrast the interviewees to, than the more global framework by Bryan & Mochizuku. Hence, figure 5.3 explains the various elements of the sourcebook.

Contrasting the two, it is apparent how the primary sourcebook primarily is focusing on the *learning to know* aspects of Bryan & Mochizuku's framework. Aspects like understanding of causes and consequences of climate change, climate science, knowledge of mitigation and adaptation and sustainable consumption and production are all covered in the sourcebook. Bryan & Mochizuku's framework underlines the need for knowledge of local environmental conditions, risks and strategies, which is highly visible in the sourcebook. An example of this is how deforestation is stressed as the main contributor to CO2 emission, although globally fossil fuel is the main contributor. Additionally, the sourcebook focuses on both mitigation and adaptation measures which relates to trees and soil: planting trees and grass, and minimizing burning of the same as mitigation actions, as well as reforestation and planting of trees for fertility as adaptation measures. In the section where learners are given activities they can do

for mitigation at home, these are all central aspects. Bryan & Mochizuku's framework also mentions reforestation (but as a mitigation action), but stresses other mitigation measures such as renewable energy and examining economic systems. Adaptation measures are more focusing on disaster risk reduction. Notably, the sourcebook does not explicitly mention such activities. It neither stresses features mentioned within *learning to do,* and *learning to live together and to be*, such as coping with emotional realities of climate change or developing an understanding for global issues and trends and respect for key universal values.

Background information on climate change	GHG's contribution to climate change	Human activities that increase climate change	Impacts and effects of climate change	Mitigation	Adaptation	Suggested learner activities
• Explain the concept *global warming* • *Gradual increase in global surface temperature, caused by emissions from human beings → rise in temperature, changes in climate system* • Explain the concept *climate change* • *Long term changes in weather patterns* • Explain origin of climate change • Main cause: more industries in West→ increased carbon dioxide levels • more waste production • cutting down trees for land releases CO2	• Gases keeps sunlight radiation in atmosphere (keeps earth warm) → greenhouse effect • Gases prevent radiation from escaping the earth. • Gases come from carbon dioxide: "accumulation of CO2 mainly increases due to deforestation as a result of depletion of vegetation, which would recycle the CO2 to O2*. Other gases are water vapor, methane, nitrous oxides. • *only 16 % from deforestation, 58 % from fossil fuel.*	• Human activities • *Burning of fossil fuels for energy (cars, planes, industrial use, natural gas for heating, charcoal for cooking and heating), industrial activities, oil drilling, coal mining* • Non-industrial activities • *Burning of forest, bushes, crop fields and residues** • *Deforestation and forest degradation (contribute 18 % of GHG emissions. Due to turning of soil every season which releases gases, making forest farming land, cutting trees that cannot absorb, and releases CO2)* • *Careless dumping of waste* • *Agriculture (livestock farming, use of chemical fertilizer in crop production which contributes to release of nitrate oxide in atmosphere).* • *90 % of farmers do this. burning crop residues; burning forest, hunting, land preparation).*	• Agriculture (livestock and crops) impacts: failing crop production due to raising temperatures and reduced rainfall. Also affects fisheries sector due to low water • *Adverse effects: scarcity of food – malnutrition; diseases such as malaria, cholera; decline in business with agriculture products; loss of lives and property* • Forestry impacts: dry conditions = drier forest types. Loss of important tree species used for food, timber and spiritual reasons • *Adverse effects: reduced timber products and scarcity of natural fruits due to drought* • Water sector: vital for livelihoods of households and ecosystem. Drought and floods disrupt quantly & quality of water • *Adverse effects: chronic sickness due to no water sanitary, shortage of water* • Energy sector: floods & droughts impact energy generation on river banks, like Shire River. Blackout affects families and industries • *Adverse effects: reduced industrial production, inefficient service provision in health sector etc*	• Planting trees and grass • Minimizing burning bushes, grass, crop residues and crop fields • Practicing conservation agriculture (tilling of land releases CO2) • Reuse, reduce, recycle • Using renewable energy • Change lifestyle (biking, eat more vegetables) • Using bio-fuel for transportation • Efficient use of energy (energy saving bulbs and charcoal burners) • [they also list international and national policies for mitigation (like Kyoto, UNFCCC)	• Many different actions mentioned, within areas of fisheries, forestry, gender, tourism, wildlife, transport, industry, human health, energy… • *Agriculture (planting trees that add fertility, crop rotation, early maturing crops, irrigation, compost manure, drought tolerant crops, improving land management, crop and animal diversification)* • *Forestry (reforestation, forest management)* • *Health (provision of safe water and sanitation hom/in schools, school feeding programs, emergency medical services…)*	• Reduce emissions: avoid setting bush fires, reduce, reuse, recycle waste production • Adaption: rain water harvesting from roof tops (for watering plants, washing), tell parents to plant early maturing crops, practicing crop diversification (not only maize) • Mitigation and adaptation: advise parents not to burn crop residues, separate waste, planting trees and grass around school and house establishing wildlife clubs,

Figure 5.3. Locally adapted framework for understanding climate change knowledge, based on the Malawi Primary School Sourcebook on Climate Change (illustration made by the author).

5.3 The Quality Framework

UNESCO's 2005 quality framework is based on a comprehensive understanding of the quality concept, where both economist and humanistic aspects are visible. The framework explains what elements affect educational outcomes, by defining five different dimensions that all are

thought to influence the process of learning and teaching. These are: *learner characteristics-;
contextual-; enabling inputs-, teaching and learning-,* and *outcomes dimension* (see appendix
10.2) *(UNESCO, 2005).* As the goal of this thesis is to explore the possibility to achieve quality
climate change education, the adapted quality framework is first and foremost focusing on the
contextual-, and *inputs* dimensions. Tikly (2010) raises criticism against the framework and
the fact that it assumes a linear relationship between inputs, processes and outputs of education.
This is problematic since the inter-relationships between the variables according to her are far
more complex (Tikly, 2010). Such arguing can justify the choice to fit the framework to the
purpose of the study. Thus, emphasis is not put on the outcomes-dimension. Notwithstanding
its importance to the concept of education quality, measuring outcomes is not feasible for the
study, since climate change education has not yet been formally introduced in the teacher
training curriculum. Although many teachers do claim they already teach about climate change,
trying to examine agriculture outcomes for measuring climate change would create bias.
Furthermore, measuring outcomes is more suitable for quantitative studies. If outcomes are not
measurable, one might argue a framework answering to a human rights approach with a more
learner-centered view could have been used instead. Nonetheless, such framework would not
have been fruitful considering the levels of comparison are the teachers within the colleges,
not the students. For the same reason, the adapted analytical framework is not focusing on the
learner characteristics dimension, as answers responding to these aspects would not provide
reliable results, nor give a fair picture of the student population. Although students from all
three schools was interviewed, the samples are not big enough for providing interpretable data
on the dimension. Similarly, even though teachers and administrators did discuss some learner
characteristics, their responses are not sufficient for drawing conclusions about their students.

Bearing Tikly's criticism in mind, the framework has been adapted for operationalization of
the study. There is no universal model for achieving education quality, neither for exploring it.
For this reason, while some categories within the original contextual dimension have not
received extensive attention as they are not relevant for the topic, a few aspects have been
added. One evident deficiency with chosen framework is how not all characteristics within
each dimension are defined (see UNESCO, 2005). For example, while an explanation of what
school governance implies is given, one on what they mean with labor market conditions is
not. While this can be negative in the sense that it makes operationalization more difficult,
more open interpretations are suitable for a qualitative study than it would be in one where a
quantitative method was used.

Enabling inputs dimension

Inputs are *enabling* in the sense that they support and are so strongly related to the teaching and learning processes. Teaching and learning processes can be strongly affected by inputs; meaning what resources are available and how those are handled (UNESCO, 2005). The main variables here are human and material resources, as a school without learning materials or teachers will not be effective. In addition to that, *governance* of the resources play an essential role - how the school is managed and organized can have an indirect impact on teaching and learning (UNESCO, 2005). Important factors can be good community involvement and incentives for achieving good results (UNESCO, 2005). In relation to CCE, school governance will relate to measures taken by the schools that can have a positive or negative effect on CCE, as well as administrators' perceptions on the topic.

Within the *human resources* category, teachers is the most important group, since they both influence the outcomes and are affected by the context surrounding them (UNESCO, 2005). *Material resources* are all important to the quality of education and include availability of school facilities, classrooms, libraries and other infrastructure, as well as textbook and other learning material. The same goes for climate change education, where teachers need materials to support learning activities on the topic (UN CC:Learn, 2013b). Relevant material can include resources guides, books, videos and cartoons to empower students (ibid). Notwithstanding its importance, relatively more emphasis is put on the human resources category than on materials aspect. Evaluating teaching materials in relation to climate change learning would be contra productive, as it is not yet integrated in the formal curriculum. Nevertheless, teaching materials will still be addressed, but in terms of how the respondents believe it is important for their teaching and how they experience the current situation.

Teaching and learning dimension

Teaching and learning processes are closely interrelated with the enabling inputs and other contextual factors, simply because it is here the impact of the other categories can be revealed. However, this dimension refers to what actually happens in the classroom, for example what *methods* are being used (UNESCO, 2005). One of the quality indicators is *time spent on learning* – a large body of research show how instruction time correlates with achievement (ibid). In this context, time spent in teacher training is essential. Future teachers should preferably enter teacher training with sufficient knowledge about the subjects they are going

to teach, but in many low-income countries this is often found to be a deficiency (UNESCO, 2013). Initial teacher training should therefore be able to make up for teacher students' potential weak subject knowledge so they acquire a good understanding of what they are going to teach (ibid). Furthermore, "regular, reliable and timely *assessment* is key to improving learning achievement" (ibid, p. 158).

Contextual dimension

The links between society and education are strong and each have an impact on the other (UNESCO, 2005). The *general wealth of a nation* affects the education system, as poverty can constrain opportunities to increase resources for the sector (UNESCO, 2005). The existence and goals of *national policies* for education are other influential aspects of the contextual part of the framework, since they set the enabling conditions for the educational practice nation-wide (UNESCO, 2005). For developing countries like Malawi, international aid strategies are influential for the same reason (UNESCO, 2005).

Besides impact from international agencies and the Government, factors like economic and labor market conditions, socio- cultural factors, national standards and parental support matter. These affect, and are affected, the enabling inputs dimension. In this study, some contextual categories may not have a direct effect on the education on climate change, but indirectly affecting it. For example, the general management of local environment and waste may affect respondents' perceptions about such issues. Lastly, *secondary education* has been added as a contextual category, as the structure and quality of that system highly affects the teaching and learning process at teacher training colleges.

The analytical framework is presented on the following page.

Locally adapted framework for understanding climate change knowledge (figure 5.3)

Enabling Inputs

Teaching & Learning
- Learning time
- Teaching methods
- Assessment, incentives
- Class size

- Teaching and learning materials
- Physical infrastructure and facilities
- Human resources: teachers/principals & administrators
- School governance

Context

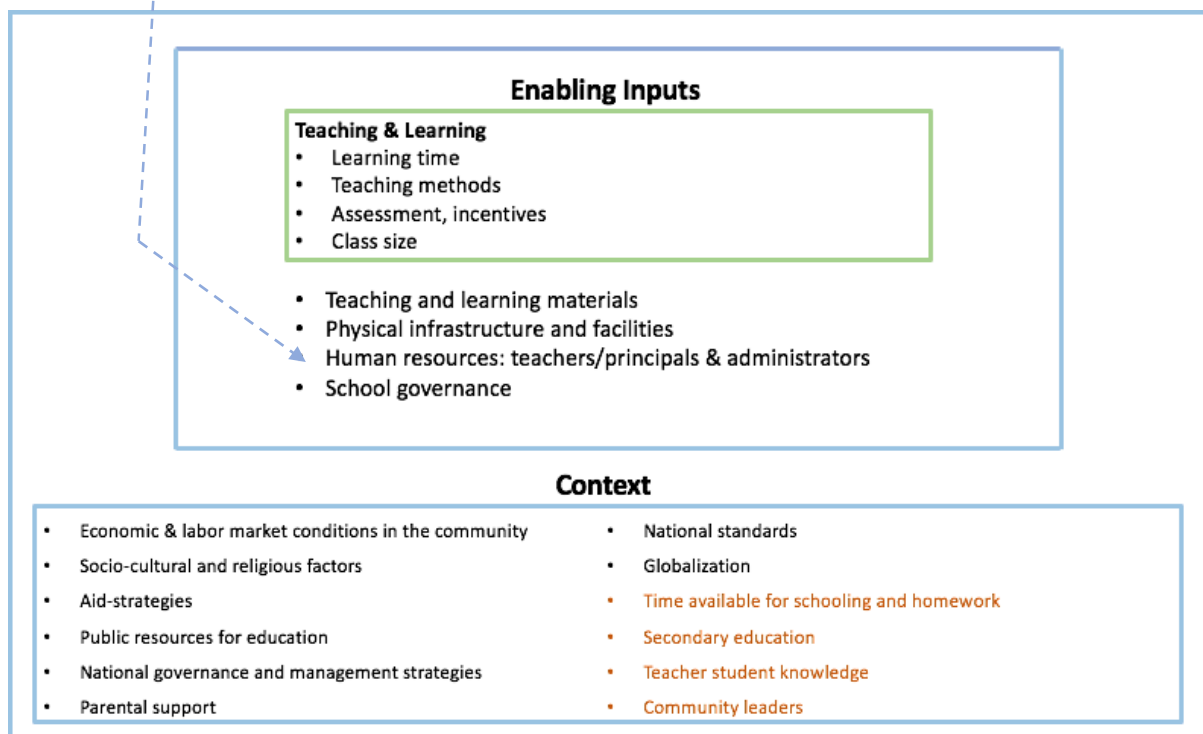|	
• Economic & labor market conditions in the community	• National standards
• Socio-cultural and religious factors	• Globalization
• Aid-strategies	• Time available for schooling and homework
• Public resources for education	• Secondary education
• National governance and management strategies	• Teacher student knowledge
• Parental support	• Community leaders

Figure 5.4. Analytical framework based on UNESCO's quality framework and the Malawi Primary School Sourcebook on Climate Change (compiled by the author).

6 Findings and Discussion

In this chapter, the gathered data will be presented and discussed. The first research question corresponds to the local framework on climate change knowledge, whereas the following two more explicitly relates to the dimensions of the quality framework. Data collected through interviews with the teachers and administrative staff serves as main body of the research findings, complemented and reinforced with the findings from focus group interviews with students, interviews with key informants, field notes and findings from secondary sources. All three colleges are compared simultaneously. Findings from the three research questions are presented separately, each followed by a summary and smaller analysis. A larger discussion then follows, with the overall purpose to discuss what implications the findings have in the possibility to achieve quality climate change education at the colleges.

6.1 Research question 1: What does climate change mean to the respondents?

This section will present the 16 teacher educators' (T, referred to as *teachers')*, and administrators' (A) knowledge on climate change in relation to the locally adapted framework (see figure 5.3), which entails what should be taught at the primary schools around the country. In all questions relating to their knowledge and perceptions on climate change, the aim was to pose them as openly as possible before probing, rather than asking about specific aspects brought up in the sourcebook. This was done to avoid an initial presumed type or level of understanding of the concept. Hence, open questions were asked so they would not be lead into a pre-set definition, but rather to be able to create an open environment where they could reflect freely. The purpose was also to gain understanding of what the respondents found to be the most important aspects. The section is finished with a comparison to the students' (S) perceptions, as they bring another dimension to both the teachers' perceptions and curriculum implementation. Unfortunately, the student samples were too small to provide robust comparisons college by college, hence such comparison is not carried out. The main finding of this section shows the knowledge level does not appear to vary much between the colleges. Naturally, on an individual level, knowledge levels on the topic will always fluctuate, however not so much that clear differences between the colleges are visible.

Meaning of concept

In the beginning of the interviews, all respondents were asked what the first thing that came into their mind was when they heard the words climate change. The most apparent association was undoubtedly the connection to a change in the rainfall pattern. Throughout the whole interview session, changes in rainfall pattern was mentioned by nearly all respondents, and often already during the introductory question:

> X3T: Basically, what comes to my mind is the way the weather is changing (…) you look at elements of rainfall patterns…
>
> Y1A: Well the first thing that is almost obvious is the rain pattern changing
>
> Y2A: I'm thinking of change of rain season…
>
> Z4T: I view it as a change in weather pattern. For example, rainfall.

This notion was not exclusive to the college staff. During the time in the field, this question was asked to as many people as possible. More or less everyone immediately related climate change to changes in rainfall pattern. Yet one perception of the term climate change was deviating. The administrative staff at college X did at first not grasp the question, then responded by linking climate change to the seasonal changes accruing over a year. Furthermore, many teachers and administrators responded to the initial question with relating the concept to some kind of change over time, yet some were ambiguous as to what kind of change was implied:

> X1T: I think what comes into my mind is like… what can I say… the way how the climate is now, is different in the way how it was in the past.
>
> X4T: the… entire world undergoing, or going through some sort of transition, changing from the way things were being done and migrating into another way of living.
>
> Y3T: I understand it as the way the environment, the entire environment, how it is now than it was before. In most cases not for the better, but something has been lost.

Both the definition of climate change as provided by Corcoran et al. (2013) and the primary sourcebook stress how the concept involves a time-perspective. Climate change refers to decade-long changes in climate variability, whereas weather refer to the from day-to-day experience. As the above quotes also indicate, respondents from all three colleges (10 out of 16) indeed showed an awareness of how climate change is a phenomenon which implies a time perspective. While some addressed the time perspective in a way which referred to a longer perspective (X3T, Y5T), some emphasized recent season changes (Y1A, Z1T):

56

X3T: From history, we have been seeing, and also hearing that rainfall pattern which we are having now is different from what we used to have before. And it's very evident because even nowadays when the rains come it's not the same.

Y5T: Changes in weather pattern, changes in what we have been seeing in seasons, in rainfall, temperature changes…. For example seasons in Malawi, we have witnessed them changing. We used to have, for example in the southern regions, rains used to start in October. Then over the years we have seen a change from October…

Z1T: We are living in a world that is changing, technologically, and that climate thing, the world that surrounds us – the environment itself – the… is changing in a way that you can see that… um for example in Malawi, October like this one, rains used to come at this time a year. But last year, rains started in December and close to January.

Y1A: Now you cannot predict really how long the hot season or the cold season will be. Like this year, it was a longer cold season that would be normal.

The sourcebook states teachers should be able to explain the concept global warming, as well as how greenhouse gases contribute to climate change by keeping sunlight radiation in the atmosphere and through that keeping the earth warm. There was just one respondent, a SES teacher at college X, who brought up greenhouse gases and carbon dioxide when asked what climate change meant to them:

X5T: I think climate change is a phenomenon, which basically refers to issues like global warming… Now that basically the vegetation is being destroyed, you have less amount of… You have more carbon dioxide in the atmosphere. And the carbon dioxide is one of the greenhouse gases, and most of these also come from exhaust fumes of cars, refrigerators, the old ones, and also from factories.

Just one respondent from college X and one from Z related climate change to changes in temperature, but not to a *rise* in temperature as the explanation in the sourcebook requires. Nevertheless, even though such perspectives did not immitigably come in to the minds of the respondents, before the end of the sessions an additional four respondents, representing all three schools, brought up either the concept of greenhouse gases or carbon dioxide. They all did so when discussing the causes of climate change. Y1A pointed to the fact that we must reduce emissions of greenhouse gases and change people's lifestyles, whereas Z2T suggested an imbalance of carbon dioxide and oxygen in the atmosphere is causing the climate to change. Y3T referred to actual greenhouses:

Y3T: there is this issue now of greenhouses, where people now cultivate in greenhouses.

Other greenhouse gases mentioned in the sourcebook, such as methane, nitrous oxides and water vapor, were not brought up during any interview. In college Y and Z, three respondents also brought up the atmosphere, although more mentioning it, rather than doing so in relation to greenhouse gases or the greenhouse effect.

Climate change is a global phenomenon which affects the whole world, albeit unequally (Bryan & Mochizuki, 2015). To understand the interviewees' knowledge and perceptions on the global complexity of the thematic, they were asked if they believed countries around the world experience these issues in the same way. In this sense, answers were scattered. Three teachers, two from college X and one from college Z, believed that people experience the same thing across the world. The rest either were uncertain, could not say anything about other countries or solely pointed to the fact that neighboring countries like Zimbabwe, Zambia and South Africa were hit just as hard as Malawi. Two teachers from college Z mentioned the difficulty to say anything about other settings depended on how they had not been able to travel across the boarders themselves:

> Z1T: It's difficult for me to talk more about other countries I have never been there, but maybe if I google… Yeah, I chat with those people that have been to those places, you actually appreciate that climate change is changing the whole world.

> Z2T: since I have not been to these other countries, but I just assume that the experience is the same.

On the same note, for one of the teachers who meant climate change affects all countries, an earlier possibility of traveling seemed to have had an impact on the understanding:

> X4T: I had a chance of visiting other countries like Zambia, South Africa, UK – I see this problem as being universal. Yes.

One teacher from college X showed an understanding of the global aspect by talking about president Obama's efforts to promote green energy and China's unwillingness to sign such protocols. However, the same teacher later asked me about the impact in countries in the northern hemisphere:

> X2T: I just want to learn from you about impact in your countries, in the northern hemisphere. Is it the same as here? (…). Oh ok. it is because of the same climate change?

Causes of climate change

Both the Bryan and Mochizuku's framework in the context of ESD and the locally adapted framework implies CCE should involve knowledge about background information on climate change and what contributes to the phenomenon. The sourcebook addresses how more industries in the west has led to increased levels of carbon dioxide in the atmosphere. Teachers should further describe how human activities (burning of fossil fuels for energy) and non-industrial activities (burning of forests, deforestation, agriculture and dumping of waste) contributes to increased levels of greenhouse gases in the atmosphere.

One of the most striking aspects of the interview part regarding climate change knowledge and perceptions was that, regardless of the college, all respondents continuously addressed the issues with a very clear domestic/local perspective. The only exception was Y1A, who pointed out that cutting trees was happening 'across the world'. Otherwise if not explicitly asked about what happened in other countries, all questions on causes, consequences and responses were seen through a local perspective. Sentences often started with "Here in Malawi…" or "In our country…". In many cases, this was not only in relation to the whole Malawian context, but also to the actual physical surroundings. When starting to describe the causes, it almost always started from a local perspective. In college Z for example, several interviewees pointed out the window and explained all the trees that had been cut down from the mountain was what was causing the climate to change.

> Z5A: Who are the ones causing the climate change? We, the people, because if you look outside at the mountain, we have cut all the trees!
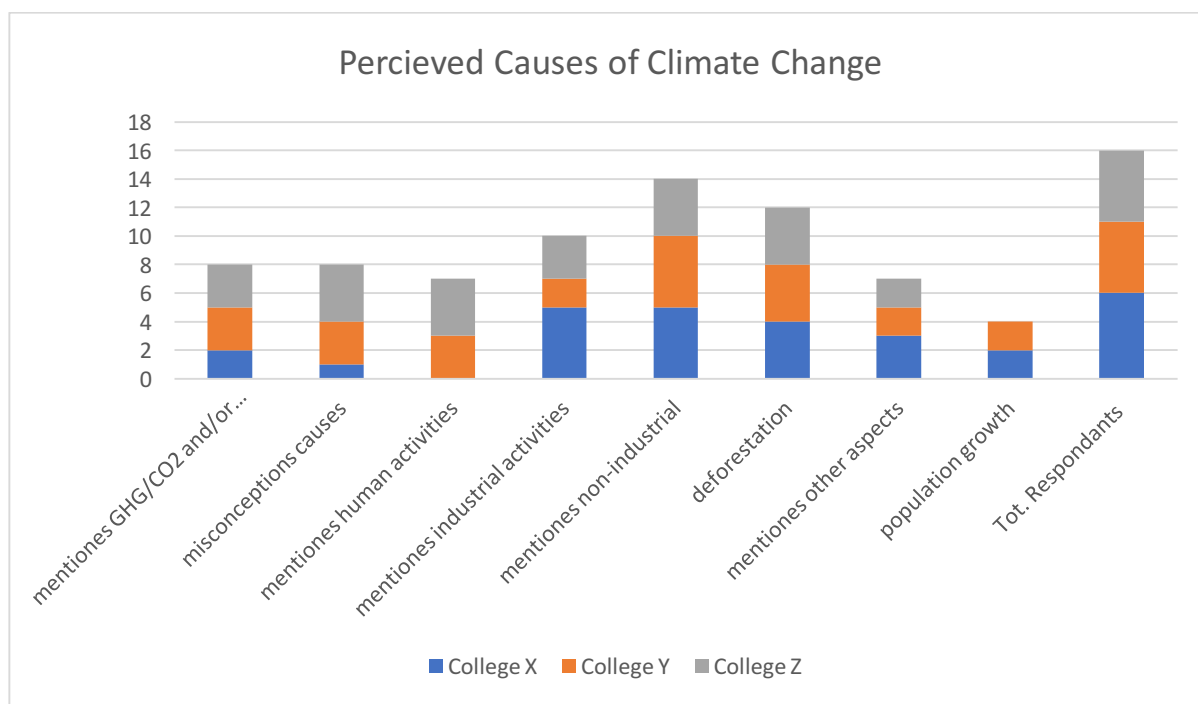
Figure 6.1. Respondents' perceptions on causes of climate change, divided by college. College X = blue, Y = red, Z = green.

During the interviews, everyone except the administrative staff at college X mentioned some kind of *industrial activities* - either industrial waste, growth of industries or fumes of cars – as causes, whereas only two teachers at college Y and three at Z did the same. On the other hand, 14 out of 16 respondents in one way or another pointed to activities labeled as *non-industrial activitie*s when asked to describe what is causing the climate to change. For example, one teacher from college Y mentioned plastic waste as a cause, one from college X and Y respectively declared consumption behavior needs to change. Respondents at college Y & Z explicitly mentioned *human activities* as a cause. Apart from these responses, the remaining explicitly focused on issues relating to deforestation: cutting down of trees for burning charcoal and building houses, not planting trees and destruction of vegetation.

The issue of deforestation was omnipresent in all interviews, just as in the sourcebook. There, deforestation is mentioned as one of the main contributors of climate change, although it only accounts for 16 percent of the total CO_2 accumulation (it explains 58 percent originates from fossil fuel). Yet, after traveling the country from north to south, its immense importance to the life of the Malawians is indisputable. As mentioned in the contextual framework, estimates show Malawi have had annual deforestation rate of more than 2 percent. This rapid

deforestation was raised many times during the conversations, but it was not until when passing the boarder to Tanzania that I fully understood its implications. While the Malawian side of the boarder was bare and the red soil clearly visible, the Tanzanian side just 100 meters away was covered in green and the vegetation flourished.
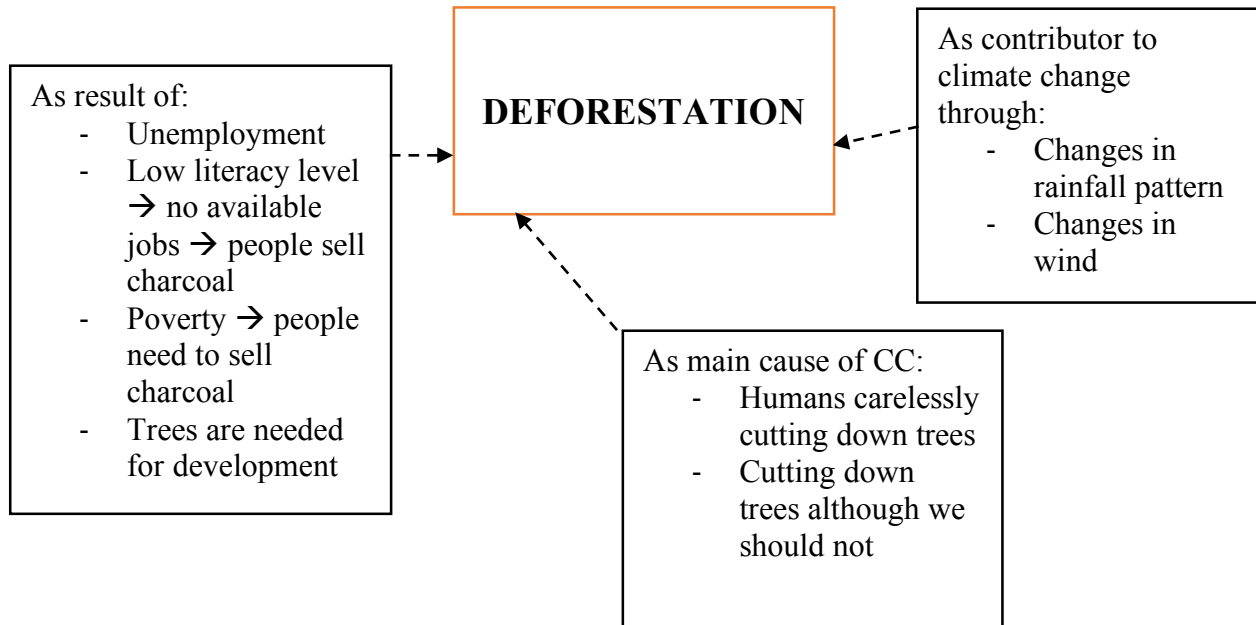
Figure 6.2. Illustration of respondents' perceptions on climate change and deforestation.

Respondents from all three schools underlined the issue of deforestation as one of the main causes of climate change. The degree of explanation as to in what ways this was causing the climate to change was varying; from X5T who said that when vegetation is being destroyed, you have more carbon dioxide in the atmosphere, to others who purely stated cutting down trees destroyed the systems. Deforestation was also seen as an inevitable consequence of other issues in society, through that causing the climate to change. Y3T explained this by saying that trees are cut because they are needed in construction work and in the development process of the country. Poverty, illiteracy levels and unemployment levels were said to contribute to the deforestation, since rural people must cut down trees for survival:

> Y4T: Because of the literacy level, the rural person never thought about anything else. Because what he or she could mind is 'let me have money in my pocket'. So you could find somebody's cutting trees, burning charcoal. You don't have to travel long on the roads of Malawi to see charcoal. But they couldn't know the consequences of cutting those trees.

As for *how* deforestation causes climate change, answers also varied. Nevertheless, many believed cutting down trees locally was connected to local changes in wind- and rainfall

pattern. Several respondents shared the understanding that when trees were cut in the immediate surroundings, the weather at the same place also changed:

> Y4T: Now would you believe that when we were coming here in 2008, there were all trees there? But people have falling down the trees, and today, the wind is just [swosh sound], and look at this dust and the heat!

> Z1T: The trees. You look at the hill there (points), that hill was full of trees. (Now) there are no trees. Where do you expect us to get rains? (…)

> Z5A: We don't experience any reliable rainfall, because we don't have any things that can blow rainfall to our area…

Findings indicated several respondents held misconceptions about the causes of climate change. One of the most common misunderstandings was that ozone depletion is a cause of climate change, a view shared by administrative staff and teachers in all subjects, from all three colleges (6 respondents in total). Many did speak about how radiation cannot leave earth as it should, but failed to explained why this was the case. As SES teacher Y5T put it:

> Y5T: (…) the destruction of the ozone layer. Yeah, which at least protects heat from the sun to come heavy on us. So that is one cause".

Other misconceptions regarding causes included "chemicals in the atmosphere which hinders rainfall" and that el Niño is causing the effects. Notable here is that there was only one from college X who had misunderstandings about the causes, compared to three from college Y and four from college Z. Y5T was the one respondent who provided the most accurate explanations in regards to the mechanisms of climate change and contribution of greenhouse gases, yet they too also had misconceptions in relation to the ozone layer.

Impacts and effects of climate change
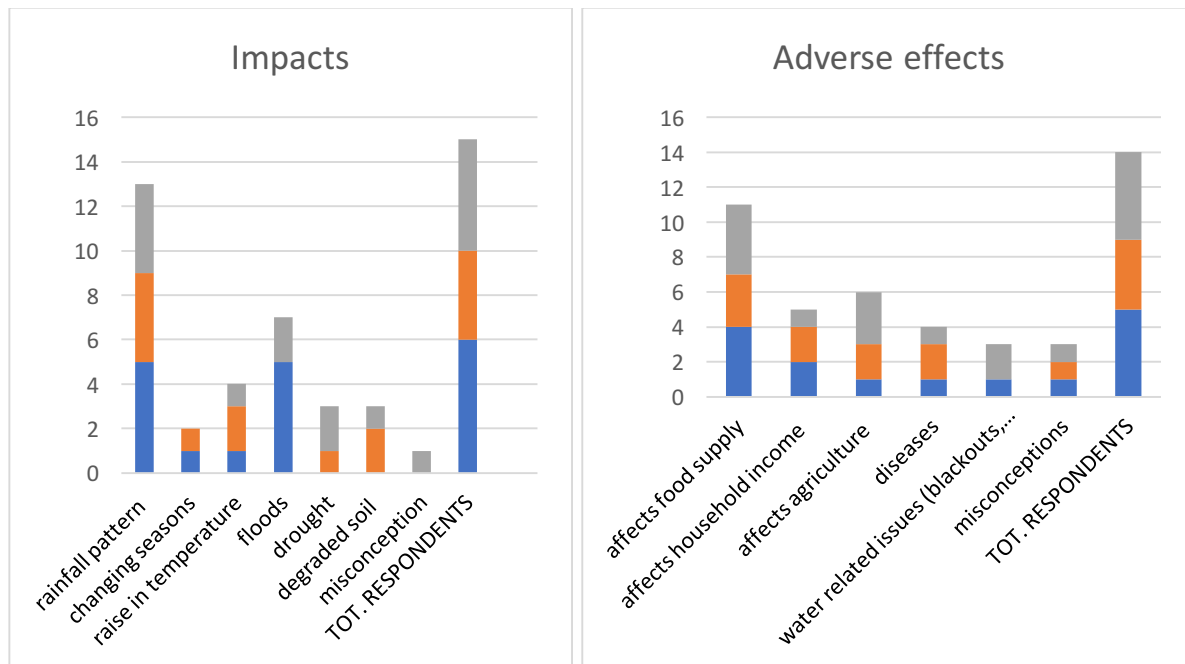
Figure 6.3. Perceptions on impacts and effects of climate change, divided by college. College X = blue, Y = red, Z = green.

In a country where over 90 percent (GCCA, n.d.) are small holder farmers depending on the agricultural sector for their survival, it is no wonder this aspect was the most discussed during the interviews. As earlier mentioned, nearly everyone linked climate change to changes or reduction in rainfall pattern. This caused a perceived change in seasons. Earlier, in some areas people used to say rain season start October 14, which was no longer the case. In Z1T's words:

> Z1T: For example in Malawi, October like this one, rains used to come at this time a year. But last year, rains started in December and close to January.

However, although nearly everyone mentioned changes in rainfall pattern, just three people stressed drought as an impact. Further, contrary to what the sourcebook highlighted together with reduced rainfall, only four respondents from all three colleges mentioned raising temperatures as one of the consequences. Noteworthy is also the fact that all respondents but one (X6A) from school X brought up flooding as an effect, whereas no-one from school Y mentioned the same.

Listening to the respondents elaborate on the stated adverse effects, the degree of effect the above-mentioned factors have on peoples' lives, became painfully clear. Delay in in rainfall season meant farmers could not prepare their lands accordingly. Without irrigation, the seeds would not survive. When rain then did start to fall, it did so in an unpredictable way, many times also causing floods. Thus, crop production failed. Failing crop production and food insecurity was in turn was linked to numerous effects, some examples mentioned below:

"Poverty"	"People are starving"
"Loss of development of country"	"Hunger, throughout the year"
"People lack resources"	"Malnutrition"
"Household income is degraded"	"No water for drinking or cooking"
"Unemployment, people steal"	"Diseases "

Figure 6.4. Examples of mentioned impacts and effects of climate change.

There were also misconceptions in regards to the effects. One teacher from college X related climate change to an increase in cancer across the country, whereas one at college Z explained schools must close because of climate change, since there is a scarcity of trees. When trees disappear, they explained, there are no paper, hence no schoolbooks. Further, soil erosion and degradation were repeatedly brought up to discussion, as many stressed that this affects the harvest. Yet, this might not be as much of an effect of climate change per se, as something which results from rapid deforestation and mismanagement of the soil.

Mitigation & adaptation

In line with the thematic on the causes of climate change, tree-related measures were also the most commonly mentioned mitigation and adaptation measures. Here too the respondents shared the local perspective of the sourcebook. My own presumption after reading and hearing about the scarcity of food and climate change's impact on the agricultural sector, was that there would be a significant focus on such adaptation measures among the respondents. This was not the case. To me, the most striking result in this aspect was thus how most responses related to what could be done to make every Malawian contribute to change, rather than leaving mitigation responsibilities to someone else and simply focusing on adaptation. The response rate on these questions was not as high as for other topics, and answers tended to be quite general - as X2T replied on what could be done in response to climate change:

X2T: People should be sensitized and take action, maybe plant trees.

Comparatively speaking, the only thing which stood out was that all teachers in college Y highlighted the importance of working together as a whole society for combatting climate change, not mentioned in any other college. Otherwise, the same type of answers was raised equally across the colleges. The terms *mitigation* and *adaptation* were never mentioned, although mitigation aspects were brought up by a few. Contrasting the answers to fieldwork observations, suggestions were all relating to their own lived realities. One teacher suggested there should be a ban on plastic bags, most likely relating to the vast amount of plastic bags that were to be found everywhere you went – in the roadside as well as in the fields. There were no available garbage bins, and thus a mentality among the public where garbage was just dumped on the street. Other suggestions included giving people branches of trees to replace what they cut down, using sunlight for electricity, and not retire people so early so they must turn to selling charcoal for their survival. To make companies stop dumping waste was the only action mention which related to industrial activities.

One teacher from all three colleges respectively (two teaching SES and one agriculture) were the only ones who stated there is a need to rethink agriculture and to use crops that can adapt to new realities. On the other hand, other actions which can be seen as both mitigation and adaptation measures, were brought up. In this category, *plant more trees* was the most common answer, although the reason for it varied. While X4T meant the trees will take up more CO2, Y5T said planting trees was needed because it would bring back the rain. There was only one person mentioning actions which industries can take, yet there was a strong collective thinking present in many answers. Several pointed to the importance of working together as a society to reach change. The importance of legislation and top down approaches was emphasized by five respondents. Four pointed to civic education as a tool for change, as the low education level hinders the public's understanding of the issue:

> Z5A: And also civic education – people should be told about the bad of burning the bush. If you look outside there, you'll find out that mountain people already lit the bush, so the smoke has polluted the environment.

> Z2T: We need to civic educate our people about CC, by using different stakeholders. As I have said, this issue needs a multi sector approach.

All teachers and administrators were asked how they had received their climate change knowledge. In these responses there were an equal distribution among the colleges, and most of the respondents explained they were self-taught through books and radio. One from each

college mentioned they learnt some when in college. Only one person mentioned they had learnt through what they were currently teaching in the TTC.

Comparison teacher students

The way teachers and administrators perceived climate change was enhanced by the interviewed students, as they to a large extent pointed to the same things as their educators. However, definitions and explanations varied greatly among the students and no clear patterns could be found within the colleges. While some could not relate to the concept of climate change at all, others correlated it with a change in rainfall pattern and the cutting down of trees. Only one student explained the causes of climate change without mentioning deforestation and instead relating it to emissions, otherwise deforestation was a prominent theme. The only consistent finding amongst the students' perceptions was that all respondents displayed a clear local perspective on the issues. When talking about effects, they were relating to issues like dry boreholes in the area or too much wind on the school ground. Despite Malawi's dependency on their farming, only three students explicitly mentioned that climate change is affecting food production. At the same time, many did indeed highlight how climate change caused drought and resulted in "*too much sun on the ground*" (Y4S).

In consistency with the teachers, a few students also held misconceptions about the ozone layer, all coming from college Y. They were the only ones mentioning this, but also the ones who were the most capable of elaborate on the topic in general. In line with the teachers was also the finding that students too faced difficulties in explaining what sort of change the concept related to, apart from the fact that something is changing. In general, the students had a lower level of understanding than their lecturers, although many of the respondents were passionate about the topic. Several interviewees from all three colleges mentioned how they intended to start up wildlife clubs during their practice. Yet, such clubs would foremost be focusing on environmental conservation, as they mentioned planting trees and looking after small bugs around the area.

Summary and discussion research question 1

This first section of the findings has discussed what climate change means to teachers and administrators, by examining their knowledge and perceptions with the primary school sourcebook as basis for comparison. As displayed in the literature, there is no universal model

of CCE(SD); each country must identify its own sustainability priorities and adapt the teaching so it becomes locally relevant (UNESCO, 2010). Many researchers have also stressed the importance and benefits of linking climate change and sustainability education to the local context, as it facilitates the understanding and enables learners to act and influence the ecological and social places where they live (Orr, 1992). This type of approach was clearly visible among the respondents in all colleges. The most prominent finding in relation to the first research question indicated that knowledge and perceptions amongst all respondents were strongly attached to the local environment and context. Using the nearby environment and local issues to exemplify was the most common theme among all respondents when elaborating on causes, consequences as well as mitigation and adaptation measures. Climate change was defined by lived experiences, not scientific definitions. When asked to describe the global perspective, the majority either could not, or referred to neighboring countries. Misconceptions about climate change that have been demonstrated in earlier studies on pre-service and in-service teachers (see Areskoug & Ekborg, 2006; Weber, 2010) were also found at all levels and in all three cases. Almost all respondents linked climate change to a change in rainfall pattern, yet, such observations might as well be relating to changes in weather. A few explained by saying that how the climate is *now,* is different from *before*, but the decade-long time frame which defines the concept was never mentioned. This correlates with Weber's (2010) research, which shows that people tend to rely on personal experiences for discussing climate change, although it is a statistical phenomenon. Similarly, the complex of problems highlighted might not be directly related to climate change. Given the difficulty in detecting climate change, it is possible that the impacts and adverse effects raised in many interviews such as soil erosion, flooding, unemployment, degraded incomes and diseases, could be linked to environmental mismanagement, unsustainable practices and lack of development discussed in chapter 3, rather than climate change per se. The same tendencies were found amongst the students.

In general, a knowledge gap could be found concerning background information on climate change, as well as how greenhouse gases contribute to its progress. Such knowledge is highlighted in the sourcebook, but was only rarely brought up by the respondents themselves. In regards to this, perhaps the most distinguished aspect was the fact that nearly no-one blamed others than themselves for climate change. Discussion about the causes often came back to how "We, here in Malawi, are not doing what we are told". The fact that Malawi is unproportionally affected by climate change was never discussed, neither was West's primary contribution to global emissions. Even though latter is mentioned up by the sourcebook, it too

focuses on Malawi's own contribution to the issues rather than the global perspective. Just as the respondents, the sourcebook heavily emphasizes deforestation as the major contribution to accumulation of CO2. However, the absence of a clear global perspective on the issues are explicable given the strong local attachment, as nearly all stated causes related to issues visible to the respondents.

Just as the Malawian's were considered as large contributors to climate change, they themselves were perceived as a part of the solution. Contrasting answers on what could be done as a response to the actions in the sourcebook, much of what was highlighted related to mitigation rather than adaptation measures - almost exclusively relating to actions on a local level. However, the focus on such measures were to a large extent revolving around planting trees and minimizing burning of bushes. Other mitigation actions brought up by the sourcebook, such as using renewable energy and bio-fuel for transportation as well as changing lifestyles were only discussed by a few. It is remarkable that such actions were not brought up to the same extent, but it does not necessarily mean that the knowledge about it does not exist. As mentioned in the findings, emphasis on agriculture adaptation was not as present as expected, neither among educators nor within the student sample. However, the reason for this might be that the agriculture sector is largely related to the forestry sector.

At the individual level, some observations in regards to different level of knowledge about causes and impacts of climate change were found, yet there were no significant differences between the colleges. The teacher training students displayed the same type of perceptions as their educators, also speaking from their own experiences and emphasizing issues relating to deforestation. Though the number of respondents holding misconceptions varied some across the colleges, there did not seem to be a strong connection between misconceptions and level of climate change knowledge. Even the most knowledgeable teachers had misunderstandings about some concepts. The level of understanding varied between the four administrators at the colleges. Although one of the two administrators at college Y had some misconceptions about the ozone layer, overall they both showed a rigid understanding of the issues. Moreover, Y1A was the only respondent who explicitly connected causes to the global stage. X6A on the other hand failed to understand the climate change concept, instead linked it to the different climates a country experience during a year. Yet, when elaborating on consequences and effects, administrators answers corresponded to others. Theirs too were concerning lack of water, starvation and poverty. This could hence reinforce the initial part of this discussion on the

difficulties in differentiating between climate change and general environmental mismanagement. Regardless, all administrators showed great interest in the topic as such. Lastly, nearly all respondents at college X mentioned flooding as an impact, whereas only brought up twice at the other colleges. The only one not addressing this at college X was the administrator. College X is indeed located near a river, however so is college Y, thus that cannot explain such discrepancy.

Summing up, the first part of the findings showed little differences in regards to knowledge and perceptions on climate change between the three cases. A large majority of respondents in all groups showed similar perceptions, which were strongly attached to the local environment and to a large extent aligned with the information of the sourcebook. Still, many had the same type of misconceptions as found in earlier studies, and a large majority were unaware of scientific concepts, the historical background and climate change's global complexity. Next, findings concerning the enabling inputs and teaching and learning dimension of the quality framework will be discussed.

6.2 Research question 2: How, and to what extent, is climate change issues currently being address at the three colleges?

The following section will present findings in relation to implications for the possibility to achieve quality climate change education at the three TTCs. As mentioned in the analytical framework, it is first and foremost the respondents' perceptions about the dimensions that are studied, not what is objectively true. For simplicity, the findings are presented in accordance to the teachers' field of teaching. The students' responses will also be elaborated upon, as their perceptions on the matter reflects the teaching in the colleges.

As the contextual part showed, climate change education is not formally included as a topic in the teacher education curriculum, yet it does contain topics which can be related to climate change. Prior to fieldwork it was not known how this was exercised, as the most detailed information about the teaching available only described the broader topics. Hence, all educators were asked to describe their teaching and how it was relating to such issues. The same were asked to the administrators. For triangulation purposes, the second year students were asked to describe their experiences in relation to climate change education.

The main findings show perceptions have a large impact on the teaching practices. On an individual level there were significant disparities in views on topics taught, methods used, assessment and perceived flexibility in regards to classroom practices, but equally scattered across the colleges. On a college level, the most significant difference relates to college Y's ability to include more extra curricular practice on environmental issues. In regards to the teachers' perceptions on their teaching, two results stood out. Firstly, they seemed to believe that CCE first and foremost was concerning climate change *science* and knowledge *about* climate change. After probing, many of them did recount topics they taught that according to the climate change sourcebook can be considered as mitigation and adaptation measures (picking litter, using crop rotation, planting trees, agroforestry). However, as they did not explicitly talk about the concept of climate change in those topics, they were not considered to be dealing with the issue. Secondly, the learning which was labeled as CCE might purely be related to environmental conservation and protection, since the topics were not linked to climate change issues per se. Even though *natural resources*, a topic mentioned by a SES teacher, might involve CCE, it was not explained in what ways the topic related to mechanisms of climate change. This was the case for administrators as well as teachers in all subjects.

Contemporary teaching, and learning time

Overall, the there was a consensus amongst all teachers in that climate change was already more or less being discussed in their teaching. Nevertheless, neither teachers in the same college, nor teachers within the same discipline, agreed on *how* this was currently being covered. There were different understandings of what climate change entailed and within what subjects and topics it was covered. One of the key informants from MIE said this could be true; subjects could already be including elements like weather and climate and through that address climate change, without necessarily doing so within an actual topic on climate change. The key informant from UNDP had the opposite opinion. They believed the reason for UNDPs involvement in curriculum development was that topics like environmental conservation and preservation were not yet linked to climate change. Most striking in this aspect was how there was no S&T teacher participating in the study from college X, as the subject was not considered to be related to the research, whereas S&T teachers from the other two colleges participated. These two teachers mentioned they taught climate change within topics such as *how to conserve the environment; how to avoid cutting trees* (Y5T) and *how to take care of plastic*

waste (Z4T). Nevertheless, contrasting the perception of the colleague from college Z, Y5T underlined how climate change was not being addressed in depth:

> Y5T: So as we look at those (topics), we just chip in, not that it is singled out and included as an issue that we are teaching. Even if we go to my students who have graduated here and you ask them 'did you read about climate change in your science lessons?', they will say no. Because it's not directly included (…) I wouldn't remember when I spent some hours talking about it, or even an hour. But just mentioning it, to say 'you see, we are having problems of this because of CC'.

In total, six SES teachers participated in the study. Among the six, there were various perceptions on how they taught topics which related to climate change. Four of the teachers, representing all three colleges, said they were teaching the topic *environmental education for sustainable development*, however only two out of the four teachers at college X stressed this fact. Two of the SES teachers at college X also claimed climate change is a topic within *environmental protection*, which was not mentioned by anyone else. A variety of examples of what sub-topics they taught was brought to the table, such as *causes of destruction of environment, deforestation, wild life, about natural resources, how to conserve the environment, effects of destroying the ozone layer* and *pollution.* The SES teachers' explanations of their teaching thus covered some of the core elements mentioned in the IPTE curriculum (see chapter 3), but not all.

Just as the interview part on climate change knowledge showed difficulties in separating day to day weather from the concept of global warming, there were difficulties in differentiating weather- from climate related teaching. In many instances it was not clear whether teachers were referring to climate change, or simply seasonal changes in weather. The teacher students from all colleges were also struggling with such differentiation - one student even stated:

> Y6S: Sometimes I say climate change is like the change in season, or weather.

This was especially prominent when talking to the four agriculture teachers at all three colleges. Where one of the agriculture teachers from college Z mentioned they taught a topic on climate change and its causes, the other one merely responded that they discussed weather and seasonal changes. All four said they talked about environmental changes, but what that implied was not clear. X4T simply pointed out:

> X4T: You cannot do agriculture without talking about environmental changes.

In regards to the specific elements of their teaching, numerous different examples were highlighted. While Z2T said they discussed topics on climate change, but complained about how some modules had been left out, Y3T believed all relevant issues were already being touched upon:

> Y3T: Agricultural in particular has some topics which totally covers how climate change can be controlled.

Nevertheless, the former was still under the impression that the current teaching adequately covered everything it needed on environmental changes. In regards to the elements of the teaching, the most commonly mentioned ones were *agroforestry* (although according to Z2T only covered very briefly) and *organic farming*, where residues were used to cover the soil. The two teachers from college Y brought up *farming in God's way*, which related to a practice where not much fertilizer is used, to keep it as natural as possible. The teacher from X also said they taught clean agriculture, but in contrast to college Y, they did so by using chemicals.

The administrative staff only briefly accounted for how climate change was being addressed at their colleges, however, Y2A stressed the importance of keeping studies locally relevant. Topics like *how to conserve the forest, wildlife clubs, soil erosion,* and *taking care of trees* were mentioned by college Y and Z. Although these answers by Y and Z highlighted topics which can be related to environmental conservation, X6A's responses' link to climate change were even more ambiguous. They mentioned topics such as *how to take care of vegetables and flowers* and *taking the students to see a fish pond to learn about irrigation.*

Comparing teachers' and administrators' perceptions with the students was challenging, since their understanding of the climate change related education at the colleges were so different from their educators. I had to refer to teaching about *environment* instead of *climate change*, as the latter did not make sense to the respondents. Unlike their teachers, they could not point to specific topics which were touching upon this. Still, students mentioned sub-topics which confirmed they had been learning what their lecturers mentioned in their own interviews, like *early planting to match rainfall, agroforestry, irrigation, mixed cropping* and *crop rotation*. These sub-topics however almost exclusively related to sub-topics in agriculture, rather than SES or S&T. At the same time, one student from college Z claimed climate change was treated as a crosscutting issue, where it was touched upon in all three subjects.

The focus on deforestation

Just as deforestation constantly was brought up during the discussions on causes and effects of climate change, *trees* in one way or another occurred during questions relating to their teaching. Planting trees was repeatedly used to exemplify the practical aspects the teaching, and to specify in what ways climate change was discussed in mentioned topics. When explaining the four dimensions of the SES topic *Environmental education for sustainable development*, one teacher exemplified three of the dimensions with tree-related issues:

> Z1T: There are four dimensions: political, social, economic and biophysical (…) Political are the decision makers that see to it that the climate is being destroyed. We need to bring in policies, for example 'we got one tree, we plant ten trees'. Economic environment is that type of environment where people live for… to earn a living – they need money. So they cut trees simply because they want to burn charcoal, sell it and get money. But at the same time, they need to plant those trees, yeah. Social environment, that's where people interact. When people interact, their culture values that they follow – for example here in Malawi when you go to a graveyard, you always find trees intact. Its only of late when chiefs have gone as far as selling trees from the graveyard…

The key informants also used deforestation as the primary illustrative example during their interviews. The below quote demonstrates how K1 stressed deforestation as the one example to explain how climate change topics were integrated in the teaching:

> K1: Climate change related topics, environmental education topics are there. Issues of deforestation, how we can avoid deforestation etc, they are there.

This was further underlined by the students, where planting trees was the first thing that came to their mind when asked how climate change and the environment was addressed during teacher training. One key informant provided an explanation as to why this could be the case, saying it has become the focus because it is tangible, something concrete:

> K3: it's easier to communicate that way, because ok fine its bigger – global warming affecting this, greenhouse gas – if you break it down and look at what Malawi probably would associate itself with, we are not doing any... For instance if we were doing coal it would have been easy to explain how we are polluting. But it's a bit difficult to explain from that angle because we don't have that. We are not a very industrialized country, our energy is hydro. So to explain from that is also difficult. The only way that is easier to explain on a community level, at our literacy levels, is to link it to the issue of our carbon print. So that's why everybody will go to the trees.

The sourcebook addresses many additional areas, not only deforestation. However, cutting down of trees was something everyone regardless of their age could understand and relate to, hence it could be taught in all levels in primary school. The key informants K1 and K3 agreed

that certain perspectives, such as industries and their impact, could be brought in during secondary education where the students had better comprehension. At the same time, both believed other elements than those relating to trees could be taught during later primary. While K1 suggested higher primary also should talk about emissions of greenhouse gases, but in a broader sense, K3 mentioned waste management should come in around standard 5. K4 on the other hand believed the sourcebook was aimed for all classes, not just for one standard. K2 suggested that while other issues like agriculture with fertilizer and how to recycle waste also should be raised in the teaching, deforestation stayed with the respondents because it *"comes closer to the people"*. Nevertheless, the UNDP respondent said the aim of UN CC:Learn also was to train people to understand climate change's global mechanisms.

Teaching methods

No matter the subject, all teachers stated they predominantly focused on theoretical methods when teaching topics they considered to be related to climate change. According to the administrative staff at college Y, this was the case because the government syllabus required them to focus on theoretical aspects - although agriculture had some room for practical parts. Still, teachers in all subjects had different perceptions on the trade-off between theory and practice. In college Y, the little focus climate change got within S&T was strictly theoretical, whereas the S&T teacher from college Z said they had a practical part where they built latrines for learning how to dispose waste. For SES and agriculture, how, and to what extent, practical aspects was incorporated in the teaching, in most cases depended on the respective teacher rather than on the college.

To many, *practical aspects* simply implied planting trees. Others referred to it as the possibility to take the students outside as well as showing pictures, to give meaning to the theoretical parts they taught in the classroom. In college X and Y, several SES teachers claimed that planting trees was a practical aspect of their teaching. However, this was not mentioned by all six teachers. SES teachers at college X did not agree with each other. While X2T and X5T said their teaching merely contained theoretical aspects, X1T and X3T mentioned practical elements such as planting trees and picking litter. In conformity with the SES teachers at college X, agriculture teachers at college Z too were dissentient on the matter. Although both agreed more practical aspects was needed, one thought the subject currently did not include practical elements, while the other explained they have practical parts where they establish

woodlots. One student at college Z confirmed the teaching included practical aspects, but that theory was at focus.

Regardless of how the teachers perceived their current teaching methods, the importance of a practical aspect in teaching was omnipresent to all agricultural teachers. It was raised as a current method for teaching, but foremost as a challenge and potential area of improvement. Including practical aspects in the teaching on climate change was vital for many reasons – primarily for the ability to pass on the knowledge to the rural part of the population:

> Z2T: We're supposed to add something so that it should be more practical work. Because the areas where we feel have been hit hard by climate change, they have problems in reacting to it. (…) The people who are experienced quite a lot when you talk about climate change, they are people who are living in the villages. Because they experience hunger, shortage of water and what have you. So there is a need, to change this curriculum, by adding some of the things that are necessary - to assist those people in the villages to react to climate what? Change.

SES teachers presented similar opinions. Although planting trees was said to be in the action plan of the SES department, for them, a practical aspect was mainly important so they could *show* their students the reality outside, rather than to give them tools to do things practically:

> X3T: you wish to show the students the realities – what is it exactly that is happening – so you keep on maybe talking about theoretical things in a situation where you would bring them on the ground

Teachers believed they had to focus on getting the students to learn for life and to engage practically in their home environment, but to do that they also needed to have practical assessment. As one teacher at college X expressed it:

> X1T: of course they react most of the time positively [on the topic], maybe because they know that they are going to be assessed. But what encourages them is that we say 'this is an ongoing thing, a continuous thing'. So practically - that's our emphasis. Because we can say we have to change the environment verbally, but without practice aspect that cant work. Of course the students support it, yes. Last time we told them to plant trees they were very cooperative.

The challenges of time and resources

When asked to elaborate on possible challenges they came across, above all, two issues were raised: time and resources. Even though the initial findings section showed the respondents felt climate change issues were already incorporated to some extent, many believed that the given time for doing so was not enough. A majority of the teachers from college X and Y, as well as the administrative staff at college Y, all supported this feeling. As the S&T teacher from college

X - who did not think climate change was covered much in his subject - exemplified, this created frustration. They felt the curriculum priorities were wrong:

> X5T: We would be talking about it even in science, in SES, so that… Yeah. I would have *loved* if this was included because some of the things people are learning in science, I would not be happy with that. Why should people be learning about parts of a grasshopper, a fly… and yet such (?) issues are left out. Why?

The one exception was Y4T, who, in contrast to many others, did not have any problem with the current curriculum:

> Y4T: The best they could have done is what they have done. The remaining time is for an individual person to create it on his/herself (…) We always have enough time after the academics, where we can do all these others, which we call extra curricular, and what so ever. And I think that's the best time to implement some of these things, and look up some of these things.

As Y4T's quote indicates, many shared the understanding that climate change related learning had to be done outside the ordinary syllabus as an extra curricular activity. In this case, the colleges diverged in regards to the possibilities to do so. At Y, the administrative staff explained they added extra curriculum activities on environment and climate change, as they felt the government curriculum did not provide adequate information on the matter. During a course taught by an external consultant, students learnt about environmental conservation actions such as using energy saving stoves and how to conserve forest. The course was not examined, but participating students received a certificate upon completion. While getting a tour of the college, one could see solar cells installed on the roofs and how energy saving stoves was being used in the kitchen. Such actions or equipment were not found in the other two colleges. However, college X had been chosen for an eco-school pilot project, where they focused on conserving the environment. Within this frame the students had been asked to bring a tree to plant and take care of. They also planted trees within both SES and agriculture, although one teacher explained it had to be done outside the curriculum because there was no time during the ordinary hours. In college Z and Y, environmental clubs outside the curriculum were mentioned as a preferable action for raising interest. College Z had in recent years organized field trips for their club to go to national parks, but lack of funding now made such activities impossible.

According to some, the shallow coverage of the topic in the primary school curriculum created a hindrance for going deeper at the TTCs. This was further underlined by a student at college Y, who believed they should be learning more than just according to the level of their learners.

Additionally, for many, the lack of time derived from an overcrowded curriculum. The combination of a centrally controlled and overcrowded curriculum left many respondents feeling frustrated, as they felt they had little room for own initiatives:

> Y2A: The first challenge is that all curriculums are centrally controlled. We are not given enough flexibility so that I can put in what I feel is important.

Students too believed this to be an issue:

> Y3S: At college, we learnt a lot of subject. They (the teachers) may jump, because of time. He says 'by this end we have to finish this course'. There at the college, yes we have gained something, because we had a field where we could practice our… growing beans etc. But it needs more to be taught, so that you should be able to explain more than the little you have at college. (…) Now we are learning on pressure, we have to finish, and the moment you are learning on pressure you miss concepts, because you have to do this this and this.

Yet this was tackled differently by the teachers. In response to the question on whether they felt they had flexibility in their own teaching, there were significant differences in the answers. At one end of the spectrum, X4T firmly believed they as teachers were a part of the government, and therefore it was up to them to adapt new methods of teaching, even if they are not yet in the curriculum. Others shared the belief that even though they must follow the curriculum, you can choose *how* you want to deliver or if you want to add something extra. At the other end, there were respondents from all schools who felt they had no flexibility what so ever, since they had to teach everything in the syllabus:

> Z2T: to us we are simply given the content to be covered based on the curriculum we have. We don't go outside as we said, even if you can have maybe a solution, but you are tied by the curriculum. It's sort of not practical based… Not practically based, sort of theoretically. As teachers, we don't go beyond. We are given what to teach, 'this is the curriculum'.

This correlates with another issue brought up by several respondents, namely the heavy exam orientation of the system. Y1A and X1T explained:

> Y1A: the biggest challenge, because in Malawi the system is very exam oriented, so it would be the fact that then we are talking about the whole issue of that they are taught for examination. And you might get resistance from the teachers because the syllabus is already overloaded (…) The exam system… people feel that unless you exam it, it is not important.

> X1T: here in Malawi, most of the time we are exam oriented, we do things for the sake of passing examination at the end of the academic year. But we don't think of having that knowledge for the future use. After the end of the examination if you have passed it, it ends there.

The resistance of teachers that Y1A mentioned was indeed reinforced by some, who said that if climate change was to be more incorporate din their current teaching, it had to be at the expense of their own free time. At the same time, there was a clear notion among all educators that they *wanted* to teach about climate change. The importance and urgency of the topic increased the importance of moving away from learning for examination to learning for life and their survival. All respondents at college X, as well as a majority in the other two, believed teachers have a responsibility in teaching about climate change, if not alone, then together with various groups in society.

The second issue teachers brought up related to financial restrictions as a hindrance in their teaching about climate change. SES teachers mostly lacked equipment to show pictures and take their students on excursions. All three colleges had fields for practicing farming; agriculture teachers instead felt that fertilizer and seedlings were lacking. This was also connected to an overcrowded curriculum, as some stressed how there is no one to take care of the plants and trees after school is finished. Yet, not all agriculture teachers shared the notion of lacking resources; Z3T explained they just had to plan for getting the resources time, which was why Z3T was the only teacher at college Z who managed to plant maize last year. The students did not mention any challenges in regards to the training; when they talked about financial restrains, it was in regards to their own teaching practice. They were missing watering cans to practice irrigation and money to by seedlings for planting trees. In line with this, one key informant from MIE were under the impression that there were no resource issues at the TTCs, only at the primary school level.

In accordance to the government curriculum, each subject had two assignments per term and one end of term exam where content and methodology were examined. Assessment was centrally controlled by the examination board in Malawi, but teachers themselves could decide how to form the two assignments. However, what they taught needed to be in line with the end of semester examination. Here too, teachers within the same subject and college had various classroom practices. An example is the two agriculture teachers at college Z who assessed differently; while one said continuous assessment included no practical aspects, the other claimed practical parts were examined too. The agriculture teacher at X made sure to include practical aspects in their assessment as well.

Just as the exam orientation affected flexibility of the teaching, teachers and administrators in all colleges emphasized the need for formally including climate change in the curriculum, so that it must be examined. If not included, there would be no incentives for them to teach, nor for the students to learn.

Summary and discussion research question 2

The second part of the findings section has discussed perceptions on teaching and practices at the three colleges, relating to the enabling inputs- and teaching and learning dimensions of the quality framework. Recalling the part of the literature review addressing curriculum implementation, goals of a curriculum can be perceived and interpreted differently depending on the level (Goodlad et al, 1979). This study indeed supports such theory - it is clear there is a discrepancy within the current intended and implemented teacher education curriculum. The findings also support earlier research on how teachers' knowledge and perceptions influence their classroom practice (see Pajares, 1992; E. W. Taylor & Caldarelli, 2004). When elaborating on their teaching, significant differences in regards to the implementation were found both within colleges and subjects - despite the fact that all colleges follow the same formal curriculum. These results thus correspond to Ching-Ho & Seow's (2015) findings from the Singaporean context, where the climate change teaching was described differently by the teachers, despite a centralized curriculum. S&T teachers were addressing climate change to various extents, using different methods. SES teachers had diverse perceptions about what teaching about climate change entailed, even within the same college. Some agriculture teachers claimed they had topics which "fully covered climate change", while others believed it was not covered at all. Additionally, teachers had various understandings as to where in their teaching climate change was being addressed. Responses by the teachers did not reinforce the initial presumption that there would be a stronger focus on agricultural practices at college Y, where teachers are trained for the rural areas. Still, on a college level, Y had a slightly stronger emphasis on environmental matters.

Although these results show discrepancies in intention versus implementation, it is essential to bear in mind that climate change education has not yet been infused in the teacher education curriculum. Respondents were asked to explain how they teach something which is not yet formally included, hence some fluctuations could be expected. Still, the observations concerning their notion of the classroom practice is important, as it points to large differences in the understanding on how to implement the current curriculum amongst the teachers.

Differences in perceptions of the curriculum were found at other levels as well. The implementation varied among the administrators, most visible in the decision not to include S&T staff at college X. As for the students, it was clear that they too experienced the curriculum differently from their educators. Opposite to what their teachers argued, it was hard for them to recall learning about climate change at all. When they did discuss what they had learnt in regards to environmental and CCE, they primarily highlighted planting trees and sub-topics within agriculture. This is an interesting result, given not many respondents stressed the agriculture sector during the parts on climate change mitigation and adaptation. However, it might tell more about the students' perceptions about climate change than about the teaching. In line with Blum et al., (2013) research, which showed lack of consistency in the usage and conceptualization of CCE among stakeholders, the key informants had different understandings as to when elements in the sourcebook should be approached. While there seemed to be a common understanding that actions and issues relating to trees were favorable because they were "tangible", they did not agree on when the primary students would be ready to learn about the more complex aspects of climate change. For some, a broader perspective including the contribution by industries should not be taught until secondary school.

Both teachers' knowledge and teaching were strongly connected to the local environment. Just as the respondents' perceptions on climate change were attached to their surroundings, so was the teaching. Noteworthy, even though effects and impacts often revolved around food supply and malnutrition in the discussion on climate change knowledge, examples for teaching about the same was not brought up as often. Using the local environment to enhance what theoretically was taught in class was stressed multiple times by teachers in all three colleges, in all levels. Corresponding to findings in the first section, respondents in all colleges faced difficulties in differentiating actions, effects and causes relating global warming from those predominantly related to other environmental issues. In some instances, teachers said they discussed climate change in their teaching, but without explaining how the mentioned topics addressed such issues. One example is the topic *seasonal changes* mentioned by an agriculture teacher, which might only address weather variations over a year, rather than climate change per se. Topics brought up by the SES teachers, such as *wild life* and *how to conserve the environment,* might rather correspond to teaching about environmental conservation. Yet other sub-topics, like *pollution* and *causes of destruction of the environment*, indicated a more direct link to the topic of climate change. At the same time, some were not aware of how some aspects

they taught were relating to climate change (mitigation and adaptation measures such as crop rotation and agroforestry), because those actions did not directly talk about the topic.

Teachers – both within the same college as well as within the same subject – were dissentient on where and how climate change learning was incorporated, but they had similar perceptions on the challenges they faced. First and foremost, such challenges related to lack of time and resources to carry it out properly. In regards to resources, the private college Y provided an enabling environment by running extra courses on environmental conservation and using environmental friendly energy sources. As many teachers pointed to the importance to be able to learn from their local environment, keeping energy saving stoves that the teachers can show the students may facilitate their understanding of the same. College X and Z were more tied to financial constraints, which hindered field trips with environmental clubs and the possibility to buy seedlings for planting during class.

While teachers agreed on the fact that time spent on climate change learning was too little, they responded to this fact differently. Due to various perceptions of the flexibility in their teaching, the topic was differently emphasized in their respective classrooms. This further underlines the fact that teachers' perceptions – not only those about climate change but those concerning the teaching practice – affects the decisions they make. These differences alike, teachers as well as administrative staff shared the feeling that time was not enough, which indicates positive perceptions about the subject. Respondents, regardless of their knowledge level, seemed concerned about climate change and eager to increase its space in the curriculum. This supports Liu et al. (2015) findings, which showed that teachers have a 'positive' attitude towards climate issues still can hold misconceptions about aspects of it.

6.3 Research question 3: What contextual possibilities and challenges lies ahead for a successful implementation of quality climate change education with the upcoming teacher education curriculum?

The last section of the findings present contextual aspects brought up by the respondents during the interviews, which in one way or another affects the possibility of achieving quality climate change education at teacher training colleges across Malawi. As the contextual aspects reflect a macro level of the analysis, no specific emphasis is put comparison between the colleges. Public resources for education, aid strategies and national governance and management strategies have already been discussed in the analytical framework.

Socio-cultural factors and labor market conditions

The most prominent socio-cultural factor mentioned was the unsustainable usage of the local environment in terms of deforestation among the Malawians, something respondents continuously came back to throughout the interviews. There were several stated reasons for why this was happening. To a few, the heavy exploitation was a result of an ignorance amongst the population - people cut down trees because they took them for granted and believed they 'cannot end':

> Y2A: in my country, we are not following instructions. We are being told what we should do, but we are not following instructions.

The most commonly mentioned reason for this unsustainable usage related to the low literacy levels across the country. This resulted in two things; a lack of knowledge of the importance of preserving the environment, and a lack of options for surviving without having to destroy it. For the rural people, this created a downward spiral, as the more trees you cut the less fertile your soil got, and so the possibility of creating a surplus in your harvest that you could sell. Some believed the Government was doing a good job on putting strategies in place to stop deforestation and to civic educate the people, whereas others thought there was much left to be done. Either way, such actions could be redundant because of the lack of possibilities to survive without the trees and the charcoal needed for making fire. During the fieldwork period, electricity scarcity made power- and water cuts a part of the everyday life. Regardless of the place of residency, such cuts suddenly occurred and could go on for hours and hours. Without the possibility to keep a generator, the usage of charcoal and wood was unavoidable. One teacher explained how even those who were advocating for climate change measures could not practice what they preached:

> Y5T: I should give an example of a scenario in Africa. Where people destroy trees because they need to get source of energy, making charcoal. If we just go telling them 'stop, don't use trees for fuel, for charcoal' without an alternative, then it doesn't work. (…) even you could be having somebody who is advocating for climate change, the same person is buying charcoal.

The over usage of the nearby vegetation was furthermore closely linked to the economic and labor market conditions of the country. The combination of low literacy levels and high unemployment rates, forced poor and unemployed people to cut trees for their survival:

Y1A: If you travel around you find a lot of bicycles carrying charcoal, they are aware, or at least I have been told, but then they say 'how do I survive', their means of survival in the past has been cutting down the trees and burning charcoal.

National management strategies

The clear majority of the respondents believed a multi sector approach and a joint effort by several stakeholders was needed to succeed with teaching the Malawians about climate change. Government strategies were thought to be a big part of this, as they could reach large parts of the illiterate population:

Y3T: I know the government is doing a lot. But maybe if there was an intensifying of awareness… to people. Not only by the teachers but the government to find more strategies apart from which are already in place now (…) but maybe we could intensify so that the message goes across to almost everyone. So then, the government, and we, the teachers, work together. So both inside and outside school.

Respondents suggested strategies not only should be aiming at intensifying civic education, but also at waste management and finding better sources of energy so those who can afford electricity should have it. People need to have alternatives to destroying the environment. Regarding strategies affecting the college level, teachers were concerned with their lack of authority to follow up their students after graduation. Students, they said, might understand it theoretically, but it would not be applied when they left the compound, because the colleges did not have the mandate and resources to follow up:

Z2T: They (the students) belong to other areas, so when they go there we don't have any follow-up about what they will be doing. They don't have maybe that feeling to say 'let me take a role and possibly change the mindset of others'. Whatever they learn here, stay here…

In this sense, the private college Y had a clear advantage. The administrative staff explained they had an alumni association where they met twice a year to share the experiences from teaching. Through that, they could monitor their alumni students. However, one teacher at Y, seemingly unaware of this, also raised the problem of lack of monitoring. They believed the need for monitoring would not be a problem if climate change issues were incorporated in the primary curriculum, so teaching it became mandatory.

Media, especially the radio, was considered an important tool for combatting climate change, one that many felt recently had increased its attention towards such questions. Radio was especially important for reaching out to the rural areas. Nevertheless, even though people hear on the radio that they should not cut trees, some ignore such advice because they have no other

choice. Besides the media and governmental strategies, the involvement of local chiefs was mentioned during serval occasions. X1T and X3T explained:

> X1T: If I want to a certain community to have that knowledge, I go to chief, I tell the chief, the chief can mobilize the community (…) Because here, they are highly respected. Whatever they are saying, people obey.

> X3T: Here in Malawi they are very key. Even for me I cannot just go and give a lesson and teach some things when the chiefs are not convinced. When you leave, they will give different information to the people. So they are the ones who are supposed to be key, they should be trained, given the right information, (and then) it's easy to influence the rest.

The chiefs were leaders of the community and imperative to engage. Without their involvement, the teachers job in the schools would risk of getting undermined, as new practices needed to be passed through them. At the same time, by educating the chiefs, more people could be reached, as their communities listened and trusted them.

Parental support

Given Malawi's high poverty rate in combination with the large percentage of population living as smallholder farmers, it is likely that many of the teacher students can relate to the above-mentioned realities. Respondents, especially the teacher students, addressed the importance of teaching students about climate change, so that they could transfer their knowledge to their families. While a few teachers discussed parents as enabling for their students' development at the TTCs – they understand the value of schooling and want to learn from their children – others discussed how parents could be a bad influence to their children. Due to the dependence on the environment, they did not teach their young ones about the importance of using it in a sustainable way, but instead how to destroy it. As one said, the parents do not understand the value of education because of their own illiteracy.

Secondary education and teacher student knowledge

Respondents at the colleges were asked about the knowledge level of their students, and how it might affect their learning about climate change related issues. Most of the teachers said their students comprehend what they were taught and reacted positively to the topic, because it related to their own experiences:

> Y3T: Yeah some do, a few don't. But because now, because of what they are experiencing, they understand quicker than before. Because they have experienced some of these things happening where they are coming from.

Contrastingly, several teachers from college X and Z stated the knowledge level of their students sometimes causes problems, one teacher exemplifying by saying the students would not understand the connection between cutting down trees and no rain. Some correlated such complexity with another perceived problem also found at the TTCs, namely an education system with too heavy exam-orientation. Teachers and administrators were concerned with how the system forces the students in secondary school to only study for passing the exams, instead of learning for life. Such reality was something I got a sense of when talking to the secondary students I met during the fieldwork period. One girl explained how she wanted to become a midwife, and subsequently needed good results on the end of semester examinations. Therefore, she had chosen the subjects which she found to be the easiest, even if they were not what she thought she needed for her continuous life. In line with this, teachers from all different subjects associated an inability to comprehend with the choice of subjects during secondary school:

> X2T: Most of them, starting from secondary school, they drop subjects like maybe geography and even SES… So because they don't have a good background, when they learn these two topics which has to do with climate change, sometimes it becomes difficult for them to understand it.

Lastly, I experienced a clear difference in English proficiency between the respondents at the colleges and their teacher students. The curriculum states all teaching from standard 4 should be in English. Nevertheless, many of the teacher students had great difficulties in understanding posed questions, as well as formulating responses. At the same time, as mentioned in the *limitations* section, this might just be because of the geographical language barriers between the interviewer and the interviewees.

Time for schooling/homework

As discussed in the contextual framework, teacher training consists of one year residential education, followed by one year practice in a primary school. Both teachers and administrative staff expressed concerns with the amount of time they had in their hands. The key informant from GIZ explained the colleges aim at six hours of teaching per day, followed by two hours of self-studies. Only two years of training this was considered as too little, especially when compared to other Sub-Saharan African countries who either have longer programs or degrees. Adding on to that, during the full fieldwork period, which stretched until late October, the privately funded college Y was the only one that had managed to start the semester, albeit one week too late. When conducting interview at college Z, the semester start was already six weeks

delayed, because of application issues within the governmental application committee. Yet, these issues were not brought up by the students.

Summary and discussion research question 3

As the analytical framework explained, the links between society and education are strong and influence each other. Earlier research and the above presented findings have shown how climate change perceptions and knowledge have an impact on teachers' relations to the topic and their classroom practice. Careless management of the local environment hence not only has implication for the possibilities to combat climate change locally, but also for the possibility to achieve quality climate change education. Just as the college teachers want to be able to show their students the consequences outside their classroom so that they will understand the impacts better, the students will be affected by what they see and experience in their everyday life. If climate change learning becomes integrated in the curriculum, fully understanding and practicing the topic will become harder for the students if the context is not enabling. The same is true for the teacher educators. As perceptions are shaped by events and personal experiences, the social and ecological environment where teachers find themselves will influence them, and thus their teaching. In other words, teaching and learning about the importance of waste management becomes much harder if there is nowhere to throw litter, and household waste everywhere you go on the streets.

National strategies aiming towards climate change adaptation and mitigation, affect the context outside the classroom and hence people's perceptions. Many of the respondents stated that they believed a multi sector approach was needed to combat climate change, that merely teaching about it in primary school was not enough. Hence, if teachers see that other measures are taken, it is possible that they will more encouraged to teach about these issues. On the same note, if students see that they have the possibility to practice what they have learnt in class, they will likely be more prone to do so, thus consolidate their knowledge about the same.

The literature review sketched the current education quality in Malawi, elaborating on several challenges the education system faces. The structure of the teacher training system is largely a response to the lack of qualified teachers and large classes around the country, especially in the rural areas. Two years of training, one carried out in teaching practice, is supposed to answer to this issue by increasing the annual output of qualified teachers. Yet, teachers indicated the

short time spent at teacher training could hamper the quality of climate change education at the colleges. With delayed semester starts and an overcrowded curriculum with 10 subjects to go through, spanning over all primary standards, much of the learning is left to the student him/herself. When the time in the classroom at college is not enough, their motivation becomes more important. In this sense, the topic of climate change has an advantage, since teachers expressed students could comprehend it better because it was so relatable. Many issues relating to socio-cultural aspects were brought up during the interviews, such the heavy exploitation of nearby environment. Seeing those practices in their everyday life could indeed facilitate the understanding when discussing it in class. However, if the students' beliefs about those unsustainable practices are too strong, it might have the opposite effect. Yet some contextual aspects might already work in favor for the possibility to achieve quality climate change learning at the colleges, the radio being one of them. According to the respondents, there had recently been an increased attention to climate change issues on the radio. That being the case, new teacher students could come to college with an advantageous understanding of the issues, thus facilitating the comprehension although the time for learning about it is limited.

The results of this thesis reinforce the reality presented in the contextual framework, as well as Glasson et al.'s (2006) findings from 2006, where teachers argued deforestation was one of the major activities that affected Malawi's sustainability. Respondents at the three colleges stressed deforestations contribution to climate change, induced by low literacy levels and ignorance amongst the population. Above all, the lack of alternative sources of income and energy made cutting down trees for survival an inevitability for most people. Following the above arguing, this unsustainable usage of the environment has several negative implications for both classroom practice and peoples' perceptions.

The following discussion will shed light on the findings in relation to the analytical framework, and discuss the challenges and possibilities the new teacher education curriculum faces in terms of achieving quality climate change education.

7 Discussion

QUALITY DIMENSION	CATEGORY	POSSIBILITY			POSSIBILITY/CHALLENGE			CHALLENGE		
		X	Y	Z	X	Y	Z	X	Y	Z
Human resources - knowledge and perceptions	Local perspective (T)	o	o	o						
	Background/historial knowledge (T)				o	o	o			
	Climate change science knowledge (T)							o	o	o
	Mitigation and adaptation awareness (T)				o	o	o			
	Possibility to implement sourbook knowledge (T)	o	o	o						
	Perceptions on populations ability to mitigate (T)	o	o	o						
	Knowledge (A)		o	o				o		
	Perceptions (A)	o	o	o						
Teaching and learning	Learning time					o		o		o
	Teaching methods				o	o	o			
	Assessment, incentives				o	o	o			
Enabling inputs	Teaching and learning materials				o	o	o			
	Physical infrastructure and facilities		o		o		o			
	School governance	o	o				o			
Context	Economic & labour market conditions							o	o	o
	Socio-cultural & religious factors				o	o	o			
	Aid strategies	o	o	o						
	Public resources for education				o	o	o			
	National governance & management strategies				o	o	o			
	Parental support				o	o	o			
	Globalization				o	o	o			
	Secondary education				o	o	o			
	Teacher student knowledge				o	o	o			
	Community leaders				o	o	o			
	Time avaliable for schooling/homework							o	o	o
	national stratgeies on CCE	o	o	o						

Table 7.1. Illustration of the perceived relationship between the three colleges (X, Y Z) and the dimensions of the analytical framework (figure 5.3).

7.1   Human resources, knowledge and perceptions

This chapter aims at exploring the research purpose, by more explicitly discussing how the findings of chapter 6 relate to the analytical framework. Recalling the analytical framework (see p. 55), human resources is an essential category of the quality framework; what teachers know and believe about climate change and their teaching practices in general will have significant implications on the classroom practice. According to UNESCO, teachers need to have the capacity to promote critical thinking and take action on climate change mitigation and adaptation, to integrate local content and to deliver accurate information, in order to promote climate change education (UN CC:Learn, 2013b). After exploring teachers' knowledge on climate change in relation to the sourcebook, which from a local perspective largely answers to UNESCOs definition, results paint a promising picture for the future integration of quality CCE. Although a knowledge gap could be found in relation to background and climate change science, teachers had a solid knowledge foundation on which it will be feasible to continue building their climate change knowledge on. The findings showed that knowledge and perceptions amongst teachers and administrators at the TTCs in Malawi largely correlated with those found in other research settings. Malawian teachers and administrators shared the same

type of misconceptions as the public, teachers and students (Areskoug & Ekborg, 2006). The findings also enhanced Liu et al,'s (2015) study, which showed climate change knowledge does not necessarily correlate with attitudes to the same. On a teacher level, there were no great differences observed in regards to climate change knowledge between the three colleges. Even though the level of awareness varied, neither fluctuations nor numbers were great enough for correlating it to differences on the college level.

Subject knowledge is especially important for CCE in the context of ESD, as it requires a holistic and interdisciplinary approach (UNESCO, 2009). It was thus especially optimistic that teachers in all three subjects (S&T, agriculture and SES) were more or less equally informed on the topic, as it increases the possibility to integrate it with quality in all three subjects. What did fluctuate however was the knowledge level among the administrative staff. Given their involvement in school governance, their knowledge and perceptions may influence the shaping of future CCE in the colleges. Therefore, it was also positive that all administrators shared positive perceptions. Since they are not in charge of the actual classroom practice, their perceptions are considered the more important than their subject knowledge. However, this aspect is colored by the limitation that not all principals were available for interviewing. It is possible that the ones not interviewed have different perceptions, and thereby influence the future teaching differently.

Boon (2016) found that personal interest was vital to students' engagement in CCE - the same should be true for teacher educators. The respondents' answers implied a strong interest in the topic, not the least through their desire to further include it in the teaching at the colleges. The fact that many focused on mitigation rather than adaptation actions and saw themselves as a part of the solution is also encouraging for their future CCE teaching, and to Malawi's sustainable development in general. There were no significant differences on perceptions between the cases, yet attitudes to some extent varied on an individual level. Teachers had various perceptions on their current possibility to engage students in practical activities, which both underlines an existing implementation gap between intended and implemented IPTE curriculum, as well as the importance of understanding teachers' perceptions on the subjects they teach. Future CCE requires clear guidelines and stated goals.

The strong link between climate change knowledge and perception and the local context was a recurring theme in all parts of the teacher interviews, not only in relation to their own

knowledge but also when it came to describing their classroom practice. This finding resonate well with earlier research pointing to the importance of a local perspective on CCESD. Studies, such as the one by Schweizer et al. (2013) has reinforced UNESCO's call for linking CCESD to the local context, by showing how climate change messages were more easily understood when attached to a specific place. Just as in Sobel's (2004) findings, teachers believed that using the local environment in their practice facilitated the students' learning processes, as it gave them a *real world experience*. Respondents argued talking about cutting trees made causes and consequences more comprehensible, since people could not as easily relate to issues concerning industries and fumes. The teachers were aligned with the primary sourcebook, where suggestions for mitigation and adaptation measures were focusing on what was locally relevant. Hence, also in this sense teachers are well prepared to teach about climate change. However, teachers did not focus as much on mitigation actions within agricultural sector, despite its linkage to all impacts of climate change earlier mentioned. Following the results in the socio-cultural dimension, this might be because deforestation and charcoal production is considered to be a catalyst for all issues and closely linked to malnutrition as well as poverty. Educators thus need a somewhat more wide-ranging understanding if more agricultural- and health perspectives are to be added, and need further training on what falls under the umbrella of mitigation and adaptation measures, as this did not always seem clear to them.

It is true the local surroundings currently is where the Malawians have the most opportunity to impact, and hence is the most relevant perspective given the contemporary situation. Yet, solely relying on the local perspective may be harming considering a justice- and relevance perspective. Climate change is a worldwide phenomenon which requires a holistic understanding and a global perspective of the concept (Dal et al., 2015). Although many might not be able to relate to other aspects now, economic growth and development can suddenly spike. As the students are the leaders of tomorrow, in order for Malawi not to fall into the unsustainable patterns as the more developed countries, they need to be equipped with more comprehensive understanding of what contributes to global warming. By stating that teachers are essential for the possibility to implement a holistic and interdisciplinary approach to education for sustainability (UNESCO, 2009), then if not integrated now, at least educators at the colleges should have the capacity to also teach about this in the future. From a justice perspective, a more holistic perspective this is essential for two reasons. Firstly, Malawian students should have the possibility to compete on the global market and therefore needs a comprehensive picture. Secondly, people have the right to know the inherited unfairness of the

issue. Many of the key informants explained a broader theme would be brought in during secondary school. Yet, due to high dropout rates many students do not make it through primary education to receive that knowledge. Even though the teachers' current knowledge and perceptions resonate well with the sourcebook, the book itself provides little options to expand the teaching about this perspective. However, SES offers space for further integration of those aspects, as the contemporary curriculum involves topics like *interdependence between Malawi and the world* (see chapter 3). Nevertheless, in case of an enforced tradeoff between the two angles, in a short perspective, CCE with a prominent local attachment may be favorable as that is what currently can make the most difference. Even though climate change is a global challenge, its effects are local and thus needs to be tackled locally. The question is where the line should be drawn for what is considered *local*, and if this local perspective too needs to be broadened among the respondents. Many sectors highlighted in the sourcebook, such as the fishery industry, was not mentioned by the respondents, although it is highly relevant to their national context.

The literature review described how CCE is placed in the wider framework of ESD. Mochizuku & Bryan (2015) argued climate change is not only an environmental issue but also a social and economic one, which affects sustainable development issues like food security, human displacement and economic growth. For this reason, climate change needs to be approached *holistically* (ibid). Many of the sustainable development aspects mentioned above were brought up during conversations with the respondents, but it was often difficult to know if the problems raised by the respondents were linked to climate change, or rather an effect of development related issues and environmental mismanagement. The request to approach climate change holistically could hence mean the local perspective on climate change shared by the respondents and the primary sourcebook has negative implications for the implementation of quality CCE. But does the framing matter? Regardless of the cause of the issues Malawi are facing, the important thing should be to find sustainable solutions.

Furthermore, it is never explained what 'holistically' implies. The study correlates with Glasson et al.'s (2006) findings regarding Malawian teachers' notions on the sustainability concept. Similar to their study, these respondents were discussing sustainability-related issues without referring to it as 'sustainability'. Many of the problems they brought up when discussing effects of climate change related to all three spheres of the sustainability concept; economic, social and environmental. In this sense, perhaps both the sourcebook and the

respondents' knowledge already are approaching climate change holistically, even though it is within a place-based approach? Focusing on deforestation may feel like a narrow perspective, yet due to the width of the problematic, such teaching touches upon all spheres of sustainable development. Teachers in all subjects were aware of the complexity connected to deforestation, thus providing an enabling environment for approaching CCE from an ESD perspective. Reinforcing this and further providing an enabling environment for approaching CCE from the perspective of ESD, Malawi's strategy on climate change learning (which has led the way to the sourcebook on climate change and thus the locally adapted framework) places itself within the international context of ESD (Ministry of Environment and Climate Change Management, 2013). It has been developed together with the international agencies who are promoting CCE in the frame of ESD, but still it is clear the content of the climate change learning is influenced by the local context.

7.2 Enabling inputs and teaching and learning dimension

Differences between the cases were more visible when moving from the human resources perspective to other enabling inputs/teaching and learning. In many aspects, the three cases were embedded in the same enabling inputs-environment, but college Y had an advantage in the sense that more resources were already put on environmental education. Through this course, students already had the possibility to expand their environmental knowledge. Yet the course was not mandatory, thus leaving it up to the students to decide if such knowledge was worth investing in. As their teachers are vital for building this interest, it is promising that all teachers showed great interest in the topic. Chosen to participate in an eco-school project, college X too had a solid foundation to continue building climate change engagement, yet this choice was an external one. Unlike the other two colleges, Y made use of environmental friendly tools like energy saving stoves and solar cells, potentially facilitating the students' comprehension about the same as it becomes the visual element so many teachers asked for.

Given the low literacy rate at primary level (UNESCO, 2013), learning practical teaching approaches might be especially important for the students. Kretzer et al.'s (2016) found that equipment to teach agriculture practically in primary schools were limited, something the respondents' perceptions showed to be true also in the teacher training. Even if the colleges had fields, teachers in all colleges stressed the lack of some facilities and materials for

practically teaching what they also practiced theoretically in the classroom. Being externally funded, it is possible that the private college Y and the grant-aided X have a better position for meeting those needs when CCE is introduced later this year. At the same time, although some respondents at all colleges said they had some practical aspects in the teaching, financial restrictions were mentioned as hindrances also at college Y & X. This was perceived differently by all students, who only saw challenges in their own teaching environment. Regardless of the actual gaps, colleges need enough resources for connecting CCE to real experiences, for it to be locally relevant and comprehendible for all levels in primary. In terms of other learning material such as CCE books, although neither of the colleges possess that now, the revision of the curriculum and the already existing material at other levels paint an optimistic picture for this to be included also in teacher training institutions.

The lack of time for elaborating on CCE, which a majority of the respondents in all colleges pointed to, will likely become less of a problem when the new curriculum is introduced. Yet, earlier studies have found that ESD in other national context have been reduced to an add-on in an already overcrowded curriculum, and that it does not get high priority if it is not examined (Aikens et al., 2016; Læssøe et al., 2009). These were fears shared by many of the respondents in the colleges, who were afraid the lack of incentives for teaching about it would make climate change learning less of a priority. The tradeoff between quickly training new teachers to meet the heavy teacher shortage across the country and the need for more in-depth pre-service training may mean a much heavier emphasis on climate change issues in the new curriculum is unlikely. Yet, given the outcome based curriculum and the perceived heavy exam orientation of the IPTE curriculum, it is imperative that the topic become a part of the end of year assessment. With little time in the college and much to go through, and semesters starting later than planned, climate change risks of falling outside the teaching if it is not formally included. If it does get included, the centrally controlled end of year assessment is positive, as it minimizes the gap between intended and implemented curricula between the colleges.

7.3   Contextual dimension

In regards to the contextual dimension, the categories' potential impact on quality CCE varied. Earlier studies on other contexts (Bagoly-Simo, 2013) found a top-down approach to be favorable for the successful implementation of ESD in state-level curricula. Given this, Malawi's commitment to climate change learning through the many governmental strategies

and international agreements signed are promising for the integration of CCE in the new IPTE curriculum. Key informants were dissentient on when and where some aspects should be integrated in the teaching, both on primary and teacher education level. Therefore, it is promising that MoEST has financial, administrative and academic control over both systems, so they have the possibility to connect the two accordingly. Still, the sourcebook is limited in the sense that it does not provide clear instructions on what and where certain aspects should be taught. Regardless of when during primary the elements of the sourcebook ought to be addressed, teacher students need to have a comprehensive understanding of the content, as they should be ready to teach in all standards. Teacher educators therefore need to be equipped with knowledge and capacity to teach about all aspects of sourcebook.

Climate change requires a comprehensive approach, and CCE cannot be the only arena for fighting climate change. Many respondents felt there was a need to attack the structural problems affecting both the environment and their teaching about it through a multi-sector approach. This study has not reviewed the full spectrum of existing national strategies and measures addressing climate change, and does thus not aim at drawing conclusions regarding this aspect. The important point is however that the contextual aspects affecting the respondents' everyday lives as well as their teaching need to be approached simultaneously as the climate change learning is implemented, or else its effects might be diminished. This relates to many different levels of society. As many respondents pointed to, there was a need for changing people's mindset on how to sustain the environment, which in turn is relying on effort on a national level. There is little point in teaching students about using energy saving stoves if the only available source of energy outside the classroom is charcoal and wood. Additionally, teachers need to be allowed to integrate these types of learning in their classroom practice, as children can transfer climate change knowledge to their families (Bryan & Mochizuki, 2015; Damerell, Howe, & Milner-Gulland, 2013). Since the approval of the local chiefs were essential to the teachers, their capacity must be strengthened too.

Læssøe et al. (2009) highlighted the fact that ESD in teacher education will not mean anything if not also integrated in the curriculum at school level. Climate change sourcebooks and posters are already printed and distributed in primary schools around the coutry, in this sense the contextual conditions are favourable. But even if the materials are there, just as with their educators at the colleges, it requires will from the teachers. They must want to integrate it, especially if climte change in primary school is still just an add-on and not yet formally

94

included in the curriculum. As Belicher & Lambert (2013) showed it is possible to increase pre-service teachers concern about climate change thorugh teaching about the same, educators must strive to create engagement around the topic amongst their students.

Recalling the discussion on the so-called implementation gap (see Goodlad et al., 1979), even if the will is there, there is a risk that teachers and administrative staff understands the national guidelines differently than what is intended. CCE has not yet been infused in the IPTE curriculum, hence the aspects brought up in relation to curriculum implementation were relating to the current one. However, it is likely that the implementation gaps found in relation to the now active curriculum will be transferred to the new curriculum. The fact that individuals at all levels had different perceptions on when and where climate change education had been or should be implemented, as well as how much freedom teachers had in relation to their teaching, underlines the role knowledge and perceptions will play in the implementation of the new curriculum, but also the importance of providing clear directions on the goals and intended implementation of the CCE.

Given the global thematic on climate change, globalization may have both positive and negative impacts on CCE. Positive in the sense that the topic is getting increased attention, which can result in continuous increased support from international aid donors to Malawi's work on climate change, in all related sectors. Considering Malawi's aid dependency, such outcome is likely. Negative in the sense that global warming will continue to negatively affect many of the contextual dimensions. For example, parents may want to send their students to school, but the increasing difficulties of farming that global warming contributes to, forces them to make their children stay home and work.

UNESCO has stated teacher students in low-income countries often enter training with unsufficient knowledge (UNESCO, 2013). In the Malawian context, the structure of the secondary education may be seen as a challenge for quality CCE implementation. The system allows students to start teacher training without any credits in geography, which means initial understanding of environmental issues can be low. At the same time, the topic of climate change has an advantage in the sense that both teachers and students themselves indicated the relateability made students interested in the subject. Public spending on education is considered low in comparison to other African countries. However, the per pupil spending is considerably higher at secondary level compared to primary level. Given that total spending on education

correlates with education quality, quality should be higher in secondary than in primary. As teacher students have to complete secondary school before attending teacher training, they should be relatively better prepared to absorb CCE than if this was not a precondition for attending. The climate change stratgey has already infused CCE into the secondary curriculum, making future students even more prepared to learn about this in teacher training, if they do decide to take credits in subjects which touches upon the area.

Brock-Utne & Mercer (2014) highlighted how learning in an exogeneous language, which is the case in both primary and secondary school in Malawi, can affect education quality. Many student interviews were characterized by communication difficitulties, and if students cannot comprehend what their teachers say, the educators knowledge on climate change becomes redundant. On the other hand, it is positive that Malawi unlike some other countries in the region have English as an offical language, as it makes students more exposed to the language. The communication difficulties could rather be linked to differences between the interviewer and the interviewees, yet this aspect needs to be taken into consideration so that the teacher students fully grasp the content of CCE.

8 Concluding remarks and implications for primary school

The overarching aim of this study has been to explore knowledge and perceptions on climate change, the current climate change related teaching, and the elements affecting the same within the three TTCs, to examine the possibility to in the future integrate quality climate change education in the teaching. Given the teachers' and administrators' current level of climate change knowledge and their expressed wishes to further increase climate change learning into the teaching, there was a solid foundation for integrating CCE into the new teacher education curriculum. Respondents in all colleges displayed the same type of knowledge and perceptions. In this sense, the most prominent finding was the strong connection between climate change knowledge and perceptions, and the physical and social local environment, as well as the perceived importance of linking CCE theory with practical experiences. Due to the strong attachment to local environmental issues such as deforestation, the quite narrow perspective still touched upon social, economic and environmental issues, thus placing current climate change knowledge within the context of Education for Sustainable Development.

Although the colleges had different financial prerequisites, respondents in all three cases experienced the same type of challenges in terms of time and monetary resources. Despite a centrally controlled curriculum, teachers had different perceptions on how and when they were integrating climate change issues in their teaching, which underlined an implementation gap in the current curriculum and called for clear guidelines in the reviewed one. On a macro level, there were contextual aspects that could aggravate the strive to achieve quality CCE for all colleges, such as unemployment, the general public's perceptions on environmental conservation and mismanagement of natural resources. Other factors, such as time spent in college and the structure of the secondary education, could potentially be harming for the strive to achieve CCE of good quality. At the same time, national management policies, aid-strategies and continuous financial support to the educational sector provided an enabling environment for both integrating CCE in the training and fighting climate change through other sectors.

Given the research design and the qualitative approach of the study, the aim is not to make robust generalizations, rather to say something about the specific cases. Yet, a few points can be raised in relation to the other TTCs. Despite their different funding structures, the cases showed more similarities than differences, both in terms of individual knowledge and perceptions, as well as possibilities and challenges faced in their current teaching. The three

colleges are embedded in the same socio-economic context as the other colleges around the country. Therefore, it is likely that the same type of findings would be found in other cases, thus making the study generalizable to these settings. Yet, another research design would have made such generalization even more appropriate. A mixed method, where interviews were supported by questionnaires on the respondents' knowledge on climate change would have provided more robust results.

Succeeding the results of this study, some policy recommendations to strengthen the future quality of CCE in the colleges follow:

- If the new IPTE curriculum too will be outcome-based, CCE must be included in the end of semester assessment.

- Given that CCE does get integrated in the new IPTE curriculum, with limited time devoted to residential pre-service training, it is imperative that the colleges start the semesters on time.

- Teacher educators and administrators should be given adequate training on the mechanisms of climate change, but also on the intended implementation. The latter is especially important if the topic will be crosscutting, for not risking CCE to be forgotten.

- More attention should be given to practical aspects in the teaching, both in terms of time devoted to practical learning in agriculture and SES and in terms of resources allocated to for example go on fieldtrips and to buy seedlings for agricultural teaching.

- The Climate Change Learning Strategy aims as developing a 'critical mass' of human resources with the capacity to respond to the impacts of climate change. Given this goal, notwithstanding the importance of the educational sector, it is essential that knowledge, awareness and capacity is built also outside the classrooms and that contextual issues such as low employment levels and energy provision are tackled simultaneously.

Although the outlooks for implementing CCE of good quality in teacher education seems promising, the problems facing primary schools nationwide persists. Due to low literacy levels, high dropout rates and the importance of learning to respond to climate change, CCE needs to be integrated in the learning as soon as possible. Considering the raised problematic with English as medium of instruction, it is in this area especially important that future teachers can provide information that is comprehendible, also to them who do not understand instructions

in English. In this sense, practical methods can be useful, although the predominantly large classes make the same type of teaching challenging. In a bigger perspective, there is also a need for working towards reducing class sizes and improving the overall education quality at primary level. Teaching in rural areas needs to become more attractive to teachers want to go, so climate change learning spreads where it is needed the most. Continuous financial commitment to the educational sector is fundamental.

This study has been focusing on the intended versus implemented interplay of curriculum implementation, as this was considered to be the most important level for the purpose of the study. After formally integrating CCE into the IPTE curriculum in 2017, it will be purposeful to also investigate students' experienced curriculum, which future studies could set out to do. Such studies could also contribute to these findings by exploring learner characteristics and outcomes of the new curriculum through a quantitative approach. Finally, this study and earlier research has pointed to the importance of linking the climate change education to the local realities. It would therefore be interesting to compare this study with a future exploration of Western perceptions in similar institutions, to see if a local perspective is equally omnipresent.

9 References

Afdal, G. (2004). *Tolerance and Curriculum: Conceptions of Tolerance in the Multicultural Unitary Norwegian Compulsory School (Dissertation).* (dr. theol.), The Norwegian Lutheran School of Theology, Oslo. Retrieved 2017-03-03, from: http://www2.mf.no/dokumenter/forskning/fulltekst_pdf_filer/Afdal.pdf

Aikens, K., McKenzie, M., & Vaughter, P. (2016). Environmental and Sustainability Education Policy Research: a Systematic Review of Methodological and Thematic Trends. *Environmental Education Research, 22*(3), 333-359.

Anderson, A. (2010). Combating Climate Change Thorugh Quality Education *Global Economy and Development, 2010-03*.

Anderson, A. (2012). Climate Change Education for Mitigation and Adaptation. *Journal of Education for Sustainable Development, 6*(2), 191-206.

Areskoug, M., & Ekborg, M. (2006). How Student Teachers' Understanding of the Greenhouse Effect Develops During a Teacher Education Programme. *Nordic Studies in Science Education, 5*, 17-29.

Bagoly-Simo, P. (2013). Tracing Sustainability: An International Comparison of ESD Implementation into Lower Secondary Education. *Journal of Education for Sustainable Development* (7), 95-112.

Bangay, C., & Blum, N. (2010). Education Responses to Climate Change and Quality: Two Parts of the Same Agenda? *International Journal of Educational Development, 30*(4), 359-368.

Barrett, A., Chawla-Duggen, J., Lowe, J., Nikel, J., & Upko, E. (2006). The Concept of Quality in Education: A Review of 'International' Literature on the Concept of Quality in Education. *EdQual Working Paper, 3*, 1-18.

Bleicher, R. E., & Lambert, J. L. (2013). Climate Change in the Preservice Teacher's Mind. *Journal of Education for Sustainable Development, 24*, 999-1022.

Blum, N., Nazir, J., Breiting, S., Chuan Goh, K., & Pedretti, E. (2013). Balancing the Tensions and Meeting the Conceptual Challenges of Education for Sustainable Development and Climate Change. *Environmental Education Research, 19*(2).

Boon, H. J. (2010). Climate Change? Who Knows? A Comparison of Secondary Students and Pre-service Teachers. *Australian Journal of Teacher Education, 35*(1).

Boon, H. J. (2016). Pre-Service Teachers and Climate Change: A Stalemate? *Australian Journal of Teacher Education, 41*(4).

Bray, M., Adamson, B., & Manson, M. (2007). *Comparative Education Research. Approaches and Methods.* Hong Kong: Springer - CERC/University of Hong Kong.

Brinkmann, S., & Kvale, S. (2009). *Den kvalitativa forskningsintervjun*. Lund: Studentlitteratur

Brock-Utne, B., & Mercer, M. (2014). Languages of instruction and the question of education quality in Africa: a post-2015 challenge and the work of CASAS. *Compare: A Journal of Comparative and International Education, 44*(4), 676-680.

Bryan, A., & Mochizuki, Y. (2015). Climate Change Education in the Context of Education for Sustainable Development: Rationale and Principles *Journal of Education for Sustainable Development, 9*(1), 4-26.

Bryman, A. (2012). *Social Research Methods* (Vol. Fourth Edition). New York: Oxford University Press.

Corcoran, T., Scherer, C., Shubert, W., & Shanahan, M. (2013). Climate Chnage in Africa: A Guidebook for Journalists. *UNESCO Series on Journalism Education*.

Crouch, M. (2015). Sustainable Agriculture in Malawi: a Desperate Struggle.   Retrieved 2017-01-18, from: http://www.theecologist.org/blogs_and_comments/Blogs/2834345/sustainable_agriculture_in_malawi_a_desperate_struggle.html

Dal, B., Alper, U., Özdem-Yilmaz, Y., Öztürk, N., & Sönmez, D. (2015). A model for pre-service teachers' climate change awareness and willingness to act for pro-climate change friendly behavior: adaptation of awareness to climate change questionnaire. *International Research in Geographical and Environmental Education, 24*(3).

Damerell, P., Howe, C., & Milner-Gulland, E. J. (2013). Child-oriented Environmental Education Influences Adult Knowledge and Household Behaviour. *Environmental Research Letters*(8).

Department of Population and Development. (2012). Why Population Matters to Malawi's Development: Managing Population Growth for Sustainable Development. Retrieved 2017-05-03, from http://www.prb.org/pdf12/malawi-population-matters.pdf

DeStefano, J. (2012). *Teacher Training in Malawi: Efficiency and Costs*. Washington, DC: Creative Associates International.

Duschl, R. A. (1990). *Restructuring Science Education : The Importance of Theories and their Development*. New York: Teachers College Press.

EPDC. (2014). Malawi National Education Profile 2014 Update. Retrieved 2017-05-08, from http://www.epdc.org/sites/default/files/documents/EPDC NEP_Malawi.pdf

GCCA. (n.d.). Global Climate Change Alliance in Malawi. Retrieved 2017-05-08, from http://www.gcca.eu/national-programmes/africa/gcca-malawi

Gerring, J. (2004). What Is a Case Study and What Is It Good for? *APSR, 98*(2), 341-354. doi:10.1017/S0003055404001182

Glasson, G. E., Frykholm, J. A., Mhango, N. A., & Phiri, A. D. (2006). Understanding the Earth Systems of Malawi: Ecological Sustainability, Culture, and Place-Based Education. *Science Education, 90*(4), 660-680.

Goodlad, J. I., Klein, F. M., & Tye, K. A. (1979). The Domains of Curriculum and Their Study *Curriculum Inquiry : The Study of Curriculum Practice*. New York: McGraw-Hill.

GPE. (2016). Education in Malawi. Retrieved 2017-05-07, from http://www.globalpartnership.org/country/malawi

Gregson, J. (2017). The Poorest Countries in the World. Retrieved 2017-05-04, from https://www.gfmag.com/global-data/economic-data/the-poorest-countries-in-the-world?page=12

Guba, E., & Lincoln, Y. S. (1985). Naturalistic Inquiry. *Beverly Hills CA: Sage Publications*.

Guba, E. G., & Lincoln, Y. S. (1994). Competing Paradigms in Qualitative Research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research*. Thousand Oaks, CA: Sage.

Ho, L.-C., & Seow, T. (2015). Teaching Controversial Issues in Geography: Climate Change Education in Singaporean Schools. *Theory & Research in Social Education, 43*(3), 314-344.

Humphreys, H. (2016). Malawi: IPTE 12 - Initial Primary School Teachers Training Programme.

International Council on Human Rights Policy. (2008). Climate Change and Human Rights: A Rough Guide. Retrieved 2017-05-08, from http://www.ohchr.org/Documents/Issues/ClimateChange/Submissions/136_report.pdf

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Switzerland: Geneva

Jones, P. W., & Coleman, D. (2005). *The United Nations and Education: Multilateralism, Development and Globalisation*. London: RoutledgeFalmer.

Kamwendo, G. H. (2016). The New Language of Instruction Policy in Malawi: A House Standing on a Shaky Foundation. *International Review of Education, 62*(2), 221-228.

Kazembe, J., Yaron, G., Mangani, R., Mlava., Kambewa, P., Makungwa, S. & Magoola, W. (2011). Economic Analysis of Sustainable Natural Resource Use in Malawi. *Malawi Poverty-Environment Initiative*. Retrieved 2017-05-19, from http://www.unpei.org/sites/default/files/e_library_documents/Malawi_Economic_Study_Jan_2011.pdf

Kretzer, M. M., Engler, S., Gondwe, J., & Trost, E. (2016). Fighting resource scarcity – sustainability in the education system of Malawi – case study of Karonga, Mzimba and Nkhata Bay district. *South African Geographical Journal*.

Kumbani, P. (2016). MoEST reviewing IPTE curriculum. Retrieved 2017-03-16, from http://mwnation.com/moest-reviewing-ipte-curriculum/

Liu, S., Roehrig, G., Devarati, B., & Varma, K. (2015). In-service Teachers' Attitudes, Knowledge and Classroom Teaching of Global Climate Change. *Science Educator, 24*(1), 12-22.

Læssøe, J., & Mochizuki, Y. (2015). Recent Trends in National Policy on Education for Sustainable Development and Climate Change Education *Journal of Education for Sustainable Development, 9*(1), 27-43.

Læssøe, J., Schnack, K., Breiting, S., & Rolls, S. (2009). *Climate change and sustainable development: The response from education—Cross-national report.* Retrieved from Copenhagen: International Alliance of Leading Education Institutes (IALEI):

Mckeown, R. (2002). Education for Sustainable Development Toolkit. Retrieved 2016-02-18, from http://www.esdtoolkit.org/esd_toolkit_v2.pdf

Michail, S., Stamou, A. G., & Stamou, G. P. (2007). Greek primary school teachers' understanding of current environmental issues: An exploration of their environmental knowledge and images of nature. *Science Education, 91*(2), 244-259. doi:10.1002/sce.20185

MIE. (2008). *Evaluation of IPTE Instructional Materials for Term One and Two*. Domasi: Malawi Institute of Education

MIE. (2014). *Climate Change Sourcebook for Primary School Teachers* Malawi: Domasi: Malawi Institute of Education

Milner, G., Mulera, D., & Chimuzu, T. (2011). *The SACMEQ III Project in Malawi: A Study of the Conditions of Schooling and the Quality of Education*. Retrieved 2017-01-04, from http://www.sacmeq.org/sites/default/files/sacmeq/reports/sacmeq-iii/national-reports/mal_sacmeq_iii_report-_final.pdf

Mining, M. o. N. R. E. a. (2014). *National Climate Change Programme (CCP): Progress Report*. UNDP.

Ministry of Environment and Climate Change Management. (2013). *Malawi's Strategy on Climate Change Learning*. Lilongwe.

MoEST. (2008). National Education Sector Plan 2008-2017. Retrieved 2017-05-15, from http://www.sdnp.org.mw/Education2010/FinalNesp.pdf

MoEST. (n.d.). *Primary Teacher Education Reform and Assessment framework*. Departement of Teacher Education and Development

NASA. (2017). Climate change: How do we know? Retrieved 2017-05-06, from
https://climate.nasa.gov/evidence/

Nespor, J. (1987). The Role of Beliefs in the Practice of Teaching. *Journal of Curriculum Studies, 19*(4), 317-328.

NORAD. (2015). Facts about Malawi. Retrieved 2017-05-07, from
https://www.norad.no/en/front/countries/africa/malawi/

Pajares, F. M. (1992). Teachers' Beliefs and Educational Reserach: Cleaning Up a Messy Construct. *Review of Educational Reserach, 62*(3), 307-332.

Palmer, J. (1998). *Environmental Education in the 21st Century: Theory, Practice, Progress and Promise*. London: Routledge.

Philander, G. (2012). *Encyclopedia of Global Warming and Climate Change, Second Edition* (2nd ed. ed.). Thousand Oaks: SAGE Publications.

Reinvang, R. (2013). Children and Climate Change: An Overview. *Vista Analysis AS, 2013:44*.

SACMEQ. (n.d.). Management and Administration of Education Retrieved 2017-03-09, from http://www.sacmeq.org/?q=sacmeq-members/malawi/management-and-administration-education

Saunders, M., Lewis, P., & A, T. (2009). *Research Methods for Business Students* (Fifth ed.). Harlow: Pearson Education Limited.

Schweizer, S., Davis, S., & Thompson, J. L. (2013). Changing the Conversation about Climate Change: A Theoretical Framework for Place-Based Climate Change Engagement. *Environmental Communication: A Journal of Nature and Culture, 7*(1), 42-62.

Shepardson, D. P., Niyogi, D., Roychoudhury, A., & Hirsch, A. (2012). Conceptualizing Climate Change in the Context of a Climate System: Implications for Climate and Environmental Education. *Environmental Education Research, 18*(3), 323-352.

Sobel, D. (2004). *Place-based Education: Connecting Classroom and Community*. Great Barrington, MA: The Orion Society.

Stevenson, R. B. (2007). Schooling and Environmental Education: Contradictions in Purpose and Practice. *Environmental Education Research, 13*(2), 139-153.

Taylor, E. W., & Caldarelli, M. (2004). Teaching beliefs of non-formal environmental educators: a perspective from state and local parks in the United States. *Environmental Education Research, 10*(4), 451-469.

Taylor, S. J., & Bogdan, R. (1998). *Introduction to qualitative research methods : a guidebook and resource* (3rd ed. ed.). New York: Wiley.

Tikly, L. (2010). Towards a Framework For Understanding The Quality of Education. *EdQual Working Paper, 27*.

UIS. (2016a). Education: Government expenditure per student in PPP $. Retrieved 2017-05-07, from http://data.uis.unesco.org/index.aspx?queryid=190

UIS. (2016b). UIS Fact Sheet. Retrieved 2017-05-07, from http://www.uis.unesco.org/Education/Documents/FS39-teachers-2016-en.pdf

UN CC:Learn. (2013a). Malawi Designs and Field Tests an Educational Poster on Climate Change for Primary School Teaching. Retrieved 2017-02-28, from http://www.uncclearn.org/news/malawi-designs-and-field-tests-educational-poster-climate-change-primary-school-teaching

UN CC:Learn. (2013b). Resource Guide for Advanced Learning on Integrating Climate Change in Education at Primary and Secondary Level. Retrieved 2017-02-10, from http://www.uncclearn.org/sites/default/files/inventory/resource_guide_on_integrating_cc_in_education_primary_and_secondary_level.pdf

UN CC:Learn. (n.d.). Strengthening Human Resources and Skills to Address Climate Change Retrieved 2017-02-28, from http://www.uncclearn.org/national-projects/un-cclearn-malawi

UNDP. (2017). What are the Sustainable Development Goals? Retrieved 2017-05-21, from http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

UNDP-UNEP PEI. (2016). Livelihoods in Malawi depend on the environment – there is a need to promote sustainability. Retrieved 2017-05-19, from http://www.unpei.org/sites/default/files/e_library_documents/Policy Brief - Livelihoods in Malawi_1.pdf

UNESCO. (2005). EFA Global Monitoring Report. The Quality Imperative. Retrieved 2016-02-17, from http://unesdoc.unesco.org/images/0013/001373/137333e.pdf

UNESCO. (2009). Second Collection of Good Practices: Education for Sustainable Development. Retrieved 2017-05-02, from http://unesdoc.unesco.org/images/0018/001812/181270e.pdf

UNESCO. (2010). The UNESCO Climate Change Initiative. Retrieved 2017-01-17, from http://unesdoc.unesco.org/images/0019/001901/190101E.pdf

UNESCO. (2013). *EFA Global Monitoring Report 2013/2014. Teaching and Learning: Achieving Quality for All.* Retrieved 2017-03-17, from http://www.unesco.org/fileadmin/MULTIMEDIA/HQ/ED/GMR/pdf/Malawi_Factsheet.pdf

UNESCO. (2015a). Not Just Hot Air: Putting Climate Change Education Into Practice. Retrieved 2017-01-09, from http://unesdoc.unesco.org/images/0023/002330/233083e.pdf

UNESCO. (2015b). The World Inequality Database on Education: Malawi. Retrieved 2017-05-04, from http://www.education-inequalities.org/countries/malawi - ?dimension=sex&group=all&year=latest

UNESCO. (n.d.-a). UN Decade of ESD Retrieved 2017-05-02, from http://en.unesco.org/themes/education-sustainable-development/what-is-esd/un-decade-of-esd

UNESCO. (n.d.-b). What is ESD? Retrieved 2017-03-12, from http://en.unesco.org/themes/education-sustainable-development/what-is-esd

UNESCO. (n.d. -a). Malawi EFA Profile. Retrieved 2017-04-03, from http://www.unesco.org/fileadmin/MULTIMEDIA/FIELD/Dakar/pdf/EFA country profile 2012 - Malawi.pdf

UNESCO. (n.d. -b). Relevance/Responsiveness. Retrieved 2017-05-17, from http://www.unesco.org/new/en/education/themes/strengthening-education-systems/quality-framework/development-goals/relevanceresponsiveness/

UNESCO-IBE. (2010). World Data on Education: Malawi. Retrieved 2017-01-18, from http://unesdoc.unesco.org/images/0019/001901/190190e.pdf

UNFCCC. (2014). Cooperation & Support: Education & Outreach. Retrieved 2017-05-13, from http://unfccc.int/cooperation_and_support/education_and_outreach/items/7403.php

Unicef. (2016). Basic Quality Education: Malawi. Retrieved 2017-05-08, from https://www.unicef.org/malawi/development_15943.html

Unitar. (2013). UN CC:Learn: Integrating Climate Change in Education at Primary and Secondary Level. Retrieved 2017-01-17, from http://www.uncclearn.org/sites/default/files/inventory/resource_guide_on_integrating _cc_in_education_primary_and_secondary_level.pdf

Unitar. (n.d.). Indonesia and Malawi Join Group of UN CC: Learn Pilot Countries with Additional Support of the Swiss Development Cooperation. Retrieved 2017-02-28, from https://www.unitar.org/indonesia-and-malawi-join-group-un-cc-learn-pilot-countries-additional-support-swiss-development-coo

United Nations. (1992). United Nations Framework Convention on Climate Change Retrieved 2017-01-17, from http://unfccc.int/files/essential_background/background_publications_htmlpdf/applica tion/pdf/conveng.pdf - page=17

United Nations. (2016). Climate Action: Why it Matters. Retrieved 2017-05-08, from http://www.un.org/sustainabledevelopment/wp-content/uploads/2016/08/13_Why_it_Matters_Climate_Action_letter_size_1p.pdf

United Nations. (n.d.-a). Goal 4: Ensure inclusive and quality education for all and promote lifelong learning. Retrieved 2017-04-28, from

United Nations. (n.d.-b). Goal 13: Take urgent action to combat climate change and its impacts. Retrieved 2017-05-08, from http://www.un.org/sustainabledevelopment/climate-change-2/

USAID. (2015). Agriculture and Food Sustainability. Retrieved 2017-05-07, from https://www.usaid.gov/malawi/agriculture-and-food-security

USAID. (2016). Greenhouse Gas Emissions in Malawi. Retrieved 2017-05-29, from https://www.climatelinks.org/resources/greenhouse-gas-emissions-factsheet-malawi

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21 st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies, 44*(3), 299-321.

Walter, M. (2013). The Nature of Soical Science Research. In M. Walter (Ed.), *Social Research Methods* (pp. 1-24). Oxford: Oxford University Press.

Waters-Adams, S. (2006). The Relationship between Understanding of the Nature of Science and Practice: The influence of teachers' beliefs about education, teaching and learning. *International Journal of Science Education, 28*(8), 919-944.

Weber, E. (2010). What shapes perceptions of climate change? *Wiley Interdisciplinary Reviews: Climate Change, 1*(3), 332-342.

Wise, S. B. (2010). Climate change in the classroom: Patterns, motivations, and barriers to instruction among Colorado science teachers. *Journal of Geoscience Education, 58*(5), 297-309.

Wolfenden, F. (2014). *Supporting induction to the teaching profession for women in Malawi.* Paper presented at the Proceedings of the 4th biennial International Conference on Distance Education and Teachers' Training in Africa (DETA), DETA Conference procedings, Unit for Distance Education, University of Pretoria. Retrived 2017-04-21, from http://oro.open.ac.uk/42638/2/DETA article_final_june2012_17.pdf

World Bank. (2010). *The Education System in Malawi.* USA: Washington, D.C.

World Bank. (2011). Reproductive Health at a Glance: Malawi Retrieved 2017-05-20, from http://siteresources.worldbank.org/INTPRH/Resources/376374-1303736328719/Malawi42211web.pdf

World Bank. (2013). Open Development and Aid Management in Malawi. Retrieved 2017-05-07, from http://www.worldbank.org/en/news/feature/2013/11/14/open-development-and-aid-management-in-malawi

World Bank. (2017). Climate Change: Overview. Retrieved 2017-05-01, from
        http://www.worldbank.org/en/topic/climatechange/overview - 1

World Bank Group. (2016). Education Global Practice: Innovations in Education - Africa
        Retrieved 2017-05-06, from
        http://documents.worldbank.org/curated/en/780321468194950346/pdf/104252-BRI-
        P155972-PUBLIC-ADD-SERIES-WB-TeacherMgmt-brief-final-web.pdf

World Commission on Environment and Development. (1987). Our Common Future, chapter
        2: Towards Sustainable Development. Retrieved 2017-05-20, from http://www.un-
        documents.net/ocf-02.htm

Yin, R. K. (2009). Case Study Research: Design and Methods (4th ed. ed. Vol. vol. 5).
        Thousand Oaks, Calif: Sage.

10   Appendices

10.1   Appendix 1: Interview guides

TTC Teachers
1. Tell me a bit about your life and background in education
- *Where are you from?*
- *What is you previous study background?*
- *Why did you become a teacher?*
- *Working at TTC for how long?*
- *Previously primary/secondary teaching? Why teacher education?*

Knowledge and perceptions on climate change
2. What comes into your mind when you hear the words 'climate change'?
- *Is it debated in society? In media? Sensitive issue?*
- *Where do you hear about it? In what context?*
- *What do you believe is the biggest cause and consequence of climate change?*
- *What can be done in response to climate change?*
- *Differences/similarities on a global level?*
- *How do you feel about this issue? (is it an important issue? Why/why not?)*

3. How, and in what ways, has climate change had an effect on your community and your everyday life?
- *How/in what ways is it affecting your family?*

4. Is it possible to point at any visible changes in society due to climate change?
- *Direct effects of climate change?*
- *Responses to climate change?*
- *Is Malawi affected in any particular way?*

5. How have you gained knowledge about climate change?
- *In service courses? Workshops? Education? Non-formal education? Self-taught?*

Climate change teaching
6. How, and in what ways, are these issues being addressed during your lessons?
- *What aspects are you focusing on?*
- *What methods are being used?*
- *Within what subjects is it being taught?*
- *How much time is spent on the subject/s?*
- *How is the subject/s being assessed?*
- *Has the way you teach about these issues changed over time?*
- *Are the lessons locally relevant?*

7. How do students react when you talk about this?
- *Do they feel unease or feel anxiety when talking about issues relating climate change, such as increased droughts?*
- *How is this being met?*

8. What challenges do you face when trying to teach about CC?

9. Are you familiar with the national strategy on climate change learning?
- *If so, can you please tell me about how it is affecting your work at the TTC?*

10. In your opinion, who has the greatest responsibility in regards to teaching about climate change?
- *Schools? Communities? Families?*
- *Should more space in curriculum be given to these issues?*
- *How relevant is it to teach students about this? Why/why not?*

11. Do you have any suggestions for making the climate change learning better at your TTC?

TTC Administrators
1. Tell me a bit about your life and background in education
   - *Where are you from?*
   - *What is you previous study background?*
   - *Why did you become a teacher?*
   - *Working at TTC for how long?*
   - *Previously primary/secondary teaching? Why teacher education?*

Knowledge and perceptions on climate change
2. What comes into your mind when you hear the words 'climate change'?
   - *Is it debated in society? In media? Sensitive issue?*
   - *Where do you hear about it? In what context?*
   - *What do you believe is the biggest cause and consequence of climate change?*
   - *What can be done in response to climate change?*
   - *Differences/similarities on a global level?*
   - *How do you feel about this issue? (is it an important issue? Why/why not?)*

3. How, and in what ways, has climate change had an effect on your community and your everyday life?
   - *How/in what ways is it affecting your family?*

4. Is it possible to point at any visible changes in society due to climate change?
   - *Direct effects of climate change?*
   - *Responses to climate change?*
   - *Is Malawi affected in any particular way?*

5. How have you gained knowledge about climate change?
   - *In service courses? Workshops? Education? Non-formal education? Self-taught?*

Curriculum implementation
6. How do you feel about educating teacher students about climate change?
   - *Why is it important/why not?*

7. In your opinion, who has the greatest responsibility in regards to teaching about climate change?
   - *Schools? Communities? Families?*

6. How, and in what ways, are these issues being addressed in the education here at the TTC?
   - *Within which subjects is this highlighted? Why/why not? Crosscutting or not? Learning about or also in field?*
   - *Have you received any material from other institutions to facilitate the teaching and learning about climate change?*
   - *What aspects are in focus?*
   - *What methods are being used? Discussions etc?*
   - *How much time is being devoted to it?*
   - *How is the subject being assessed?*
   - *Within what subjects is it being taught?*
   - *Has the way this is being taught changed over time?*
   - *Are the lessons locally relevant?*

8. What are the reasons for not stressing these issues in the teacher training?
- *Too little space in curriculum?*
- *Not important enough?*
- *Issues too complex to teach?*
- *Students not knowledgeable enough?*

Are you familiar with the national strategy on climate change learning?
- *If so, can you please tell me about how it is affecting your work at the TTC?*
- *Has it played a part in the current structure of the curriculum?*

TTC Students

1. Please tell me a bit about your life and background in education
   - *Where are you from?*
   - *Previous study background?*
   - *When did you decide you wanted to become a teacher? Why?*
   - *What do you like the most with your studies? Why?*
   - *Do you find anything to be challenging? What? Why/why not?*

Knowledge and perceptions on climate change

2. What comes into your mind when you hear the words 'climate change'?
   - *Is it debated in society? In media? Sensitive issue?*
   - *Where do you hear about it? In what context?*
   - *How do you know what you know today (media? TTC? Self-taught?)*
   - *What do you believe is the biggest cause and consequence of climate change?*
   - *Is there anything that can be done in response to climate change?*
   - *Is it an important issue or not? Why/why not?*

3. Has climate change had an effect on your community and your everyday life?
   - *In what ways?*

4. Who do you think is responsible for climate change?
   - *What should/can be done in respond to it?*
   - *Where should possible solutions come from?*
   - *Your role as a teacher in this matter?*

5. In your opinion, what were the most important subjects during your teacher training?
   - *Why were they the most important?*
   - *How important do you think it is that you as a teacher learn about agriculture and how to take care of the environment? Why?*
   - *Who has the greatest responsibility in regards to spreading knowledge about climate change? Schools? Communities? Families?*

6. In what ways did you talk about the climate and environment in the education at the TTC?
   - *During which lessons did you talk about the climate/environment?*
   - *What have you learnt?*
   - *Have you had classroom discussions? Been outside on excursions? Only listening to the teacher?*
   - *How many times a week did you talk about this?*
   - *Did you have any examinations?*
   - *Did you have school material relating to climate change?*

7. Possible challenges:
   - *What was the most difficult part when learning about climate change?*
   - *Was there enough time devoted to these questions?*
   - *Did you ever feel sad when talking about this subject? Was that something that was discussed in class?*

8. What have you learnt in your teacher training about climate change, that will be relevant in your future life and career?

9. How do you find the training in this matter?
- *Sufficient or not? Relevant or not? Qualitative or not?*
- *Do you have any suggestions for the future?*

Key Informants

1. Background questions
   - *Name, age, position in organization, years as employee…*

2. Can you please tell me about how the strategy on climate change learning came into place?
   - *When did you start working on the strategy?*
   - *Who was the most influential part in the process?*
   - *What would you say is/was the main focus with the strategy?*
   - *What would you say is/was the main goal with the strategy?*

3. How do you feel about strengthening climate change knowledge among teacher students?
   - *Why is this needed?*

4. The strategy has three key priority areas, one being to a) develop a critical mass of human resources with requisite understanding, knowledge and skills to respond to the impacts of climate change, by training lead trainers to train others, and b) to develop strong organizations by mainstreaming climate change in school curricular and strengthening training at training centers.
   - What has the development been in this aspect, in relation to teacher training colleges?
     a. *Have teachers been trained at TTCs? Public? Private?*
     b. *Has the education changed since the strategy came to place?*
     c. *Is there teaching material available?*
     d. *Can you elaborate a bit about what "a critical mass" means?*

5. In what ways will climate change issues be incorporated in the new primary teacher education curriculum that is currently under development?
   - *Crosscutting or in one separate object?*
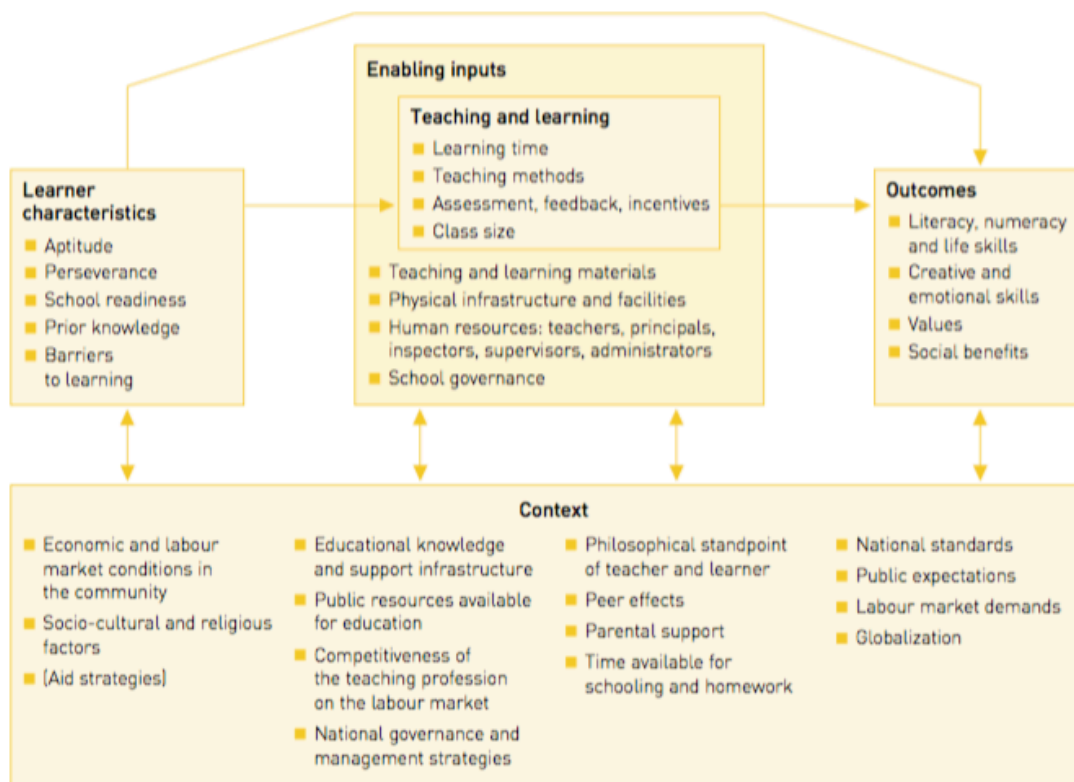   - *Locally adapted and relevant?*
   - *So far, the secondary school curriculum has been updated. Why was this prioritized?*

6. What are the main challenges for increasing the climate change training at TTCs?

7. What role do teachers play in rising climate change awareness in local communities?

8. Please tell me about the current climate change learning in primary school.

10.2 Appendix 2: UNESCOs framework for understanding education quality

Enabling inputs

Teaching and learning
- Learning time
- Teaching methods
- Assessment, feedback, incentives
- Class size

- Teaching and learning materials
- Physical infrastructure and facilities
- Human resources: teachers, principals, inspectors, supervisors, administrators
- School governance

Learner characteristics
- Aptitude
- Perseverance
- School readiness
- Prior knowledge
- Barriers to learning

Outcomes
- Literacy, numeracy and life skills
- Creative and emotional skills
- Values
- Social benefits

Context
- Economic and labour market conditions in the community
- Socio-cultural and religious factors
- (Aid strategies)
- Educational knowledge and support infrastructure
- Public resources available for education
- Competitiveness of the teaching profession on the labour market
- National governance and management strategies
- Philosophical standpoint of teacher and learner
- Peer effects
- Parental support
- Time available for schooling and homework
- National standards
- Public expectations
- Labour market demands
- Globalization

10.3 Appendix 3: Map of Malawi

10.4 Appendix 4: Letter of Consent

Request for participation in research project

"Quality and Relevance in Teaching and Learning about Climate Change Education in Teacher Training Colleges in Malawi"

Background and Purpose

The purpose of the project is to explore how the national strategy on climate change learning from 2013 is being implemented in Malawi, by investigating how climate change education is taught and perceived in teacher training colleges around the country. As the study will be comparative, the purpose is also to explore similarities and differences on the theme at private and public teacher training colleges.

The project is a master's thesis and will be written as a part of the Masters programme in Comparative and International Education at the Department of Education, Faculty of Educational Sciences at University of Oslo.

The sample has been selected based on the purpose of the study and will consist of teacher training students, teachers and school management personnel from private and public teacher training colleges across the country, former teacher students, as well as key informant involved in the creation of the national strategy on climate change learning.

What does participation in the project imply?

The interviews will require active participation and the duration will be approximately one hour per interview. During the interviews, audio recording and notes will be used to collect the data.

The questions will concern general background information, knowledge about climate change related issues, perception about the teacher training in this area, how climate change related issues are being taught, implementation of the national strategy on climate change learning and challenges in teaching about climate change.

What will happen to the information about you?

All personal data will be treated confidentially. Only the student and supervisor will have access to the personal data, and all lists of names will be stored separately from other data. In the publication, no names or personal information will be revealed a part from whether or not the respondent is belonging to a public or private institution.

All gathered personal data that is directly identifiable will be stored separately from the rest of the data. The project is scheduled for completion by May 2017. At this point, all personal data and recordings will be made anonymous. Participants will not be directly recognizable in the publication.

Voluntary participation

It is voluntary to participate in the project, and you can at any time choose to withdraw your consent without stating any reason. If you decide to withdraw, all your personal data will be made anonymous.

If you would like to participate or if you have any questions concerning the project, please contact:

Project Leader:

Johanna Eliasson +47 465 45 699 jkeliassson@gmail.com johankel@student.uv.uio.no

Supervisor:

Tove Kvil, Norad Tove.kvil@norad.no

The study has been notified to the Data Protection Official for Research, NSD - Norwegian Centre for Research Data.

Consent for participation in the study

I have received information about the project and am willing to participate

----

(Signed by participant, date)