UNIVERSITY OF CAPE COAST

ASSESSING STUDENTS' UNDERSTANDING OF, AND RESPONSES

TO, CLIMATE CHANGE IN GHANA: A STUDY AT THE UNIVERSITY

OF CAPE COAST.

BY

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Humanities and Legal Studies, Faculty of Social Sciences of the University of
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Philosophy degree in Development Studies

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DECLARATION

Candidate'sDeclaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented in the University or elsewhere.

Candidates' Signature ……………………… Date………………………

Name: …………………………………………………………………………

Supervisors'Declaration

We hereby declare that the preparation and presentation of this thesis was supervised in accordance with guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisors' Signature………………….. Date…………………

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Co-Supervisors'Signature………………………Date…………………..

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ABSTRACT

Climate change has become a contemporary environmental problem affecting human survival and development gains. It is expected that the human being whom the issue is affecting should understand and be ready to respond by engaging adaptive and mitigation measures. Tertiary students are expected to be instruments of change in this knowledge driven society. This study thus set out to assess the understanding of and responses to climate change by students at the University of Cape Coast in the Central Region of Ghana. A sample of 283 respondents was selected. Data were collected from this sample, analysed and presented with the aid of tables, percentages and chi-square tests of independence. The study found that the students generally do not understand basic concepts of climate change. It, however, established that most of the students have high perception that climate change is happening because of their experiences with certain environmental changes. They were found to have generally accepted and assimilated climate change and do not think the issue is a myth. However, the research realised that behavioural responses, which is very crucial to deal with the effects of climate change are lacking. They do not know the effective remedy to tackle climate change and that reflected also in their responses to actual action engagements. There is a gap between their perceptions, knowledge and action. In addition, the students are indifferent to the source of climate change information. Nonetheless, they expect scientists to do more of communication. The research recommends that stakeholders should intensify education by connecting scientific facts to people's experiences, perceptions, beliefs and values.

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DEDICATION

To the global community

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LIST OF ABBREVIATIONS

AGW	Anthropogenic Global Warming
CCMA	Cape Coast Metropolitan Assembly
IPCC	International Panel on Climate Change
JHS	Junior High School
MLGRDE	Ministry of Local Government, Rural Development and Environment
ODI	Official Development Initiative
SHS	Senior High School
SRT	Social Representation Theory
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

CHAPTER ONE

INTRODUCTION

Background of the study

Climate change has become an environmentally threatening phenomenon. An effective strategy which can help tackle the issue is the concern and action by the human beings who are noted to be the main cause and affected by the problem. Public actions can only be likely where the tendency to behave and response is made more vibrant. However, the presence of poor understanding of climate change poses much more difficulty in explaining and eliciting people's expected action and concern to the issue. This can weaken and annul efforts towards adaptation and mitigation.

The World Health Organization (WHO, 2003), has indicated that climate change has become a distinctive and signi cant addition to the range of environmental hazards encountered by humankind. The United Nations (UN, 2010) also observes that global pursuit for sustainable development is under serious threat because of the impact of climate change. There are increasing evidence that suggests that most places in the world will be transformed and lost through the impacts of a changing climate (Adger, Dessai, Marisa, Goulden, Hulme, Lorenzoni, Nelson, Naess,Wolf, Wreford, 2009). Urgent action is thus expected of mankind to tackle this danger (IPCC, 2014).

Climate change connotes a change in climate over a period of time, usually a decade or more due to nature and/or human activities (UNFCCC 2007, IPCC 2007). Most scientists such as Eboh (2009)**;** Anyadike (2009);

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Hönisch, Ridgwell, Schmidt, Thomas, Samantha, Gibbs,…,Williams(2012); Ashton (2002) and scientific research institutions (Pew Centreon Global Climate Change PCGCC (2009), National Oceanic and Atmospheric Association, NOAA(2007) etc. have also offered similar meaning.

There are a lot of research findings and predictions which supports the manifestation of climate change. For instance, the International Panel of Climate Change (IPCC, 2013) has revealed that global temperature has increased by about 2.0 Degree Celsius over the last 100 years; sea levels are rising and extreme events such as heat waves, heavy rainfall and shrinking Artic sea ice are all occurring. The panel has also predicted more gloomy times ahead as well. These findings and predictions have been acknowledged by most scientists (see Hönisch et al. 2012, National Research Council 2013, NOAA 2013).

The Anthropogenic Global Warming (AGW) and Human Induced theories of climate change all attributes climate change to human activities (Blasts 2010). Thus, demanding significant efforts from human beings on its related issues such as water stress, species extinction, low productivity, floods, food insecurity, diseases and many others (WHO 2003, IPCC 2014). The already existing non-climate change induced underdevelopment of Africa is increasingly being worsened by the impacts of climate change (UNFCCC 2007). Africa is highly susceptible to the impacts of climate change due to high poverty and dependency on rain-fed agriculture (Dixon, Smith & Guill (2013), illiteracy, weak institutions, limited infrastructure, limited technology and information, poor access to resources, low management capabilities, land degradation, overexploitation of natural resources, over-population and many others (UN 2010).

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The effects of climate change in Africa has manifested in the alarming rate of diseases (Guernier, Hochberg, & Guegan2004; WHO 2004), water scarcity and stress (Ashton 2002), hunger (Fischer 2002) conflicts and wars (Harrus & Baneth, 2005; Ashton, 2002), drought and flooding (Few, Ahern, Matthies, & Kovats 2004; Nicholls 2004; McMichael et al. 2008 and Christensen et al. 2007), migration (Adger et al 2009), and famine (Boko, Niang, Nyong, Vogel, Githeko, Medany, Osman-Elasha, Tabo & Yanda, 2007).

Global efforts to fight climate change can be traced few decades ago. In 1992, the United Nations Framework Convention for Climate Change (UNFCCC) was constituted to unify efforts of individual countries in order to have a global synergy towards fighting climate change (UNFCCC 2014). Regional commitments have manifested through financial, technical supports and many others. The UNFCCC, constituted in 1992, was to consider the strategies to tackle climate change. Treaties and other proceedings by the UNFCCC resulted in the adoption of the Kyoto Protocol in 1995 which legally binds member countries to emission reduction targets. The Protocol's first commitment begun in 2008 to 2012 and is expected to re-run through to 2020 which will mark the end of the second commitment (UNFCCC, 2014). These developments and many others clearly indicate that climate change has become a global concern.

Ghana is no exception to the incidence and threats of climate change. Historical climate data for the past few decades show a noticeable rise in temperature and accompanying variability in rainfall throughout the country. Mean annual temperature has been increasing and rainfall has been experiencing significant decreases over the past few decades (Government of Ghana,

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GoG,2011; McSweeney, New, & Lizcano. (n.d.), temperature is predicted to rise to an average of 2 Degree Celsius and rainfall is also predicted to decrease by more than 11 percent within the next few decades (GOG 2007). According to Minia (2008), and Dontwi &Buabeng (2008), these changes and their worse forms are expected to hit the country in the foreseeable future.

The impacts of climate change on the people and the economy of Ghana have already attracted a lot of concerns. Climate change is putting stress on natural resources (Dontwi et al 2008), river, stream systems and power generational problems (Gyau-Boakye 2001) and contributing to flooding (Brown and Crawford 2008). Other projected impacts include that on water and food insecurity, power supply problems (E-parl 2008, GoG 2007), flooding (Brown & Crawford 2008), migration (Geest &Jeu, 2008), intensifying poverty and health related problems (DANIDA 2008) and ultimately on reduced socio-economic growth and development.

Communication and education on climate change begun, and has been intensifying, since the 1980s when climate change first emerged on the public agenda. Communication serves as a means of increasing the cognitive capacity of the individual (Pruneau, Khattabi & Demers 2010), ensuring greater public understanding and engagement on climate policy and issues (Ockwell, Whitmarsh & O'neil, 2009; PCGCC 2009 and Leiserowitz, Maibach, Roser-Renouf & Smith, 2010a), tackling the current and potential effects of climate change (Frumkin & McMichael, 2008; Commonwealth Secretariat, 2009) and bridging the gap between science and society (Fischhoff, 2007).

The degree at which a nation can mitigate or adapt to climate change highly depends on public engagement (Moser 2008a, see alsoEkman & Amna

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2009). It has been observed that early climate change communication mechanisms were not effective because they focused on scientific findings reports (Weart 2003). Bak (2001)and Sturgis & Allum (2004) attribute this to the fact that communicators relied on the information deficit model which explains the lack of public engagement to insufficient information and understanding of the people. The model basically advocates for more information and explanation to people in order to elicit action.

Moscovi's (1984) Social Representation Theory (SRT) proposes that appreciating public understanding on climate change can be very important in the climate change communication and engagement mechanisms. Leiserowitz, Maibach &Roser, (2008), Shome & Max, (2009) and Moser (2010) support this claim by advocating for more research on public understanding. They add that such research would be more relevant when they are focused on understanding the experiences and perception of people. The absence of this will still elicit low public response (Exley and Christie, 2003)

Civic, youthful engagement and adaptation and mitigation issues cannot be discussed in isolation. Young people are likely to be engaged in social issues if the issues are relevant to their lived experiences (Brady, Dolan, Kearns, Kennan, McGrath, Shaw and Brennan, 2012). Brennan (2008) reveals that recognizing youth resiliency is a greater resource for community and national adaptive capacities and well-being. The World Bank (2002) adds that students play critical roles in supporting knowledge-driven economic growth strategies, national innovation system, and the construction of democratic, socially cohesive societies and serves as a country's main informed populace.

In the quest to achieve sustainable development, University students are identified as a nation's best hope and most effective resource (Weehen, 2000). They are potential change makers, policy implementers and effective tools for making strategic national decisions (Gellin 2003). It will thus be very prudent to uncover the disposition of University students on climate change issues in Ghana.

Problem statement

Public understanding, knowledge and research are noted as critical tools to tackle human-induced climate change (Moser 2010).Public resistance to changing relevant behaviours remains a key issue for research, especially given apparent increases in public awareness of the scientific arguments (Exley & Christie, 2003).

Public reactions and engagement to climate change remains noticeably incomplete in Ghana. Leiserowitz, Maibach & Roser, (2008) and Shome & Max, (2009) suggest that research should focus on understanding the views, attitudes and beliefs of the local people for effective communication (see also Crompton & Kasser, 2010). However according to Jaspal et al (2014), that is not the existing practice. There is little empirical evidence to support the efficacy of communication and public understanding of climate change (Pidgeon& Fischhoff 2011).

The few available researches have been largely focused on the western world and marginalised vulnerable African countries like Ghana (BBC 2009, Shahadu, 2012, Leiserowitz 2007).Though previous researches have indicated that he Ghanaian public do not understand climate change that cannot justify that for University students. University students are special groups with much

exposure to knowledge and information sources. In addition, earlier research in Ghana has not given emphasis to how people's understandings are translated to responses. It is in this regard that a research into the understanding of and responses to climate change of University students with emphasis on experiences and beliefs has become imperative.

Objectives of the study

The overall objective of the research is to assess students' perception and understanding of and responses to climate change at the University of Cape Coast. Specific objectives of the study are to:

1. Describe student's experiences and perception of climate change

2. Examine students' understanding and knowledge of Climate Change

3. Determine students' level of assimilation and acceptance of climate change as an environmental issue

4. Describe the students' responses to climate change messages, adaptation and mitigation issues

5. Establish how the students' disposition about climate change is constructed

Research questions

The research was guided by the following research questions.

1. What experiences, perceptions, beliefs, and values do University students have with climate change?

2. What are the levels of the students' understanding and knowledge on climate change?

3. To what extent have the students assimilated and accepted climate change as an environmental problem?

4. How are the students responding to demands for adaptation and mitigation and behaviour change?

5. How are the students' dispositions about climate change constructed?

Scope of the study

The study was limited to University students at the University of Cape Coast located within the Cape Coast metropolis in the Central Region of Ghana. The study acknowledged the pressing and the urgent need for contemporary Ghana and the world at large to find solutions to a serious environmental problem like climate change. The study was specifically interested in adaptation and mitigation action responses to climate change. It argues that perception and understanding of an issue does not necessarily guarantee action. Due to the objective of the research, the study was limited to the understanding and responses among students. Understanding and knowledge was measured in terms of comparison with internationally accepted definition whiles assimilation and responses were measured using their agreement to issues and practice of pro-climate change activities.

Significance of the study

The importance of this research cannot be underestimated. This research will contribute to existing but limited literature or knowledge on climate change particularly within the social science discipline. It will also help various stakeholders to understand and appreciate how the public, particularly, literate and intellectuals are responding to the issue. The findings from the study will

also help to develop better and strategic communicative tools to elicit expected responses. It will be a viable tool to make recommendations to University and Education authorities to consider effecting certain curricula and co-curricular modifications. It is anticipated that this study will improve adaptation and mitigation efforts and bring about sustainable living. Most importantly, the study will identify the level of responses of the students towards climate change that are important to policy and environmental sustainability.

Limitations of the study

The research acknowledges the fact that University students in Ghana are spread out in almost every region of the country, and that even within the University of Cape Coast, the courses and programmes are numerous and diverse, resource constraints and time did not allow all of them to be included in the study. Because the research was focused on gathering data on large respondents, bearing in mind the limitedness of time, data collection instruments was limited to questionnaire administration.

Organization of the study

The study has been arranged in five chapters. Chapter one gives an introduction to the whole thesis. The chapter comprises the background to the problem statement, the problem statement itself, the research objectives and the corresponding questions the research seeks to answer. The chapter also presents the scope, significant and the limitations of the study. Chapter two connects and reviews the various theories, concepts and empirical literature which are related to the study.

Chapter three describes the method adopted for the study. Sub-issues covered under the methodology chapter include the study design and a description of the study. Other issues also include the study population, target population, sampling procedure, sampling frame, sample size determination, data collection methods and instruments as well as data collection methods and ethical considerations.

Chapter four presents a discussion and analysis of the demography of the respondents, the perceptions of the students on climate change and understanding of the science of climate change. Other issues discussed under the chapter are students' acceptance and social representation of climate change as well as their action responses. The chapter ends with a summary of the research findings. Chapter five, the final chapter, presents the summary, conclusions, recommendations, contribution to knowledge and areas which can be considered for future research.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter reviews literature on the various issues, concepts and theories which are related to this research. It reviews concepts such as climate change, climate change communication, understanding and perception, environmental knowledge, public engagement and responses. The chapter also reviews the social representation theory and the Identity process theories which will be adopted for the research.

This chapter critically summaries the current knowledge in this research, identifies any strengths and weaknesses in previous work and eliminate potential weaknesses, whilst bringing to the fore the potential strengths to support this research. It provides the context within which this study is placed. The main purpose is to develop a framework within which the findings of the study can be examined.

Theoretical review

The main theoretical underpinning of this research is the theory of Social representation. The Identity Process theories will serve as a complementary theory to the social representation theory in order to help the researcher go through a thorough assessment of the research problem. The integration of the two theories and its application to climate change research has been highly

recommended by Jaspal, Nerlich & Cinnirella (2014). The theories and their relevance to the objectives of the research are discussed below

Social representation theory

Social representations theory (SRT) is a "theory of social knowledge"(Marková 2008:483).Itis a rational attempt to find answers to certain social questions pertaining to how the scientific community influences the transformation or stagnation of societal judgments; something which the mainstream cognitive psychologies did ineffectively. The SRT has no specific definition. In actual fact, Moscovici gives different, but similar, meanings to social representation as new events unfold.

Moscovici (1973: pxiii) explains social representation as "a system of values, ideas and practices which seeks to establish a social order to enable individuals orient and master themselves in their material and social world" and to enable effective communication to take place among them. Social representations are often to be established "in the minds of human beings and in the world, and as such examined separately" (Moscovici 1988, p214). People's perception and experiences in this case is represented by the "mind" whiles the "world" connotes scientific information.

SRT is mainly concerned with how individuals, groups, and communities collectively make sense of socially relevant or problematic issues(Marková 2008). The collective sense making, in the view of Hoijer (2011),results in common cognitions which produce social bonds that unite societies, organizations and groups. This, in the opinion of Jaspal et al (2014), can make easy coordination of ideas and actions andhelp to provide the group

concerned with a shared and accepted social reality and common consciousness about a given social object.

In a further attempt to validate social representation, Höijer (2010) and Moscovici (2001) compared it to one of the most accepted social cognitive theories; Durkheim's (1898) concept of collective representations, which denotes the common ways of conceiving, thinking and evaluating social reality. It is quite similar to social representations as indicated by Moscovici (2000) except that, in the views of Höijer (2010), the former seem extremely static particularly where explanations are expected of a dynamic society.This and other flaws of collective representations are tackled by social representation. The build-up these ideas and many others has made social representation become a major tool for studying the dynamics in societies.

Social representations are created at both the receivers' (individual and group) levels (Moloney 2007) and from major producers of societal information such as the media (Carvalho 2007). The media is widely noted as a major constructor of social representation due to its capacity of circulating and transforming knowledge (Carvalho 2007), the intermediary role it plays between scientific information and society and its ability to set agenda for meaning- making in society (Olausson 2011). Breakwell (2001) concludes that both the media and individuals and groups function interactively as co-constructors of social representations (see also; Smith & Joffe, 2013). It can therefore be said that the individual, society and the media constitute the agents of representations.

Relevance of social representation theory

The benefits of SRT to researchers, policy makers, communicators and society are very enormous. It is particularly very important for both research and information dissemination in society. As argued by Breakwell (1993), Bauer and Gaskell (1999), and Höijer (2010), the theory offers a better approach for studying how the media and citizens conceptualize societal issues in a changing society. Climate change is an example of such issues (Berglez, Olausson & Höijer 2009, Höijer 2010 and Olausson 2010).

Aside the research benefits, SRT also helps to compare and give meaning to people's actions or inactions and to objectify those actions as part of the general social sett-up. This is possible because according to Moscovici (1988: 214), representations are often "in the world", and as such can be examined separately. This describes some kind of liberation of individuals from traditional binding social structures such as family, social class, and religion, which in the views of Beck & Beck-Gernsheim (2001); Giddens (1991) earlier guided thinking and behaviour. Hoijer (2011) also affirms this by identifying SRT as one which avoids social determinism and encourages transformation. .

SRT helps to explain how social issue are interpreted and accepted or rejected in society. It has been used exclusively in environmental concerns (Castro, 2006) and its application in the studies of climate change in particular is proving very potent (Olausson (2010) and Jaspal et al (2014).

Application of social representations to climate change

Climate change is generally an obscure, invisible and abstract object that makes it difficult for people to fully understand (O'Neill & Hulme 2009). As a result, most studies of climate change especially in the social

sciences, are concerned with how the issue is represented in society and people's reactions towards it (Jaspal et al 2014). This concern is fundamentally addressed by the social representation theory.

Moscovici (1988) postulates that the theory deals with how information circulates in society (e.g. in the media, in school textbooks and literature) and in the minds of people.Jaspal et al (2014) opines that SRT provides a framework for exploring how scientific issues such as climate change transits and diffuses into society, become connected and meaningful to people. It also helps to assess sources of societal information and communication mechanisms (Olausson, 2011, and Smith & Joffe 2013).Thus, SRT offers a very decent framework for the assessment of peoples' understanding of an obscure, scientifically based environmental phenomenon like climate change, how these understanding are constructed and the extent at which communication can influence these cognitive constructs in society.

Ways of representing climate change through social representation

The SRT has been flawed for being inconsistent, illogical and incoherent (Höijer 2011). However, Moscovici's (1988) distinction of representations offers good bases to negate Hoijer's criticism. Moscovici postulates three types of social representation: hegemonic, emancipated, and polemic. A representation is said to be hegemonic when it is generally acknowledged and by all members of a group or society. This implies that group character is preferred to individual distinctiveness. The general notion of the western world's industrialization-induced changing climate is a typical example of a hegemonic representation within the global scientific community.

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An emancipated representation, in the views of Jaspal et al (2014), is developed by subsets within a larger social setup as a result of distinctive knowledge and knowledge within the subgroups. It is a representation of uniquely constructed information about a sub-group which is yet to be equated to the representation shared by the whole groupMoscovici (2000). An emancipated representation may therefore have a different, but not necessarily divergent, meaning to the same notion when compared to the hegemonic level.

Similar to the emancipated representation, polemic representation is generated by a small group in a situation where there is disagreement between the subgroup and whole society(McCright, 2007).Polemic representations represent rivalry and incongruities between groups. The existence of a rivalry between the majority of climate scientists, who argue that climate change is dangerous and largely human induced, and climate change critics, who challenge the legitimacy of this hegemonic representation, in the views of Jaspal et al, (2013) represents polemic representation.

Judging from the three distinctions discussed above, it can be deduced that hegemonic, emancipated, and polemic representations all have unique possibilities of affecting the climate change agenda differently. For instance, whiles Breakwell (2001) asserts that hegemonic representations are more likely to shape attitudes; McCright (2007) argues that polemic representations are perceived as marginal to normal thinking and sometimes not taken serious. However,Boykoff & Boykoff (2004) condemn this situation. They believe sub-groups can advance their polemic or

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emancipated representations of climate change to hegemonic status to promote their personal/collective goals.Bostrom & Lashof (2007)have further advanced that polemic representation has infiltrated public understanding due to contestations of hegemonic representation in public, media and political discourses through conflicting ideas at the polemic level regarding the reality and attribution of the issue (see also; McCright2007).

Hulme (2009) maintains thatthese arguments affirm the notion that climate change is represented at all levels of social representation; not at any special level. The hegemonic social representation of anthropogenic climate is the ideal for every society concerned with climate change. It makes mitigation and adaptation mechanisms easier to implement. Emancipated and polemic representations place extra responsibility for stakeholders especially in the areas of communication, behaviour and practices.

Social representations have some peculiar weaknesses as already indicated by Höijer (2011). Vorlklein & Howarth (2005) for instance have questioned the absence of power relations in the theory whiles Potter and Edwards (2000) also expresses that the theory refuses to address people or groups' practices and activities when producing social representations. Their criticism is based on the view that cognition and action are oppositional but that social representations theorists see no such dichotomy. Vorlklein &Howarth (2005) add that the application of SRT in research renders it incomplete; it does not explain how people's perception and understanding are translated into behaviour. According to Potter and Edwards (2000) this situation makes it difficult to explain people's responses to the issue after it has been presented in society.

Dunwoody (2007)has confirmed that social representations of climate change alone cannot guarantee action probably due to certain socio-psychological which may compel individuals to either accept or reject the issue being represented.Breakwell (2010) suggest the need to assess the role of identity processes which, in his view, have more prospects to reconcile social representation and actions. Thus the gaps exposed in the SRT will be addressed by employing the Identity Process Theory to explain the issuesare not well captured by the SRT.

Identity process theory

The essence of incorporating the identity process theory is to explain how representations of perceptions and knowledge are translated into action. The Identity Process Theory (IPT) identifies existing as well as possible impediments which might psychosocially obstruct a person into moving into action or otherwise. Leiserowitz (2007) and Leiserowitz, Maibach, Roser-Renouf &Hmielowski (2010b) argue that groups who share particular risk representations, values, and socio-demographic characteristics might respond to climate change representations in similar ways. However, according to Jaspal et al (2014), this may work only at the community level but may overlook the active role of identity in explaining human or the individuals' responses to climate change.

Agyeman, Doppelt, Lynn & Hatic (2007) explain that the establishment of a total identity depends on both the individual and society.Jaspal & Breakwell (2014) further explain that social memberships, interpersonal relations, social representations and individual behaviourshould all be synchronized to ensure complete identity. Breakwell

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(1993)asserts that social group identity is very influential in shaping individual identity. Climate scientists might conceivably be said to constitute an influential group **(**McGarity &Wagner, 2008**)**, whiles the opposite may be true of ordinary people (Jaspal et al 2014**)**. This may be as a result of group power. Markova (2003) however, does not agree completely; Markova believes that individual identity is constructed through interactions between media, layperson discourse and human perception. In essence, the lay person may not be regarded as powerless as being suggested.

Ordinary people can be powerful because they can opt to disagree or invalidate the propositions of the so-called powerful groups in many ways such as capitalising on the uncertainties of climate science (Dryzek, Norgaard, & Schlosberg 2011), rationally and intentionally rejecting climate scientists(McCright 2007) giving negative attributions to scientists (Nerlich 2010) or tagging scientists negatively (Jaspal et al., 2013). According to McCright (2007), a deliberate attempt to undermine climate scientists has ever happened in the United States of America.

Making social representations relevant at the individuallevels

Prislin & Ouellette (1996) argue that irrespective of the level of communication, circulation of a social issue or the level of understanding or awareness of an issue, the individual has to embed it absolutely. This will ensure potency and assurance in constructing behaviour and attitudes.Breakwell (1993, 2001) suggests that an individual's relationship with a social representation can follow sequentially from awareness to understanding, acceptance and assimilation and finally salience. Breakwell established a sequential linkage between these concepts.

Though awareness is very important in the discussions of personalization of social issues, Deaux & Snyder (2012), suggest that it has less contribution to changing behaviour. This assertion is empirically in line with Moser & Dilling (2007) findings. They concluded that awareness can rather be upgraded to bring understanding to an appreciable level. This assertion is in agreement with the information deficit model which argues for more information dissemination in order to enhance understanding and in turn lead to a prioritization of the issue concerned

After understanding, the individual ought to accept the issue. According to Breakwell (2001), Leiserowitz (2005) and Nerlich's (2010), people can exhibit awareness and understanding of a given social representation, while accepting an alternative and sometimes contradictory representation. This situation has also been observed by Jaspal et al. (2014). McCright (2007) however explains that these actions do not necessarily annul the reality of climate change but rather poses problems when inducing expected human action.

Similar problems can also arise when the individual is expected to assimilate the issue. According to Breakwell (2001), an assimilated representation is one which incorporates previous ideas with cognitive and emotional processes. According to Poortinga, Spence, Whitmarsh, Capstick, and Pidgeon (2011)attitudes and values are examples of such processes which cause people to behave otherwise even after accepting the representation. This connects to Breakwell's (1986) argument that a social representation must not only be accepted but also be assimilated.

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Breakwell (2001) suggests that the acquisition of salience can only be fruitful if its significance to people's already developed behaviour and thoughts are established. This is necessary because, in the opinion of Jaspal et al (2014), even if the same issue is circulated among different people, different responses might be accorded to it. In response, Whitmarsh (2008) suggests the issue, such as climate change, should be attached to phenomena which have personal relevance. Examples of such experiences are flooding, harsh weather conditions, disappointment in rainfalls and disasters. A thorough consideration of the development of a positive salience ought to be done in order to increase people's motivation to take realistic action to adapt or mitigate climate change as Breakwell (2010) and Jaspal et al (2014) suggested.

The role of personal identity formation and behavioural responses

According to Devine-Wright (2004),the information deficit theory suggests that insufficient information explains the reasons why public engagement with climate change is inadequate. However, empirical research demonstrates quite a misleading proposition especially in risk representations (see;Steg, 2008). These studies converge in showing that where behaviour is perceived as important to self-esteem and other principles, it is likely to persist, despite awareness of risks. Thus, in addition to considering risk representations, Jaspal et al (2014) suggest that an assessment of the connection between identity threat and action can be more effective in predicting the adoption or avoidance of pro-environmental behaviours.

Given the demands of anthropological climate change and its related necessary behaviour change issues, Hulme (2009) and MacCright, (2007) argue

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that possible deflective strategies, such as denial. Castell (2010) gives a similar opinion by indicating that the individualmay employ reinterpretation or redefinition of social realities in order to protect identity. When this happens, the supposed threat is no more seen as threat and may not help in eliciting necessary behaviour responses (Breakwell 1986). Aside misinterpreting threats, Breakwell (1986, p. 95) posits that individuals accept both the theory and action expectation of human-induced climate change but will still disassociate themselves from it through their own behaviour; an issue as the "compartmentalism" or "deflection strategy". In this instance, the individual will exhibit a great of unpreparedness to act towards it probably by expecting that other people do what both theory and practice expects.

In conclusion, this research is arguing that the individual, at his/ her own level, may cope with the threats of climate change by either not acting or caring about it, denying its existence, giving the problem a different interpretation or refusing to accept the problem as being caused by him/her.

Meaning of climate change

Quite a number but similar definitions have been given to explain climate change by diverse institutions and individuals. The United States of America's NOAA (2007) defines climate change as a long-term shift in the statistics of the weather (including its averages). Within the purview of the IPCC (2014), climate change refers to a change in the state of the climate that can be identified by long term changes (usually a decade or more) in the mean and/or the variability of its properties. The UNFCCC (2014) gives a similar definition but in addition, attributes climate change as either directly or indirectly to human activity. A simple analysis of the various definitions explains climate

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change as change in climatic conditions within a longer time frame as a result of human activities and or natural variations.

Numerous occurrences have been used to represent the manifestations of climate change. The IPCC (2013) mentions events such as rising atmospheric temperature and atmospheric water vapour, changes in rainfall patterns, melting of glaciers, ocean and land ice, and general rise in sea levels as some occurrences of climate change. These changes have also been observed by a number of scientific researchers but they however, divert at the point where the causes of the problem are discussed.

Climate change attribution and theories

Blast (2010), indicates that seven existing theories explain the existence or non-existence of climate change. These theories, according to Blast, are the bio-thermostats, cloud formation and Albedo, Anthropogenic Global Warming (AGW) or carbon dioxide theory and human forcing, planetary motion and solar variability. The bio-thermostats theory and albedo theories, as explained by Gray (2000), Idso, Carton and Singer (2009), Lindzen and Choi(2010) implies no change in climatic conditions. Bio-thermostats theory compels adherents to disagree with assertions of a changing climate. However, the planetary motion and Solar variability theories clearly endorses climate change but traces it to natures' causation (Scafetta, 2010); It accentuates the natural causality of the phenomenon

An assessment of the remaining theories rather suggests a high connection between human activities and climate change. The theories are based on two main notions; (1) climate change is occurring and (2) it is caused by human beings. These theories are the Anthropogenic Global Warming (AGW)

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or Carbon dioxide theory and the Human Forcing Theory (HFT). These theories contend that human beings are emitting unprecedented amounts of green- house gases (such as carbon dioxide, methane, and nitrous oxide).As Pielke (2009) puts it, human beings are changing the earth's surface through clearing of forests, irrigating deserts, infrastructural developments and building cities. Major proponent of these theories are the IPCC (2007, 2013, 2014), Pielke (2005), WHO (2003); Christensen et al (2007) and National Research Council (2010). Notwithstanding, some researchers are found in the midstream; they argue that climate change is as a result of both natural and human activities (see Min et al 2011, Stott et al 2010, UNFCCC 2014). It must however be said that recent discussions have increasingly accentuated human-induced climate change.

The repercussions of climate change on human survival have been the major concern of stakeholders. It is asserted that if these climate destructive human activities are taken care of, the whole cycle of climate change will reduce to at least "the natural level" conducive for human survival. In this regard, issues such as communication and understanding, human adaptation, mitigation, investment and governance would have been at the heart of both local and global responses to climate change.

Climate change communication and environmental behaviour

Discussions and research on knowledge, attitude and behaviour has been of keen interest for the past few decades (Ifegbesan, 2009). Many studies have often found a positive and significant relationship between attitudes and behaviour. Several studies hasrevealed that levels of knowledge and attitudes toward nature conservation showed a positive relationship. The relationship is a

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basis to argue for the need to increase knowledge in other to shape attitude and behaviour as postulated by the information deficit theory, and hence, increase information and communication.

Climate change communication is inevitable as far as the fight against climate remains an objective. Communication is a means of increasing the cognitions capacity of the individual (Pruneau, Khattabi & Demers, 2010), fostering behaviour changes in relation to environmental practices (Leiserowitz, Maibach, Roser-Renouf & Smith, 2010a) ensuring greater public engagement on climate policy (Ockwell, Whitmarsh & O'neil,2009; Pew Center,2009), bridging the gap between science and society (Fischhoff, 2007) and ultimately tackling the current and potential effects of climate change (Frumkin & McMichael 2008; Commonwealth Secretariat 2009). These are, arguably, the greatest benefits needed to overcome adaptation and mitigation obstacles. It is not out of place then, for Moser (2010) to argue for more research on such issues on climate change communication bearing in mind its role in tackling anthropogenic climate change

However, the effectiveness of climate change communications has been an issue of contention in earlier and recent discussions. Weart (2003) observes that early communication of climate change focused intently on scientific findings, synthesis reports and sometimes high-powered conferences or policy meetings. Apart from these problems with audience and contents, Bak (2001); Sturgis & Allum (2004) are of the view that communication mechanism was so reliant on the information deficit theory and, attributed the insufficient public concerns to ignorance and emphasized information dissemination as a panacea for public action. Leiserowitz (2007) asserts that at least communication on

climate change has been, to a larger extent, successful. Leiserowitz, explains that as many as people who have heard of climate change before can identify at least some climate change impacts but adds that seeing people into action is still unnoticeable. In a clarification,

Moser (2008) argues that the poor public understanding clearly manifests itself in the unpredictability of public action. The media has been largely criticized for this gloomy picture. The media is noted to overemphasize the climate debate, downplays consensus, gives equal weight to opinions (see Corbett & Durfee, 2004; Moser, 2010; Carvalho,2007; Weingart, Engels, & Pansegrau, 2000; Boykof, 2007; Dirikx & Gelders,2008; Nisbet, 2009). Bak (2001); Sturgis & Allum (2004), Grothmann & Patt (2005) and Boko et al (2007), aside campaigning against the information deficit model, have attributed the impotency of communication to the negligence of cognitive capacity. They doubt the proficiency of information based communication as the medium of improving adaptive capacity. Considering the above arguments, it is imperative to consider current developments, expectations and needs in the climate change communication agenda.

The role of climate change communication and cognitive development

Communication on climate change has been noted as only a part of the picture for responding to climate change; raising awareness and discussing an issue does not necessarily result in behaviour change or policy action. For communication to be effective, Moser & Dilling (2007), Dilling & Farhar (2007) and Ockwell et al. (2009) suggest the need for policy support, economic and infrastructure changes that will give room for people's concerns and adaptive behaviours to be realized. Furthermore, according to Leiserowitz,

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Maibach, &Roser-Renouf (2010a); Shome & Marx (2009), people's understanding, values, beliefs and perception are very key in the climate change communication, adaptation and mitigation process. Equally important is curriculum designs.

Moser & Dilling (2007) summarize the whole adaptation and mitigation approach by intimating the need to complement communication with efforts to increase the urge to act and lowering barriers to actions. Though people's cognition and awareness remain a critical factor the role of science in shaping peoples' understanding cannot be neglected.

Scientific knowledge, adaptation and mitigation efforts

Climate science is a strong pillar in global climate change issues. Indeed Weart (2003) asserts that the mechanism for climate change adaptation in itself begun with the discoveries and communication of the science of climate change. According to Crona, (2006), Salick & Byg, (2007) and Finucane, (2009) people's perception alone cannot assure full understanding of climate change; scienti c information is equally important.Climate change issues need technical and more scientific models to convey accurate information about events for people to accept and respond. The UNEP (2014) acknowledges that science and knowledge enables society to understand and respond to threats posed by climate change and entreats decision makers to seek sound, well-grounded scientific information on climate. Scientific information is needed to enhance understanding and adaptation.

However, Kollmuss & Agyeman (2002) have recognized that people face quite a number of obstacles when encountering and processing scientific climate change information (see also Lorenzoni, Nicholson-Cole, & Whitmarsh

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(2007); Ockwell, Whitmarsh, and O'Neill &Nicholson-Cole (2009). Kirchhoff et al (2013) notes that sometimes some scientific knowledge are in their own structure, not suitable and easy to practice. However, this explanation does not necessarily vindicate people's inability to take action.

Climate change adaption issues have some similar features that make the interaction between science and practice very challenging. These features, according to Gardner, Dowd, Masson& Ashworth (2009), includes the presence of misinformation and scepticism, distinctive to react, inconsistencies in planning and decision making, peoples' values, beliefs and many other factors. The challenges results in unsatisfactory acceptance by the very people who scientific climate change is affecting and being communicated to. Thus scientific knowledge, if it will make any impacts, ought to consider social knowledge. Complementing science and society thus becomes the best possible alternative.

Spaapen & Van Drooge (2011) note that effecting a social change may involve human well-beings and social relations between people, community, organizations and experts. In the understandings of Young et al (2013) and Oversee Development Institute (2006), climate change adaptation and behaviour has to pass two test; that of a reliability of scientific knowledge and social relevance and more precisely, a productive science-public connection. This connection is equally important for climate change communicators, the scientific community and society as a whole in bridging the gap between them (Fischhoff, 2007). The complementary role of scientific knowledge on one hand, and peoples' experiences, perceptions, feelings, values and beliefs on the other hand is thus essential in ensuring a more comprehensive and complete

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understanding and acceptance of climate change and subsequently to a more effective adaptation and mitigation purposes.

Perception, understanding and responses to climate change

Psychologists have been researching and theorizing on how people and societies' perceive and respond to natural and human-made risks for a long period (Hacking, 2003). Slovic (1987) notes that sometimes public perception of such risks contrasted sharply with objective risk assessments made by experts. According to Slovic (1987) risk perception grew out of an imperative to better understand how people evaluate risk-informing communication strategy and predicting societal responses to risks. Similarly, Hanson-Easey, Bi, Hansen, Williams, Nitschke, Saniotis, Zhang& Hodgetts, (2013), argue that when there is limited or missing empirical information on a risk, people generally make biased and random estimations of risk and thereby employ cognitive heuristics to make misguided judgments.

The perception of the reality and the causes of climate change as a risk domain are closely related concepts(Hanson-Easey et al 2013). In psychological senses, attributing something through reasoning is generally accepted as a central component in analysing how people explain events and interpersonal phenomena (e.g., Kelly, 1955; Heider, 1958; Weiner, 1979, Hewstone,1989). Hewstone (1989); Hanson-Easey & Augoustinos (2010) affirm this by positing that knowledge about causes is not sufficient in making sense of phenomena but, in their judgment, can serve to justify and or excuse social action

Reser, Bradley, Glendon& Ellul (2012) argue that climate change is framed in public and scientific discourses in terms of the causal role of human activities. This line of discourse, in the view of Bostrom et al (2012), is very

potent because they are highly capable of influencing individuals' acceptance of various climate change and adaptation issues. Notwithstanding, the convergent of literature and theories on public understanding and perception of climate change has been noted to be very diverse. Due to this diversity, Reser and Swim (2011), for instance, attempt to synthesize countless psychological, environmental, and social factors mediating human responses to climate change. In a similar attempt, Rogers (1983) advances an integrative predictive framework which constitutes experiences, responses appraisals and cultural meaning systems. Rogers (1983, p.280) states that these factors "influence each other as well as the intra-individual behavioural and community responses".

Aside perception and experiences, another equally important element in the adaptation process are emotions and affect. As Leiserowitz (2005); Slovic, (2010); Sundblad, Biel& Garling, (2009); Weber (2010) note, the roles of emotion and affect, are recognized as important mediator of risk perceptions. Hanson-Easey et al (2013) indicate that how one feels about something can have significant effects on rational judgments, (see also Peters & Slovic 1996, O'Connor, Bord & Fisher 1999, Leviston & Walker 2011, & Reser et al. 2012)

However, Fiske (1982) argued that some issues are characterized by negative affective components which can be very important when brought out clearly. Fiske demonstrates that when people are confronted with images of nuclear waste, or concepts of a harmful disease (such as the Ebola virus, for example), they assimilate these notions to existing knowledge, and evaluate it on the basis of the affect linked to the schema. Zajonc (1980) concludes that some risk domains can be characterized and perceived by their affective qualities,

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which signal more emotional processes than influence reasonable mental deductions.

According to Epstein (1994), there are two distinct, but interactive information processing systems: the rational system and the emotionally driven experiential system. The rational system, in the view of Epstein, characterizes conscious, logical and analytical processes that are inherent whiles the later connotes a process that determines the painfulness or otherwise of a stimulus. Taking these insights on affect and its influence on risk perception, exploring how responses to environmental risk are also influenced by affect are still potent areas to explore. In all these arguments, the ultimate expectation is to see that people are responding positively to climate change.

In democratic societies individuals and groups are expected to support and shape policies. They must engage society by practically adopting into their daily lives the changes, policies, technologies, and shifting consumer and behaviour choices as expected. According to Moser (2009), there is clear evidence to suggest that the future world is unavoidably dependent on the degree to which the public is engaged on the issue of climate change. This view has been largely expressed by Halpern and Bates (2004). It is noted as the most prominent concern in the global fight against climate change**.** However, the challenge before stakeholders today, regarding the battle for climate change, in the opinion of Moser (2009) is not only to formulate efficient and effective policy but how to engage the public.

There are dimensions through which responses are discussed. Within the area of climate change, Lorenzoni, Nicholson-Cole & Whitmarsh (2007) identify three dimensions; cognitive or mental, affective or emotional response

dimension and behavioural or practical action response. (See also Maibach et al 2008; Ockwell, Whitmarsh&O'Neill 2009). It has been largely observed that none of these components can function effectively without the complementary functioning of the other. An effective public engagement, in this regard demands that obstacles against the three dimensions postulated by Lowenzoni et al (2007) be overcome.

Cognition has become an important tool for climate change adaptation and mitigation (Adger, Dessai, Marisa, Goulden, Hulme, Lorenzoni, Nelson, Naess, Wolf, Wreford, 2009). The politics of public understanding and engagement, information and knowledge, as Moser (2009) acknowledges, has become resources that can, not only empower and enable, challenge and obligate people to respond but also disempower and discourage individuals. In Moser's (2009) view, people struggle to understand climate change, its causes, and relevance to their personal and family lives, community, economic, environmental, and social contexts. Kollmuss & Agyeman (2002); Lorenzoni, Nicholson-Cole and Whitmarsh (2007) and Ockwell, Whitmarsh & O'Neill (2009), add that these struggles are mostly manifested in poor people's encounter with the issue.

Citing reasons to clarify Moser and Kollmuss et al's assertions, Immerwahr (1999) and O'Neill and Nicholson- Cole (2009) reveal that impediments such as emotional responses, denial, numbing, feeling exempt from the threat, blaming others, thinking wishfully or rationalizing that the problem will be resolved by experts, displacement of attention, apathy, fatalism, or other forms of psycho-cognitive capitulation exist. These responses have the

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potential of demotivating or undermining people's commitment to positively engage in climate change.

The forgone review clearly indicates that the mere delivery of information to people, irrespective of how important it is, the intelligence level of audience or even the medium of communication, will not necessarily guarantee expected action responses especially when affective and behavioural dimensions are disregarded in the knowledge delivery. This proposition becomes more dangerous with an invisible, conflicting environmental issue such as climate change; they must be looked at critically.

Empirical review

The issue of climate change has become very contentious particularly with regards to its reality and public engagement. There have been quite a number of researches which have been conducted in the area of the social sciences with regard to the assessment of how people understand and react to the issue but most of them have been conducted in the western world (Brechen 2003; Leiserowitz 2007; BBC 2009; Shahadu 2012).

Fortner, Lee, Corney, Romanello, Bonnell, Luthy, Figuerido & Ntsiko, (2010) examined media portrayals of global warming and the certainty with which information was reported. The study, conducted through a telephone survey, assessed public knowledge about key issues in global climate change, their conviction of the information, trust in the media and willingness to take action. The research found that media reports were scarce. The respondents, about 139 with average ages between 36 and 45 and a minimum of high school education, reported more trust in their media sources of information. The respondents had a fair knowledge and certainty about global warming information and appeared to be willing to adopt a range of responsible behaviours seen to be useful in countering global warming.

Bostrom (2001) reports, in a national survey of American adults in 1995. The results, though somehow dated, suggest that there have been at least three understandings of the causes of climate change. It reported that 42 per cent of respondents attributed climate change to both "natural" processes and human activities, 18 per cent attributed it solely to nature, and the remaining 40 per cent believed that human behaviour was the major cause of climate change.

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Bulkeley (2000), in assessing the people of Newcastle's (Australia) understanding of climate change concluded that public understanding of climate change not only involves knowledge about the physics of it, but other issues which are concerned with the society nature relationship. Based on the findings, Bulkeley contested the arguments raised in the information deficit model which recognises ignorance as a barrier to effective public involvement in the policy process. Bulkeley (2000) indicated that public understanding of global environmental issues such as climate change drew not only on scientific information, but also on local knowledge, values, and moral responsibilities. In the findings, the respondents connected the climate change to their communities, and suggested that individual action is morally sanctioned, despite concerns for the efficacy of such action and the lack of government or industry support. The research also found out that where institutional realignment occurred to provide renewable energy to householders, public involvement has been forthcoming. The findings suggested that the provision of information though important, policy attention should be directed to the social and institutional barriers that act to constrain public involvement in addressing global environmental issues.

A purely qualitative study by the BBC (2009) World Service in ten African countries including Ghana revealed that about 50 per cent of the respondents had heard or read either nothing at all or not very much about climate change. The service, among other things, discovered that climate change is deeply misunderstood and somehow confused with global warming. It also indicated that Africans have the tendency to hold themselves responsible for climate change rather than global industrial practices. In a similar cross-national study of public opinion on climate change, Brechen (2003) notes that there is

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generally broad perception of global warming as it being a serious problem with the exception of Nigeria which was the only African country included in the study. This view has been shared by Leserowitz (2007) who observes that a very wide disparity between general awareness of global warming in developed countries as compared to those in the developing countries. Though this disparity is noted to exist, Brechen (2003) expects a much more increased consensus today.

Comparing the expectations of Brechen (2003) to recent researches in Africa potrays a gloomy picture. For example, research carried out with 3,164 South Africans in 2008 revealed that more than a quarter (28%) of respondents had not heard about climate change, and that very few (less than 25%) knew either "a lot" or "a fair amount" about the subject (Seager 2008). Similarly, a 2008 Gallup poll showed that 63 per cent of South Africans had either never heard of climate change or global warming, or they said they didn't know or refused to answer.

From students' perspective, Owolabi, Gyimah& Amponsah (2012) explored the awareness pupils in Junior High Schools in the Central Region of Ghana have on climate change and sustainable development. The study was purely based on the curriculum's content analysis. This study found out that general awareness of students understanding of climate change and sustainable development is low. However, the study observed a difference between awareness of students in rural areas against those in the urban areas. The study also revealed that the Integrated Science syllabus at the JHS level contained more information on climate change than that of Social Studies.

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A critical assessment of the above researches clearly indicates that climate change is an issue which people have not really come to grasp even in the western world. The situation is much worse in developing countries and Africa due to issues such as illiteracy and poverty. It is a general observation that most of the researches conducted are skewed towards a qualitative approach, with very few doing a more quantitative research. Some were also mere media (telephone) type of research. In addition, most of the findings lack complete review of related literature because they are mostly minor researches in publications and not complete thesis. In Ghana, limited empirical research has been conducted to assess university students' understanding of climate change.

Conceptual Framework
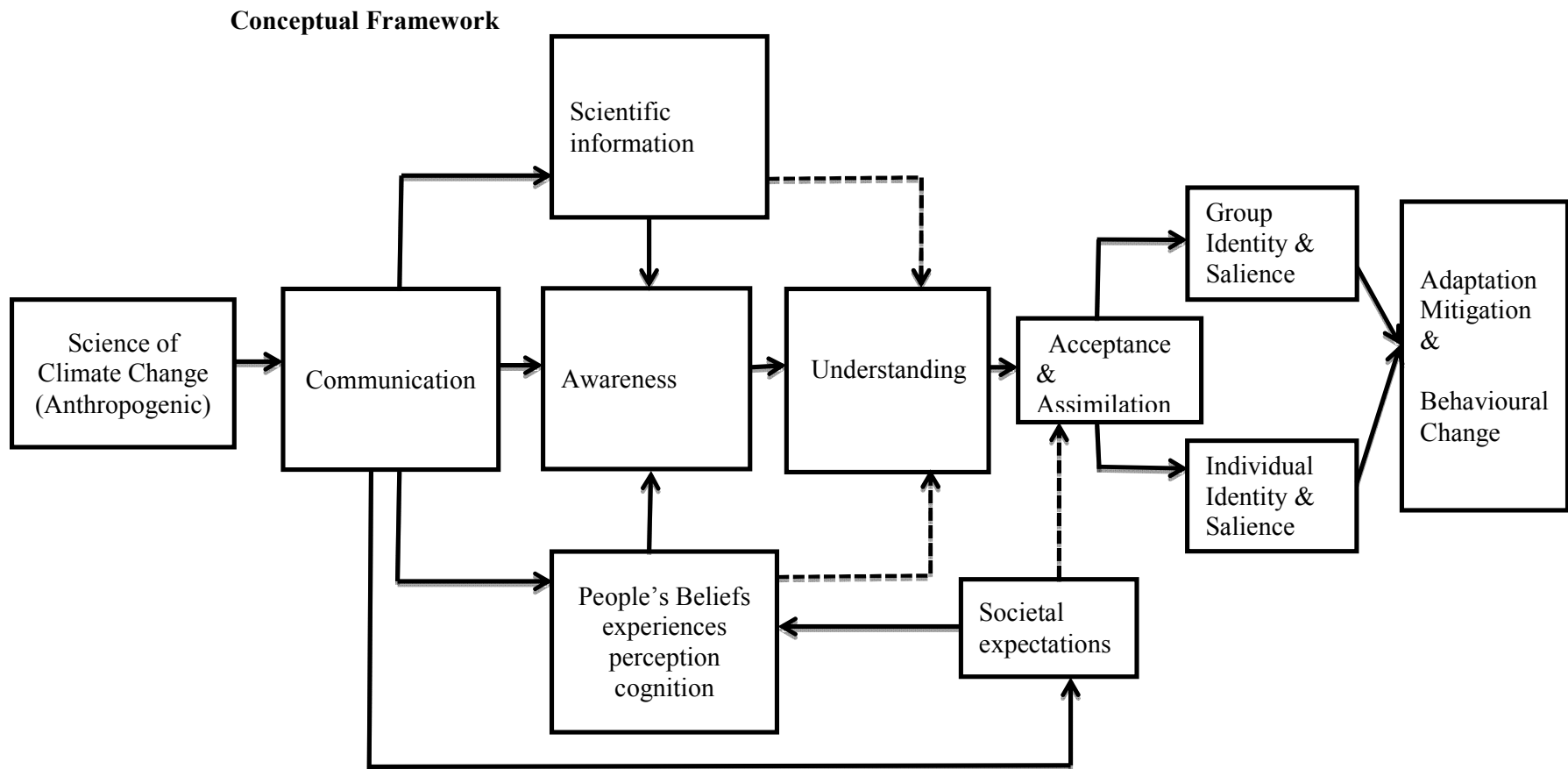
Figure 1: A framework showing the flow of scientific information of climate change to adaptation and mitigation behaviour

Source: Adapted from Bandura (1986)

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The conceptual framework for the study was adapted from Albert Bandura's (1986) Social Cogitative Theory (SCT). This theory is rooted in the role of environment in shaping the cognitive development of the individual to effect behaviour. Bandura's Social Cognitive Theory proposes that people are driven not only by inner forces, but by external factors. The model suggests that human functioning can be explained by a triadic interaction of behaviour, personal and environmental factors. Environmental factors represent situational influences and environment in which behaviour is preformed while personal factors include instincts, drives, traits, and other individual motivational forces.

Several constructs underlie the process of human learning and behaviour change (Bandura 1986). These variables which include self-efficacy,outcome expectations,self-control, and reinforcements, according to Webb, Sniehotta, and Michie (2010)may also intervene in the process of behaviours change. Bandura's social cognitive theory is limited in explaining individual behaviour within societal context. However, the influential roles of self-efficacy, outcome expectations, self-control and reinforcement (as indicated in SCT) on behaviour has been explained extensively indirectly through the integrative models of social representation and the identity process theories. In the context of this research, the external environment is adequately represented by the availability and the circulation of anthropogenic scientific information of climate change and communication. Furthermore determining the behaviour of the individual within the environment is also a societal expectation.

However these external influences do not necessarily shape behaviour. This research argues that these "external" influences can be very vital in shaping people behaviours if and only if, personal experiences, values, norms,

perceptions, and attitudes towards climate change are in agreement. This cohesion rather provides a better explanation and prediction of action/behaviour and subsequently affects the necessary policy and communication mechanisms to employ.

The framework suggests that people's personal experiences, values, norms, perceptions, and attitudes should simultaneously be considered in the communication of the science of climate change. More precisely, external information and representation must be complemented and integrated with the internal variables. Furthermore, essential motivation and positive outcomes or expectations must be adequately communicated to effect psychological dispositions of the people and expected behaviour thereof. Doing all these ensure that communication is streamlined to suit the needs, the expectations and alters the cognitive set up of these individuals in society at a higher level. They ensure better understanding, assimilationand acceptance of the issue.

Moreover, this research argues that acceptance does not necessarily lead to behavioural changes unless the issue is adequately constructed as societal problem for which concerted efforts are needed to effect a change. This is where the role of identity comes in; the identity component suggests that communication ought to construct the problem as a "societal problem" which ought to be tackled effectively by the individual. This will ensure that the individual is identified, connected and is placed in a position where adaptation/mitigation action can be activated. To conclude, this research is arguing that if knowledge of the students' perception, understanding, experiences, values and their corresponding responses to climate change are diagnosed efficiently, it will not be difficult to appreciate the reason(s) behind

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people's actions or inactions. This will help to devise effective communication mechanisms and elicit appropriate response actions to with respect climate change mitigation and adaptation.

CHAPTER THREE

METHODOLOGY

Introduction

The chapter discusses the research design, approach, and method of sampling and the procedure for collecting primary data. The chapter also presents an overview of the study area, as well as the study design adopted for the study. Other issues contained in the chapter are the discussions of the target population, the determination of the sample size and thesampling process. Research instruments for data collection, pre-testing of the instruments; data collection procedure, data analysis tools and ethical issues pertaining to the research are all discussed in this chapter.

Study area

The University of Cape Coast (UCC) is the area where the study was conducted. The University is located about five kilometres west of the central regional capital, Cape Coast, in southern Ghana. It is one of the rare Universities in the world closer to the sea. The University is surrounded by four communities namely Amamoma, Akotokyir, Apewosika and Kwesipra. These communities accommodate about 80 percent of the students' population (UCC, 2016). The area is dominated by batholith rock and is generally undulating with steep slopes. UCC is surrounded by valleys of various streams between the hills, with the Kakumriver, being the largest. The minor streams end in wetlands, the largest of which drains into the Fosu Lagoon at Bakano. The Landscape in the northern part of the University is a forest zone, which is suitable for the

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cultivation of various crops.The University is in a humid area with mean monthly relative humidity varying between 85% and 99% and an average annual precipitation of about 1295 mm (CCMA, 2016). Figure 2 below gives a geographical overview of the University.
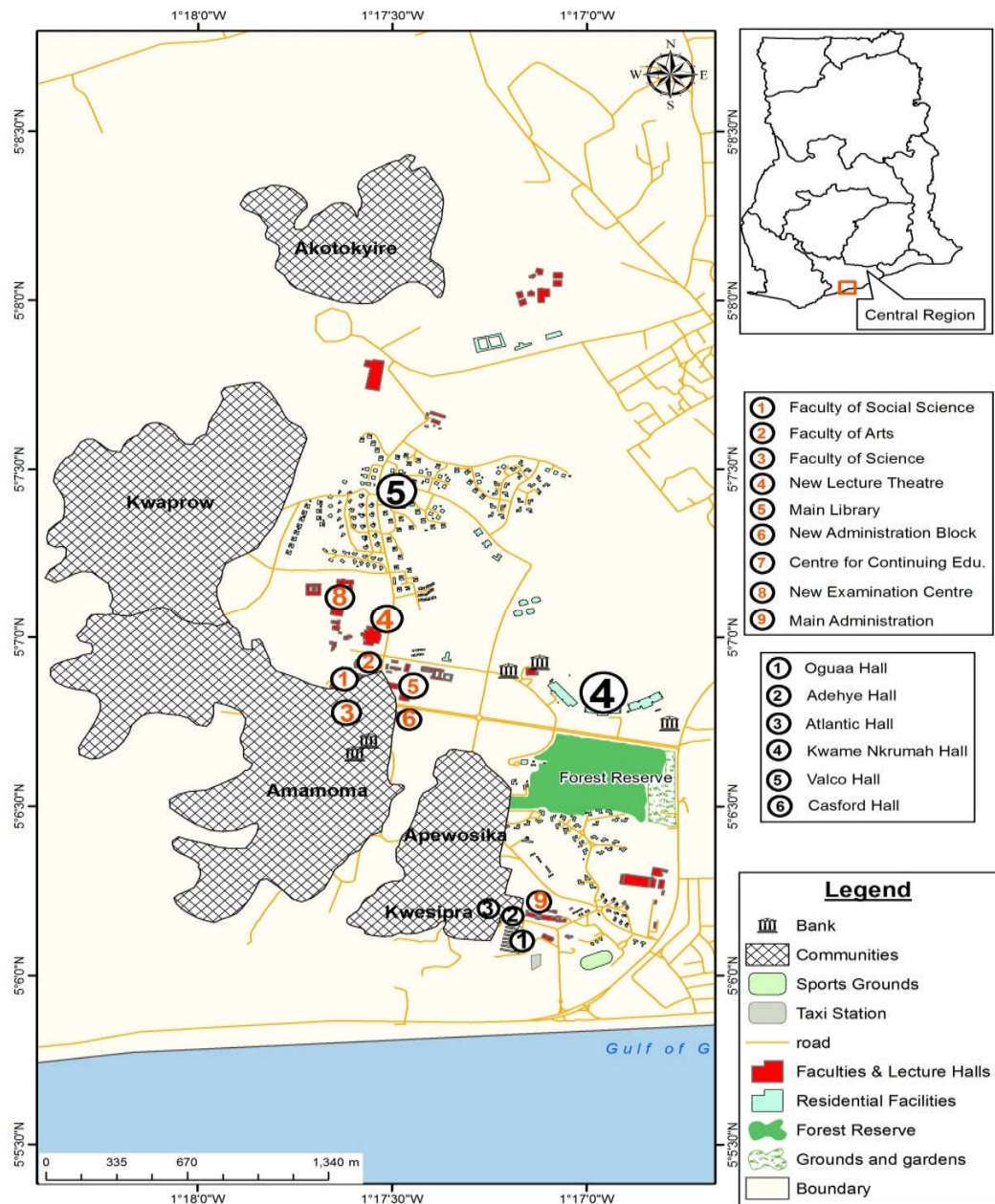
Figure 2: Geographical Map of University of Cape Coast

Source: Department of Geography, UCC (2016)

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The diverse climatic conditions, proximity to the Sea and the University's topography partly informed the basis of the choice of the study area. In addition, the University was selected because the student population consisted of students from diverse backgrounds; a criterion which the other Universities cannot meet. These include education, health, agriculture and natural science and allied sciences. As at 2014/2015 academic year, the total student population is over 55,904 with majority of them reading education-related programmes. The University of Cape Coast operates on a collegial system with five colleges. It has five main halls of residents. (Students Records and Management Information System, UCC 2014).

Study design

A study design is a "blueprint for conducting a study"(Burns & Grove 2003:195). It helps to answer research questions and problems (Kerlinger & Lee, 2000). For the purpose of this study, descriptive survey approach was used. A descriptive survey concerns itself with present phenomena in terms of situations and practices (Driver, Leach, Millar, & Scott, 1996), provides a picture of a phenomenon as they naturally are(Burns & Grove,2003)and can be used to justify current practice and make judgment (Sarantakos, 2005).

According to Descombe (2010:12), 'surveys are used to the best effect when a researcherwants to collect factual information relating to groups of people: what they do, what they think, who they are'.According to Creswell (2014), survey research provides a quantitative or numeric description of trends, attitudes or opinions of a sample of population.The primary goal of this research is to capture opinions and attitudes of the respondents in terms of their understanding and actions and explain them quantitatively. This

makesdescriptive survey and quantitative approach,the most appropriate for this research.The study, thus, employed quantitative procedure to gather the necessary data.

Study population

The study population for the study was all regular undergraduate students of the Universityof Cape Coast. Undergraduate students here imply students who are in level 100 to level 400. These students are broadly categorized under several departments. Due to the large number of students andthe diverse programmes, the research purposively selected seven (7) faculties/department/schools to represent the target population. These comprise Education humanities, Education science, Vocational and Technical education, Education Foundations, Natural science, Agriculture and finally Health and Allied sciences.

Education students are expected to promote climate change issues through education and information. Climate change is projected to impact on agriculture-related activities. The natural sciences are concerned with the science of nature (like climate change). Health and Allied sciences were selected for the fact that climate change is noted to have health-related issues. The Social Science, Arts and Businesses were not selected because the researcher, upon prior scrutiny, found out that most of the programmes run by these faculties/departments/schools were similar to the education programmes with respect to content.

Sample and sampling procedure

The sample frame for the study was the list of all students in the departments/faculties/schools which were selected for the study. The details of the sample frame are presented in table 1.

Table 1: Sample frame of the study population by areas of study.

College/school/department/ faculty	Number	Percent
Agriculture	552	5.3
Education (science)	1447	13.8
Education (Humanities)	2750	26.2
Education (Foundations)	658	6.3
Education (VOTEC)	421	4.0
Health and Allied Science	815	7.8
Natural Sciences	3860	37
Total	10503	100.0

Source: SRMIS (UCC), 2014

Sampling size determination

When dealing with people, sample represents a set of respondents (people) selected from a larger population for the purpose of the research. The sample size was determined using the table guide provided by Krejcie and Morgan (1970). This gave a minimum sample size of 370 out of the population of 10503. This encouraged the researcher to select 380 sample to ensure that possible errors are taken care and also due to cost considerations and expectations of uniformity. The choice ofa sample wasto help achieve maximum precision in statistical estimates of the population (Kumar, 2005).

Sampling Procedure

Proportional, stratified and simple random sampling were employed to select the respondents for the study. Stratified sampling was necessary because the population was stratified into seven main homogeneous groups and beecause each stratum did not have the same number of students, proportionate sampling was employed to ensure that the number of elements in each stratum is determined in relation to the total population (Kumar, 2005). Simple random samplings were then employed to select the respondents from the various strata in order to ensure representativeness of the various programmes under the selected schools/departments. These probability sampling procedures became necessary to give each respondent equal chance of being selected.The resultant sampling distribution is captured in Table 2

Table 2: Sampling distribution of students by areas of study

College/school/department/faculty	Number	Sample
Agriculture	552	22
Education (science)	1447	51
Education (Humanities)	2750	99
Education (Foundations)	658	24
Education (VOTEC)	421	15
Health and Allied Science	815	30
Natural Sciences	3860	139
Total	10503	380

Source: Field work (2015)

Research instrument

The main research instrument used for the collection of data was questionnaire. A survey strategy employing the use of questionnaire as instrument has several benefits. Among the several benefits that this study will get by employing this strategy and method are; a) it will allow for a wider and inclusive coverage of the subjects studied making it possible for representativeness and generalizations; b) it is best suited for gathering information about a population within a specific time period; c) it allows comprehensive and detail views of a situation; c) it is cost effective and time efficient, making it suitable for time-bound and less resourced student studies (Fowler, 2001; Descombe, 2010).

This instrument was divided into seven (7) sections. Section I focused on the demography of the respondents. Section II dealt withrespondents' understanding and knowledge of climate change. Section III examined the student's perception and experiences of climate change whiles section IV focused on the extent at which the students have embraced climate change as an environmental issue. Section V concentrated on theadaptation and mitigation responses of the students. Section VI was centred on how and from which source their mind-set on climate change is constructed and finally section VII solicits suggestions and recommendations to key stakeholders of climate change.

Pre-test of research instruments

Forty (40) questionnaires were administered; 10 each to students of education, health and allied sciences, agriculture and natural sciences. Ambiguous or sensitive questions, such as age, were redone before the final

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questionnaires were administered to the respondents. The pilot thereforehelped in reshaping the questions to ensure effective data collection.

Data collection methods

Primary data was collected by the researcher through the administration of questionnaires. The data was collected from February to March. The researcher encountered some challenges in the data collection process. Some of the challenges were that the students felt reluctant to answer the questions.Most of the students were writing their quizzes and assignments and so their level of co-operation was low. Others also cited that they do not understand climate change issues so they saw no need to answer the questionnaire. Some students even requested that sometime be allowed them so that they do prior reading before answering the questionnaire.

Data analysis

Data obtained from fieldwork were carefully perused to eliminate all questionnaires which were not completed. The remaining were then coded and entered on the Statistical Product and Service (SPSS) version 16. The SPSS was employed in finding frequencies, percentages, cross-tabulations, chi-square tests of independence and summarising in order to draw inferences, deductions and conclusions.

Ethical issues

The procedure for this research was subjected to ethical considerations which were highly official. All the respondents who responded were detailed and briefed about the objectives and the benefits of the research to national development. Their consents were sought alongside careful considerations of

their concerns.   Strict considerations such as anonymity of the information provided by the respondents were adhered to. In addition, all protocols were strictly adhered to.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Introduction

This chapter discusses the results of the primary data collected for the study. The chapter also analyses the responses given by the respondents with respect to their understanding, perceptionand responses to climate change.

As stated earlier in the methodology chapter, the research pre-determined a sample size of 380. Out of this number, the researcher was able to retrieve two hundred and eighty three (283) completed questionnaires. This represents a response rate of 74.5 per cent.

Demographic characteristics of respondents

The demographic characteristics of the respondents included their sex, ages, academic levels and areas of study. The distribution with respect to the respondents' sex is depicted in Table 3 below.

Table 3: Sex of respondents

Sex	Frequency	Per cent
Male	174	61.7
Female	108	38.3
Total	*282	100.0

*Less than the number of the respondents because of non-response N=283

Source: Field data (2015)

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Out of 282 respondents, 61.7 per cent were males while the remaining 108 (38.3 %) were females. This result is not so divergent from the student's population of the University of Cape Coast's population which is about 60.6 per cent males and 39.4 per cent females (SRMIS, 2014).

Age range of respondents

The age groups of the students, as depicted by table 4, indicates that 23 per cent of the respondents were aged below 21 years whiles only 6.6 per cent of them were 31 years and above. Most of them (70.6%) were aged between 21 and 30 years.

Table 4: Age range of students

Age group	Frequency	Per cent
Below 21	65	23.0
21-30	199	70.4
Above 30	19	6.6
Total	283	100.0

Source: Field data (2015)   N=283

Inferring from the UNFCC, IPCCs' (2014) definitions of climate change, it can is said that a person's perception about and responses to climate change is highly dependent on the individual's age. In view of this, it is generally expected that most of the respondents would have at least some significant experiences, perceptions or knowledge about a changing climate since most of them are above20 years.

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Academic levels of students

Because the respondents were University students, it was worthy looking at their levels. Table 5 shows the distribution of the students by academic levels.

Table 5: Academic levels of students

Levels of students	Frequency	Per cent
100	55	19.6
200	87	31.1
300	80	28.6
400	58	20.7
Total	*280	100.0

*Less than the number of the respondents because of non-response N=283

Source: Field data (2015)

It is realized that students in level 200 recorded the highest proportion with about 31 per cent followed closely by level 300s with approximately 29 per cent.Representations of Levels 400 and 100 were very close.

Academic backgrounds of the students

The research intends to find out if the areas of study have any direct bearing on students understanding and perception of climate change. It therefore sought to gather data on the backgrounds of the students with respect to their areas of study. The result is presented in table 6 revealed that students at the natural sciences represented the greatest proportion of respondents with 106 (37.5%). This is followed by students from Education humanities and Sciences

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with about 18 and 16 per cents respectively. Those from the Health and Allied science constituted the least (5.7 %)

Table 6: Respondents' academic backgrounds(Actualsample distribution)

Academic background	Frequency	Per cent
Education humanities	50	17.7
Education science	44	15.5
Education foundations	19	6.7
Technical & Vocational education	26	9.2
Natural science	106	37.5
Agriculture	22	7.8
Health & Allied science	16	5.7
Total	283	100.0

Source: Field data (2015) N=283

Respondents' perceptions and experiences of climate change.

The research wanted to know if the respondents have ever heard of climate change. Closed ended questions were given to the respondents to respond to that effect. The responses of the students are depicted in table 7.Similar to the assertions raised by the BBC (2009) and Leiserowits (2009), the research result reveals that most (about 96%) of the students have heard of climate change before with the remaining either have not heard of climate change before or do not really remember their encounter with the construct.

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Table 7: Respondents who have ever heard of climate change

Response	Frequency	Per cent
Yes	267	95.6
No	6	2.2
Don't remember	6	2.2
Total	*279	100.0

*Less than the number of the respondents because of non-response   N=283

Source: Field data (2015)

The researcher sought for perceptions and experiences of the respondents about climate change. Approximately 94 per cent of the respondents, as shown in figure 3, thinkthat climate change is a realhappening whiles only 6 per cent do not think so.

0, 0%

17, 6%

259, 94%

■ Yes

□ No
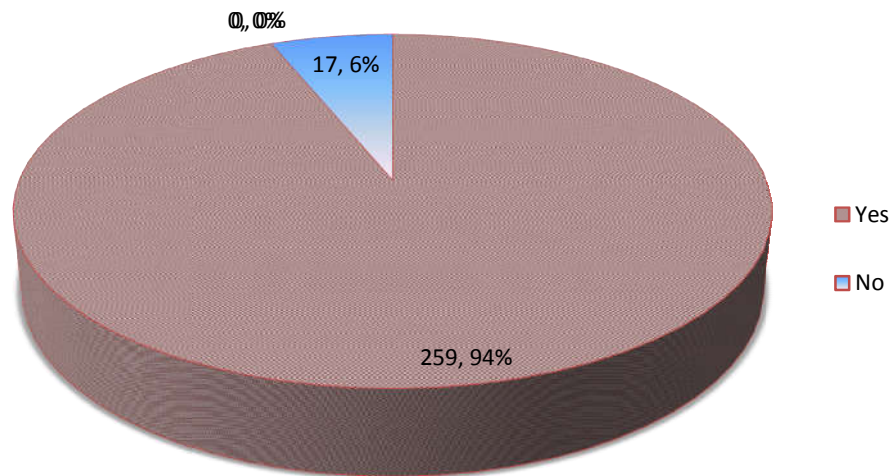
Figure 3: A pie chart showing students perception about climate change

Source: Field data (2015)

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Perceptions has been noted as a great tool for climate change adaption and mitigation in that people's perception have the possibility of ensuring full understanding of scientific information (Crona, 2006, Salick and Byg, 2007 & Finucane (2009). Breakwell (2001) also suggests that socially represented issue can acquire salience if itsignificant to peoples already developed thoughts. This will help to make the issue both scientifically and socially reliable when the connection is enhanced (Fischhoff 2007, Young et al 2013).

Peoples' experiences, perceptions, feelings, values and beliefs, aside science, is essential in ensuring a more complete understanding and acceptance of climate change which help in effective adaptation and mitigation purposes. Citing reasons why they think or feel climate change is happening as shown in Table 8, almost 60 per cent of the respondents indicated that rainfall and temperature are no more showing normal patterns and that temperature levels have been high recently. Another 8.1 per cent mentioned their experiences with floods, rainstorms and disasters happeningwhiles less than 4 per cent feel that climate change is happening because they think agriculture activities are being affected. Extinctionof species was also mentioned. However, almost 20 per cent indicated they cannot mention categorically but they just feel climate change is happening.

It is noted that a person's perception about and responses to climate change is highly influenced by age considering the geographical areas he/she has stayed. It is thus, inferred that an individual should have at least lived for ten years or more in particular area order for that person to vividly talk about perceptions and experiences about the issue.

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Table 8: Perception and experiences of climate change events

	Frequency	Per cent
Low rainfall & high temperature	169	59.7
Natural disasters	23	8.1
Fall in agriculture production & activities	10	3.5
Not clear	51	18.0
Species extinction	8	2.8
No idea	22	7.8
Total	283	100.0

Source: Field Data (2015)   N=283

Table 9 reveals that higher proportion of the students across all ages has have some real-life experiences and perceptionsabout the occurrenceof climate change being manifested through rainfall and temperature changes. About 43 per cent of student's ages between 20 and 30 cited temperature and rainfall. Less than one (0.7%) of those above 30 years cited they were not clear with climate change perception however, 4.6 per cent of those below 21 years were not clear with the indicators of climate change.After a chi-square test of independence was run, the result is showed a Pearson chi-square value of $x^2 = 12.469, df = 10, \alpha = 0.05, p \quad value = 0.255$ meaning that no significant difference exist as far as the age levels and their perceptions of climate change events are concerned. That is, there is no association between age and climate change perception.

Table 9: Respondents' responses on perception with respect to ages

Age levels

Experiences	Below 21		21-30		Above 30		Total	
	No	%	No	%	No	%	No	%
Rainfall & temperature	39	13.8	121	42.8	9	3.2	169	59.7
Disasters	5	1.8	15	5.3	3	1.1	23	8.1
Agriculture	1	0.4	6	2.1	3	1.1	10	3.5
Not clear	13	4.6	36	12.7	2	0.7	51	18.0
Species extinction	2	0.7	6	2.1	0	0.0	8	2.8
No response	5	1.8	15	5.3	2	0.7	22	7.8
Total	65	23	199	70.3	19	6.7	283	100

$x^2 = 12.469, df = 10, \alpha = 0.05, \quad p \quad value = 0.255$

Source: Field data (2015)

Perceptions on the certainty of climate change

The research gave several closed ended questions to collect data on the perceptions of respondents concerning their certainty of the reality of climate change, the causes and effects. More than 90 per cent of the respondents generally agree to the fact climate change is occurring and that some changes had occurred in the past few years. The respondents were however, divided between their views on climate abnormalities. Whiles slightly above halve of the respondents think recent climate happenings are mere abnormalities, nearly the same proportion think otherwise. These results gathered in Table 10 clearly indicate that most of the respondents feel or are certain that the climate is changing.

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Table 10: Respondents perceptions on climate certainty, change in climate in recent years and abnormalities

Level of agreement	Certainty		Change in few years		Abnormalities	
	No	%	No	%	No	%
Strongly agree	156	55.5	117	41.6	38	13.9
Agree	100	35.6	127	45.2	99	36.3
Disagree	3	1.1	16	5.7	89	32.6
Strongly disagree	6	2.1	6	2.1	39	14.4
Cannot tell	16	5.7	15	5.4	11	4.1
Total	*281	100	281*	100	*273	100

*Less than the number of responses because of no response N=283

Source: Field data (2015)

Comparing the responses of the respondents about the concept of a changing climate to real issues of temperature, rainfall and other common phenomenon indicates that the respondents are much more definite when responding to the issues than just the concepts. The information (in Table 11)shows that responses onperceptions of changes in temperature, intensification of sunshine and experiences of decreasing cold days all skewed towards agreements. Almost all the respondents agreed that temperature levels are changingSimilar percentage was recorded for respondents' perception on sunshine intensity in recent times; the respondents think the sun shines too much these days. On the other side, less than two per cent (1.4 %) disagree that cold days are decreasing; about 90 per cent say hot days are increasingly occurring.

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Table 11: Students perception about the trends in recent temperature

	Temperature changes		Sunshine intensity		Cold days	
	No	%	No	%	No	%
Strongly agree	141	50.4	145	52.0	131	46.6
Agree	130	46.4	120	43.0	130	46.3
Disagree	4	1.4	9	3.2	16	5.7
Strongly disagree	1	0.4	2	0.7	2	0.7
Cannot tell	4	1.4	3	1.1	2	0.7
Total	*280	100	*279	100	*281	100

*Less than the number of responses because of no response   N=283

Source: Field data (2015)

The perceptions of the respondents about the patterns of rainfall also revealed a negative trend just as that of their feeling of unfavourable temperature changes. The evidence to the former is manifested in the data presented in Table 12 which specifically showshow the respondents responded to patterns of rain intensity, quantities, related problems and perceptions on increasing dry days.

About 59 per cent of the respondents indicated that rainfall in the past few years has not been intense. Another 21.3 per cent also shares a strong view to this. Meanwhile, almost 60 per cent agree that rainfall is reducing as compared to the past years, with another 30 per cent agreeing strongly. The respondents were however, divided with respect to their perceptions about the hazards of recent rainfalls; whiles about 39 per cent agree that rain-related hazard have increased, 30.2 per cent shares a contradictory view.With respect to

dryness of the environment, almost all the respondents agree that dry periods have been prolonged.

Table 12: Students perception of rain-fall related issues in recent times

Response	Intensified rainfall		Reduction in rainfall		Rain- related problems		Increasing Dry days	
	No	%	No	%	No	%	No	%
Strongly agree	14	5.0	86	30.6	55	19.8	111	40.0
Agree	37	13.2	166	59.1	108	38.8	136	48.9
Disagree	165	58.7	19	6.7	84	30.2	17	6.1
Strongly disagree	60	21.3	8	2.9	22	7.9	7	2.5
Cannot tell	5	1.8	2	0.7	9	3.2	7	2.5
Total	*281		*281		*278		*278	

*Less than the number of responses because of no response   N=283

 Source: Field data (2015)

It is expected that that University students know something about climate change related events, about three per cent of the respondents do not really know anything about these events.

Perceptions about causes of climate change

Climate change is framed in public and scientific discourses in terms of the causal role of human activities (IPCC, UNFCCC, Reser et al., 2012a) as explained by the Human Forcing and AGW theories. In this research, the respondents were asked to indicate, in their own thinking,the extent to which they agree to these assertions. The result (Table 13) shows that nearly 41 per

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cent strongly agreed that human activities should be blamed for climate change, another 41.6 per cent agreeing to it. However, it was found that those who agreed that industrial pollution from human beings are causing climate change constituted almost half of the respondents with another one-quarter also agreeing strongly.

Table 13: Students' perception on the roles of human activities and pollution towards climate change

Level of agreement	Human activities as causes		Industrial pollution	
	No	%	No	%
Strongly agree	115	41.4	68	24.5
Agree	128	46.1	135	49.7
Disagree	22	7.9	52	18.7
Strongly disagree	4	1.4	15	5.4
Cannot tell	9	3.2	8	2.9
Total	*278	100	*278	100

*Less than the number of responses because of no response   N=283

 Source: Field data (2015)

The results show that the respondents agree with IPCC's (2013) arguments that   industrial pollution and emissions of green-housegas are themain causes of climate change. However, it was found out that about 20 per cent of the respondents do not agree to that line of thought.

A Pearson chi-square test of independence to assess the level of congruence between the respondents' perception about the causal roles of human beings to climate change and their perception of environmental

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pollutionwas performed. The resultwas significant; $x^2 = 214.034, df = 25, \alpha = 0.05, p \quad value = 0.000$. This means that there is a difference between the perception of the respondents about the role of human beings towards climate change and the role of industrial pollution as being the cause of climate change.

Attribution reasoning is very essential in assessing how people explain events and occurrences (Kelly, Weiner, 1979, Hewstone, 1989;). Hewstone (1989), Hanson-Easey & Augoustinos (2010) postulate that knowledge about causes is not sufficient in making sense of phenomena, but rather can often serve to justify and or excuse social action.However, causal views and awareness are highly capable of influencing individuals' acceptance or rejection of climate change news, policies and other issues (Bostrom et al 2012). Comparing the research findings to the suggestion of Bostrom et al. There is the tendency to conclude that the respondents will accept climate change issues.

Perceptions about the local impacts of climate change

An analysis of the responses concerning the respondents' perception about the impact of climate change on selected issues such as health, migration, natural disasters and others shows highly endorsing positions by the respondents on all of them. At least 41.4 per cent of the respondents agree that climate change is affecting health, causing people to migrate, causing disasters, affecting energy production and consumption, and reducing agriculture output and overall, threatening the survival of human being. A minimum of about 20 per cent were also found to be in strong agreement to these perceptions. However about half of the respondents think climate change is impacting more on agricultural production and disasters than any other problem, just as other

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research findings has shown (see IPCC, Brown and Crawford 2008, Gyau-Boakye 2001, UNFCCC). Although not all of the issues recorded 100 per cent agreement, it was found that the highest proportion of disagreement went in favour of climate change being a life threating phenomenon. Relatively more (26.9%) of the respondents do not agree to the fact that climate change is threatening human survival. These and more of the results have been presented in the Table 14.

In Ghana, it is reported that Climate change is reducing natural resources (Gyau-Boakye 2001), causing a lot of floods (Brown and Crawford 2008) and influencing human migrations (Geest and Jeu, 2008), leading to loss of land and biodiversity, impacting health services delivery (DANIDA, 2008) and affecting energy generation (Gyau-Boakye 2001). Considering the forgone discussions and analysis in this research and juxtaposing them withsome of these reports indicates some level of convergence between the respondents' perceptions and scientific research findings.

Table 14: Perceived impacts of climate change on selected events

Responses	Health		Migrating		Natural disasters		Energy crises		Falling agric. Output		Life threatening	
	No	%	No	%	No	%	No	%	No	%	No	%
Strongly agree	57	20.5	51	18.4	60	21.7	62	22.3	142	50.7	54	19.3
Agree	129	46.4	128	46.2	139	50.2	119	42.9	116	41.4	118	42.5
Disagree	46	16.5	52	18.8	48	17.3	59	21.2	9	3.2	74	26.9
Strongly disagree	16	5.8	24	8.7	9	3.5	13	4.7	4	1.4	11	3.9
Cannot tell	30	10.8	22	8.0	21	7.6	25	9.0	9	3.2	21	7.5
Total	*278		*277		*277		*278		*280		*278	

*Less than the number of responses because of no response   N=283

Source: Field data (2015)

In assessing the effects climate change has on the individual, the respondents were asked to indicate whether they think climate change is affecting or will affect them later or not. The research revealed (Figure 3) that exactly 84 per cent (236) of the respondents admit that climate change is (will) affecting them. On the contrary, 16 per cent do not think so. The respondents were asked, using an open ended question, to justify why they think or do not think climate change is affecting them. Responses were categorized into seven.

Generally, the respondents mentioned diseases,disasters and hunger as some of the ways in which they think climate change affects them. However, a sizeable proportion (35.9%) of them indicated that climate change is posing a lot of unfavourable and uncomfortable situation in their daily lives. They indicated that they sweat a lot these days because of the sun and that sometimes makes them feel very uncomfortable. Some also indicated that their expenses on items such as fans, rain coats, handkerchiefs, ice water and electricity and water bills have increased because they bath more, use more energy particularly by switching on fans every sleeping time. In all these instances three percent of the respondents think climate change will affect them in the nearby future but not now whiles 24.0 per cent who cited famine as the main threat of climate change on their lives. Figure 4 gives a more detailed analysis of the responses.
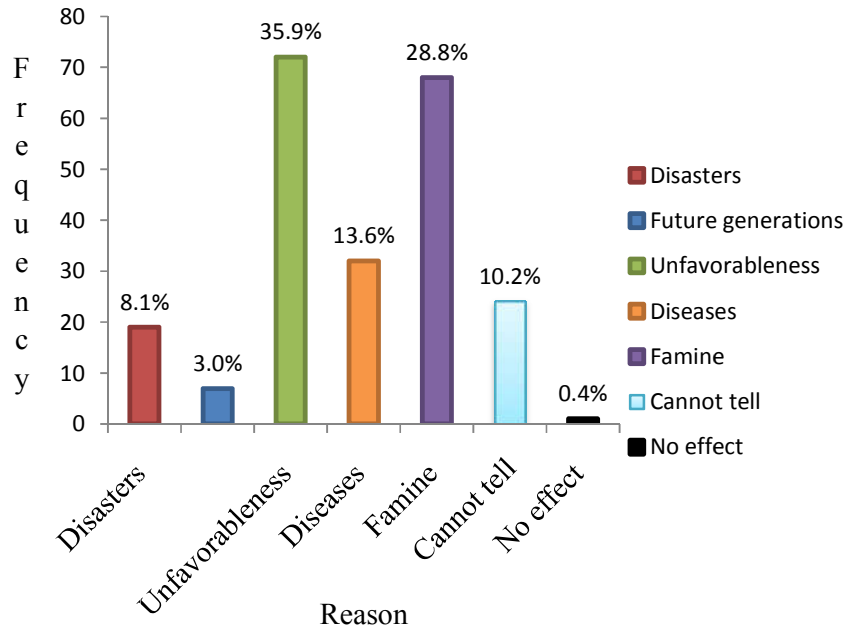
Figure 4: Bar graph depicting the responses on thepersonal effect of climate change on the respondents

Source: Field data (2015)

About 14 per cent of the respondents cited diseases as the major threat of climate change on their lives made mention of certain diseasesincluding skin burns, rushes, breathing problems, cancer, malaria and frequent severe headaches as a result of climate change. Meanwhile even some those who said climate change is not affecting them went further to contradict themselves by citing reasons such as the occurrence of natural disasters and diseases. The need to assess the perceptions of the respondents was necessary because sometimes public perceptions of issues may be different from 'objective' risk assessments made by experts (Slovic 1987).

Respondentsunderstanding and knowledge of climate change

Comparing the respondents'perceptions with the understanding of the science of climate change is the next interest of this research.The study sought to

reveal how the students understand the science of climate change. To avoid the possibility of giving leading information, an open ended question was given to allow the respondents write what they know about climate change. Their responses were thoroughly analysed and consequently categorized into four on the basis of response similarities. The responses of the respondents are presented in Figure 5.
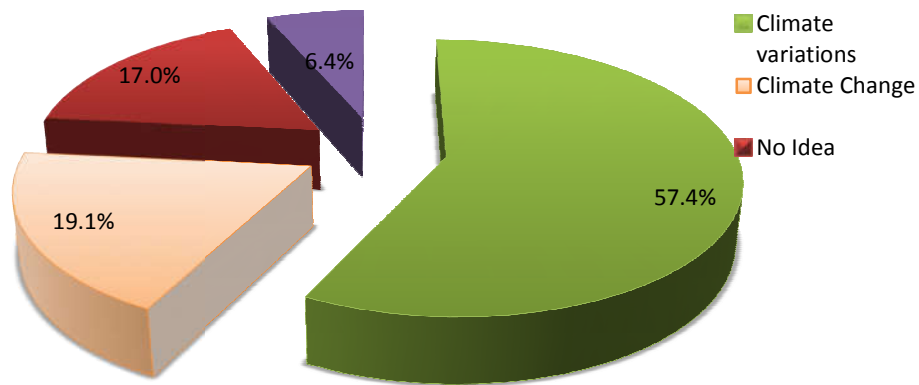
Figure 5: A pie chart showing respondents' understanding of climate change

Source: Field data (2015)

As depicted by the green slice (Figure 4), about 57 per cent of the respondents explained climate change as abnormalities or variations in weather conditions while about 6 per cent also defined it as global warming. Exactly 17 per centindicated that they cannot explain or define climate change. Only 19.2%of the responses explained that climate change is about changes in weather conditions over a given time period and, in effect, corresponded to benchmark definitions such as those given by the IPCC, UNFCCC and other globally accepted definitions.

A cross tabulation (Table 15) was conducted to compare respondents understanding with their backgrounds of study. This comparison revealed that the proportions of students from the education, natural science, agriculture, and all the other areas who misdefined climate change rather as climate variations were virtually the same. Whiles 26 (9.2%) ofrespondents from education humanities explained climate change as climate variations, 7.2 per cent of their counterparts in science gave similar responses. About 22 per cent ofrespondents from the natural sciences also indicated that climate change is referred to as variations in weather conditions. The proportion of those who gave accurate definitionswas not so different as compared to their backgrounds. There was no statistical difference between students' academic background and understanding of climate change$(x^2 = 21.798, df = 24, \alpha = 0.05, p \quad value\ 0.591)$ (see Table 15) .This result implies academic background is independent of the understanding of climate change.

Many studies have found that having knowledge about something is a great step towards putting up an attitude towards it. Understanding scientific knowledge is equally as important (Crona 2006, Salick & Byg, 2007 and Finucane, 2009). Hanson-Easey et al (2013) explain that people may prioritize issues that they more understand particularly with natural resource conservation. It was thus necessary for the research to find out the knowledge base of the respondents with respect to climate change because of its importance in action mechanisms.

Table 15: A cross tabulation of student's academic background and understanding of the science of climate change

Responses to the understanding of climate change

Students background	Climate variations		Changes in climate		No Idea		Global warming		Total	
	No	%	No	%	No	%	No	%	No	%
Education Humanities	26	9.2	8	2.8	11	3.9	5	1.8	50	17.7
Education Science	21	7.4	10	3.5	10	3.5	3	1.1	44	15.5
Education Foundations	13	4.6	2	0.7	2	0.7	2	0.7	19	6.7
Education Technical & Voc	18	6.4	3	1.1	5	1.8	0	0	26	9.2
Natural Science	61	21.6	26	9.2	15	5.3	3	1.1	105	**37.5**
Agriculture	13	4.6	3	1.1	2	0.7	4	1.4	22	7.8
Health and Allied Science	10	3.5	2	0.7	3	1.1	1	0.4	16	5.7
Total	162	57.2	54	19.1	48	17.0	18	6.4	*282	100.0

*Less than the number of the respondents because of non-response   N=283   Source: Field data (2015)

$x^2 = 21.798, df = 24, \alpha = 0.05,$ p $value = 0.591$

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Asked to indicate their understanding on who or what causes climate change it was realized that almost 60 per cent of the respondents attributes climate change to human activities (see Table 16). These respondents agree with the IPCC (2014), Christensen et al (2007) and the National Research Council (2013). Meanwhile, almost a quarter attributed climate change to nature whiles less than five (5) per cent said that both human activities and naturebring about climate change. Meanwhile, more than 10 per cent do not know what causes climate change.

Table 16: Students knowledge on climate change attribution

Student background	Hum. Beings		Nature		Hum/Nat		No Idea		Total	
	No	%	No	%	No	%	No	%	No	%
Education humanities	29	10.2	15	5.3	2	0.7	4	1.4	50	17.7
Education science	26	9.3	10	3.5	4	1.4	4	1.4	44	15.5
Educ. Foundations	10	3.5	3	1.1	1	0.4	5	1.8	19	6.7
Education technical & Vocational	19	6.7	5	1.8	1	0.4	0	0	21	9.2
Natural science	61	21.6	26	9.2	3	1.1	15	5.3	105	37.5
Agriculture	13	4.6	4	1.4	2	0.7	2	0.7	21	7.8
Health & allied Science	8	2.8	5	1.8	1	0.4	2	0.7	16	5.7
Total	166	58.7	69	24.0	14	4.9	32	11.3	*280	100

$x^2 = 21.046, df = 24, \alpha = 0.05, \quad p \quad value = 0.636$

*Less than the number of the respondents because of non-response N=283

Source: Field data (2015)

The study investigated whether respondents' understanding of the causers of climate change have any bearing on their discipline or area of study. The pattern of responses across the various backgrounds of respondents with respect to what or who causes climate change was tested using chi-square test of independence. The result was not significant at $x^2 = 21.046, df = 24, \alpha = 0.05, p \quad value = 0.636$. This means that there is no association between students'academic backgrounds and knowledge about the causes of climate change.

The attribution of climate change has been something that is still hanging in serious contention. Whiles some argue that climate change is man-made; others also think it is a natural phenomenon. Some are also in the mid-way. People have their own understanding regarding the causes of about climate change. In American for example, Bostrom (2001) reported that 42 per cent of respondent's adults attributed climate change to both "natural" processes and human activities, 18 per cent attributed it solely to nature, and the remaining 40 per cent believed that human behaviour was the major cause of climate change.

The study revealed that emission of gases; deforestation and Bush burning and improper waste management were some of the causes of climate change known by the respondents (see Table 17). Slightly above 25 per cent of the respondents understand that climate change is caused through emissions and another 28 per cent also cited clearing of forests and failure to re-plant cut-down trees. The result clearly indicates that almost half of the respondentssupport the Anthropogenic Global Warming andthe Human Forcing theories of climate change. A quite significant proportion (16.3%) attributed climate change to improper management of waste and waste disposal problems. Meanwhile, 50

respondents representing 18.1 per cent had no idea about the manner in which the issue evolve but the remaining 12.4 per cent think that human beings have no role in climate change with some categorically mentioning that climate change is caused by God. Those who attribute climate change to nature or God will find it difficult to change. They will assume that it is not their responsibility and therefore will not consider any efforts.

Table 17: Respondents' understanding about the causes of climate change

Causes of climate change	Frequency	Per cent
Emissions	71	25.7
Deforestation & Bush burning	76	27.5
Waste management	45	16.3
Natural	34	12.4
No Idea	50	18.1
Total	*276	100.0

*Less than the number of the respondents because of non-responseN=283

  Source: Field data (2015)

About 20 per cent of the respondents attributed climate change to human emission of gases. Meanwhile, 15 (5.6%) indicated that all that they know is that human beings causes climate change but could not really tell how it happens. There were some respondents(slightly above 10%) who connected the phenomenon to nature but still went on to indicate that emissions, tree cutting and waste generation cause climate change. Nonetheless, it was realized 10 per cent had no idea at all about the causes of climate change. This analysis is presented in Table 18

Table 18:   A cross tabulation of respondents' knowledge on causes of climate change and the responsible agents

Causes of climate change

Agent	Emissions		Tree cutting		Natural		Waste		No Idea		Total	
Human beings	57	20.3	55	19.8	1	0.5	35	12.5	15	5.6	166	59.1
Nature (God)	10	3.7	16	6.1	30	10.9	4	1.6	6	2.3	67	24.3
Human & Nature	3	1.2	4	1.6	1	0.5	4	1.6	2	.8	14	5.1
No idea	1	0.5	0	0	2	0.9	2	0.6	26	9.4	31	11.5
Total	71	25.7	76	27.5	34	12.4	45	16.3	49	18.1	*276	100

*less respondents than expected responses   N=283

Source: Field data (2015).

The impacts of climate change on people especially those in Africa are enormous. The IPCC (2013) has uncovered the vulnerability of African countries to climate change in respects to floods, disasters and many others. The study investigated the respondents' knowledgeon the impacts of climate change.

The results presented in Table 19 shows that less than a quarter (22.3%) of the respondents know that climate change negatively impacts agriculture production whiles about 17 per cent show that climate change is resulting in the depletion of the ozone layer. Some (15.2%) respondents pointed out that they know climate change has certain impacts but could not tell exactly what the impact(s) is (are). Meanwhile nearly 10 per cent of the respondents mentionedtemperature increases and reduction in rainfall problems as the impacts of climate change. Other issues such as health problems and desertification were also mentioned.

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Table 19: Students' understanding of the impacts of climate change

Impacts	Frequency	Per cent
Low agriculture output	63	22.3
Disasters	32	11.8
Reduced rain & high temperature	27	10.0
Desertification	8	3.0
Ozone layer depletion	47	17.3
Health problems	22	8.1
Cannot really tell	43	16.0
No idea	29	10.7
Total	*271	100.0

*Less than the number of responses because of no response   N=283

Source: Field data (2015)

The knowledge of the respondents on climate change impacts is in consonance with the findings of the IPCC (2014) andNAOO (2013).They pointed out that water stress, species extinction, low productivity, sea level rises, food insecurity and diseasesare some of the problems of climate change.

Despite the fact that most of the respondents have some knowledge about the causes and effects of climate change, their understanding on the remedies needed tofight climate change were found to be more of a "soft" (response) approach. This was realised when the respondents were asked to point out how, in their understanding, climate change can be tackled. The responses have been presented in Table 20.

Table 20: Students knowledge about mechanismsto tackleclimate change

Response	Frequency	Per cent
Education	102	36.0
Emission reduction	63	22.3
Tree management	42	14.8
Change in waste behaviour	23	8.1
No idea	53	18.7
Total	283	100.0

Source: Field data (2015)   N=283

From Table 20, it is realised that out of the 283 respondents, 36 per centare of the view that the panacea for tackling climate change is by educating the public whiles about 19 per cent indicated that they have no knowledge about how to mitigate or adapt to climate change. Nonetheless, almost a quarter (22.3%) opted for the reduction of emissions through carbon reduction,innovation and inventions and technologicaladvancement in order to reduce the emission of green-house gases into the atmosphere. Another 14.8 per cent indicated that climate change can best be dealt with through tree planting and discouraging deforestation. These points to the conclusion that the respondents (totalling 45.2%) know the mitigation strategies for climate change.

The study also revealed that no significant difference exists between students' academic backgrounds and the general knowledge about the fight against climate change. This is confirmed by a chi-square test of independence which was conducted to assess whether there is any difference between students' responses and their areas of study. Most of the students advocate for

education and sensitization as the major tool to fight climate change apart from those in education science. Those in education science rather opted for reduction in emissions. Figure 6also clearly depicts that more students with education backgrounds had no idea with regards to the fight of climate change. However, the general observation is that some students across all the various disciplines understand that climate change can best be mitigated through education.
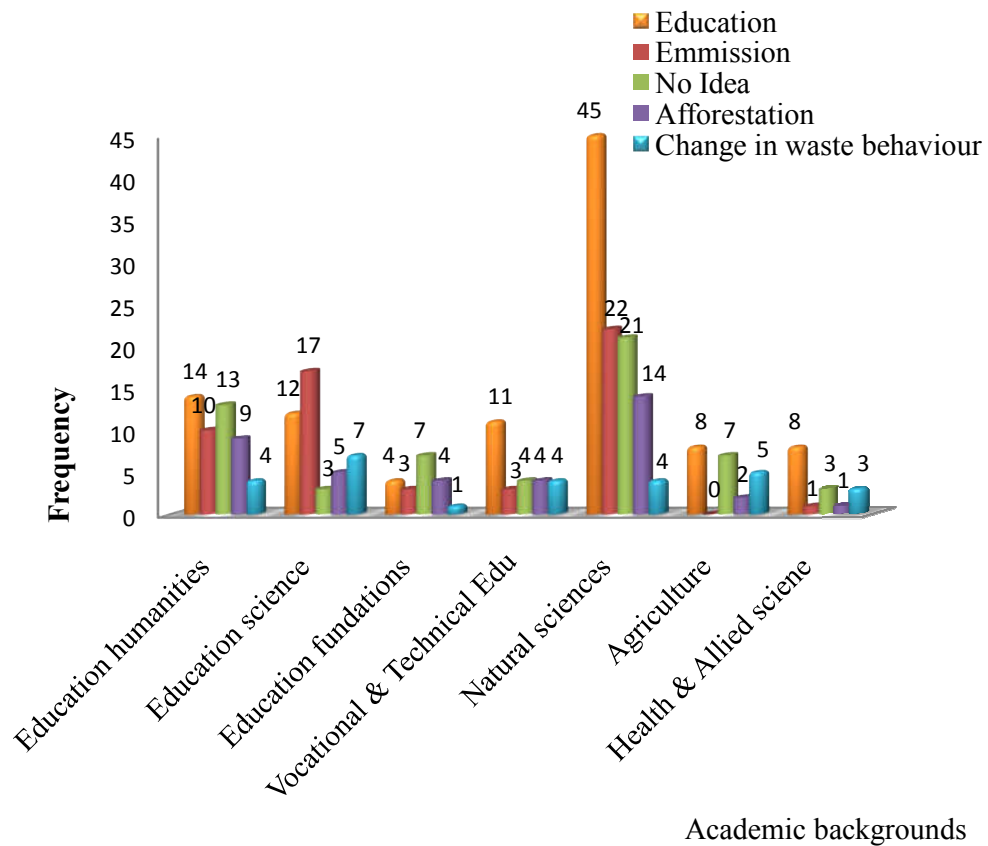
Figure 6: Respondents'knowledge on mitigation responses to climate change based on their academic backgrounds

Source: Field Data (2015)

Respondents' acceptance andassimilation of climate change

One very critical issue which is very difficult for people to accept is environmental problems particularly climate change. Bringing the perceptions and understanding of climate change at the personal and individual level of people in society is a viable step towards achieving effective communication and eliciting appropriate responses. There is enough evidence so far to predict that climate change issues among the respondents will be personalized as far as representation is concerned. The respondentsare expected to express a strong concern about the issue and be ready to help fight climate change.

It is in this interest that the study wanted to determine the extent to which students have assimilated and accepted the issue of climate change. The research asked a series of closed ended questions to probe how climate change issues are managed within the purview of the respondents. The issues and the responses have been presented in Table 21.

When the respondents were asked to indicate how important the issue of climate change is to them, about 93 per cent agreed generally asserted that climate is an important issue to them. They think climate change is an important phenomenon and thus should be treated with much seriousness. These findingsare not so different from the data collected on students concerns for climate change issues as more than 50 per cent of the respondents said they are seriously concerned with climate change. Apart from that, nearly 40 per cent also expressed their concern about the current changing patterns in the climate.

Table 21: Student's responses to personalizing and acceptance of climate change

	Personal importance		Concern about it		Ready tohelp fight	
	No	%	No	%	No	%
Strongly agree	137	48.8	147	52.5	82	29.3
Agree	122	43.7	107	38.2	154	55.7
Disagree	16	5.7	17	6.1	26	9.3
Strongly disagree	3	1.1	4	1.4	8	2.9
Cannot Tell	3	1.1	5	1.8	10	3.6
Total	*281		*280		*280	

*Less than the number of responses because of no response   N=283

Source: Field Data (2015)

It has been noted that climate change representation is very necessary in society (Jaspal,Nerlich& Cinnirella 2014). Breakwell suggests that one core issue with representing issues in society and assuring action is by ensuring that people imbibe or accept the issue, feel concern and exhibit some level of readiness to act on it.

This implies that understanding or awareness alone is nowhere near theguaranteed action. People can exhibit awareness and understanding of a given social representation but may not accept or assume responsibility for action (Leiserowitz 2006, Nerlich's 2010, Jaspal et al. 2013). This implies that a person may accept that human behaviour has contributed to climate change but will refuse to assimilate this representation within his/her existing network of knowledge. Social representation in this regard must first be assimilated and accepted (Breakwell 1986).

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Personalizing the representation of climate change at the individual level

Both political pragmatism and normative arguments suggest that the future world is unavoidably dependent on the degree to which the public is engaged on the issue of climate change (Moser 2008; see also Halpern and Bates 2004). Moser (2009) asserts that stakeholders ought not to produce viable and effective internationally supportive national policy solutions only but educate, bring along, gain the support of, and actively engage their various publics.If people for instance, questions the reality of something, or do not see that thing as harmful, they will not show any support for it.

The study in this sense wanted to find out the general opinions of the respondents about the issue of climate change. It targeted finding out whether for, instance, the respondents think climate change is not real, probably will happen in the future or maybe some powerful groups are trying to deceive the public on a changing climate.

Table 22: Respondents' thought about climate change

	Early to discuss climate change		Frightened about climate change	
	No	%	No	%
Yes	51	18.3	165	59.1
No	214	76.7	104	37.3
Cannot tell	14	5.0	7	2.5
Total	*279	100	*279	100

*Less than the number of responses because of no responseN=283 Source: Field data (2015)

The research, however, revealed that the respondents think climate change is real. Only about 18 per cent out of the 283 respondents says it is too early to say that climate change is happening whiles five per cent were indifferent or are not able to tell whether climate change is happening or not. But more importantly, majority (76.9%) do not think tackling and discussing climate change should be done later; they affirm that climate change is real and is happening now. The research also gathered responses concerning the respondents frightening position with climate change. It found out that less than 40 per cent are not frightened of the occurrence of a climate change and it related issues. Meanwhile, almost 60 per cent expressed the scaring nature of climate change. These findings are captured in Table 22. The fear for climate change can actually be a good signal because, according to Jaspal et al (2014), fear can help bring out expected action from people.

The research also explored whether there is any difference in terms of sex with respect to the fear of climate change. A Pearson chi-square test of independence was conducted to find out whether the level of female who fear

climate change is statistically different from their male counterparts. The testproved significant; it revealed that significant difference exists between males and females with respect to the fear of climate change at $x^2 = 7.954, df = 3, \alpha = 0.05, p \quad value = 0.047$ (see Table 23). This implies that the proportion of males among the respondents who are scared of climate change is statistically different from the female counterparts who fear climate change. From Table 23, about 40 per cent of the respondents are males who are scared, less than half of this proportion represents the females who are scared though the proportion of males and females who are not scared are virtually the same.

Table 23: Responses on fearsomeness on climate change against sex

	Yes		No		Cannot tell		No response		Total	
Sex	No.	%	No.	%	No.	%	No.	%	No.	%
Male	112	39.6	59	20.8	3	1.1	1	0.4	175	61.8
Female	53	18.7	48	17.0	4	1.4	3	1.1	108	38.2
Total	165	58.3	107	37.8	7	2.5	4	1.4	283	100

$x^2 = 7.954, df = 3, \alpha = 0.05, p \quad value = 0.047$ N=283

Source: Field data (2015)

Assessment of climate change representation among respondents

Indeed social representation at the societal and national level, apart from the individual level, is very crucial in determining the level at which an issue like climate change has been endorsed by the masses. Many issues can be raised to discredit adaptation and mitigation responses of climate change. The research wanted to know from the respondents how they think or respond to certain issue

which sometimes are employed by certain groups of people and climate change critics to deliberately discourage and influence people so that they will not care about climate change. The issues and the responses of the respondents have been presented in Table 24.

The result gives a different and promising picture among the respondents. Almost 80 per cent of the respondents generally accept the fact that climate change should be taken serious by all Ghanaians and that the issue ought not to be branded as a myth. However, about 20 per cent are suggesting that Ghanaians should disregard climate change issues and we should not take climate change serious. In addition, nearly 15 per cent also think climate change is a myth.

Table 24: Responses on certain general representations of climate change

State of acceptance	Should not be taken serious		Climate change is a myth	
	No	%	No	%
Accept	57	20.3	37	13.2
Do not accept	220	79.3	223	79.7
Cannot tell	4	1.4	20	7.1
Total	281*	100	*280	100

*Less than the number of the respondents because of non-response   N=283

  Source: Field Data (2015)

The research also gathered some information about certain other issues that are mostly raised to protest discussions on climate change; issues which have very serious potentials of debunking and rejecting the assertions about the realities of climate change. An example of such issues is when people are made

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to believe that some political ideologies are pushing the climate change agenda or that climate change issues are exaggerated. However, this research gathered that issue of politics, discrediting scientists and other issues of misrepresentations were not found to be dominating the minds of the respondents.

The research findings(see Table 25) indicate that the respondents do not think climate change is politicised in Ghana. They disagree that climate change has any political underpinnings. This is because only a little above 10 per cent of the respondents believe that climate change is a political issue. Meanwhile, nearly 85 per cent of the respondents do not agree with those who think climate change is political; they believe the issue cuts across political divide.

Table 25: Responses onselected social interpretations of climatechange

Level of agreement	Politicization		Deceit from scientists		Deceive Africans	
	No	%	No	%	No	%
Strongly agree	10	3.6	16	5.8	21	7.5
Agree	20	7.2	28	10.1	23	8.2
Disagree	88	31.7	100	35.9	112	39.9
Strongly disagree	149	53.6	116	41.6	105	37.4
Cannot tell	11	4.0	19	6.9	20	7.2
Total	*278		*279		*281	

*Less than the number of the respondents because of non-response   N=283

 Source: Fielddata (2015)

The respondents also do not accept that climate scientists are deceiving the public on issues on climate change. From Table 25, it is realised that over 76

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per cent of the respondents accept climate change as a reality. On a similar note, virtually the same proportions of those who believe in the findings of scientists also think that African counties, and Ghana for that matter, are not being deceived on any grounds.   All these culminate in backing the research's findings that the respondents have accepted climate change as a contemporary environmental problem.

Table 26: Cross tabulation of opinion on scientists' deception and science background of respondents

Responses on deception by scientists

Background	Strongly agree		Agree		Disagree		Strongly disagree		Cannot tell		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Non-science students	4	1.4	8	2.8	32	11.3	39	13.8	10	3.5	93	33.6
Science related Students	12	4.2	20	7.1	68	24.0	77	27.2	9	3.2	186	66.4
	16	5.7	28	9.9	100	35.3	116	41.0	19	6.7	*279	100

$x^2 = 4.531, df = 5, \alpha = 0.05, p \quad value = 0.476$

*Less than the number of the respondents because of non-response   N=283
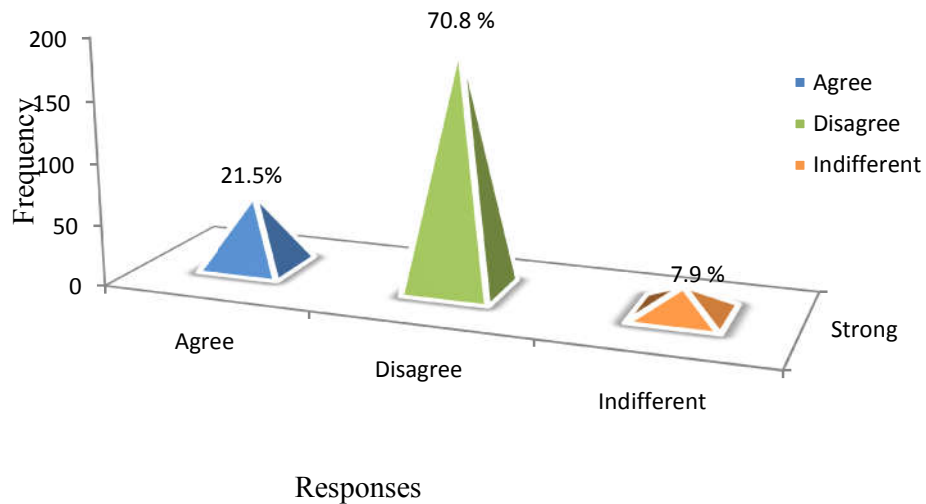
Source: Field data (2015)

A Pearson chi-square test of independence was conducted to test any difference between respondents' science background and their perceptions about the accuracies of scientific findings. That is, whether there is any difference in opinion between for example, what education science students think about the

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truths of scientific communication of climate change differs from the thoughts of those in education humanities.The result($x^2 = 4.531$, $df = 5$, $\alpha = 0.05$, $p\ \ value = 0.476$) proved that there is no significant difference between respondents' thoughts about deceptions of climate change by scientist and their science backgrounds.

The analysis cannot be better if opinions about the main channel of global climate changes information; media are not documented. The media and its role in communicating climate change issues have faced a lot of criticisms. These include hyping occurrences as well possible events, sometimes inducing fear into people. To appreciate the respondents perception and acceptance of climate change communication; whether climate change issues in Ghana is something that are being over-hyped by the media.

The responses are presented in Figure 7. It shows that whiles only 21.5 per cent of the respondents believe that climate change issues are overhyped by the media, nearly 71 per cent think otherwise.The respondents do not think climate change issue within the media circles are over-hypedin Ghana.These findings are not in consonance with Corbett & Durfee (2004) who have indicated that the media has been largely criticized for painting a gloomy picture about climate change and overemphasizing the climate debate thereby having the tendency of annulling real facts

Figure 7: Respondents' agreement with exaggeration of media portrayal of climate change

Source: Field Data (2015)

Breakwell (1986) intimates that a denial of the existence of climate change avoids the need for significant behaviour change. The IPCC and major climate change stakeholders have been pressing strongly for more and more immediate action to be taken on climate change. However, public reactions are very slow and insufficient. A reason could be that people lack that sense of urgency to take action; often regarded as an inaction strategy (Jaspal et al 2013). In view of this, the study set out to find the level of action or inaction being forwarded by the respondents in the adaptation or mitigation of climate change. The results are discussed in the next section.

Responses to climate change adaptation and mitigation

The research sought to examine how the respondents were responding to climate change with respect to the mitigation, adaptation or any other mechanisms. This indirectly had a potential to complement the assessment of

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how the respondents really understand the concept of climate change adaptation and mitigation.The respondents were askedto indicate what they are doing or intend to do to help fight climate change. Different responses were received and were categorised into five based on similarities in responses.

Table 27: Respondents' actions and intentions towards climate change adaptation and mitigation

Response	Frequency	Per cent
Nothing	108	40.5
Education	69	25.8
Waste management	33	12.4
Use climate friendly appliance	38	14.2
Afforestation	19	7.1
Total	*267	100.0

*Less than the number of the respondents because of non-response   N=283

Source: Field data (2015)

Table 27 shows that a high proportion (40.5%) of the respondents had got nothing to do to mitigate or adapt to climate change. However, though currently doing nothing, there were quite a few numbers of them (24.4 %), who expressed their intention to educate and create awareness. Those who indicated their intentions to ensure proper sanitation and help promote waste management so that climate change will be tackled constituted about 12 per cent of the respondents' whiles seven (7) per cent were willing to engage in some form of afforestation and or discourage deforestation activities. Out of the 267 responses, 13.4 per cent also said they will mitigate climate change by using

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climate friendly appliances. They mentioned specifics such as cars, fridges and televisions by avoiding the use of out-dated and second hand types of these appliances.

Various reasons were given by the respondents to support their actions and inactions (Table 28). About 13 per cent of the respondents are motivated to take action because they want to increase awareness whiles 22 per cent cited that they want to ensure environmental sustainability. Only 9 per cent indicated that they want to help reduce emissions of gases and toxic substances into the atmosphere. This proportion is far less than the expected (at least 20%) considering results gathered in the previous analysis.

Table 28: Respondents' reasons to support theiraction/inaction to fight climate change

Reasons	Frequency	Per cent
Awareness creation	38	13.4
Environmental sustainability	64	22.6
Emission reduction	27	9.5
Not in capacity to mitigate	34	12.0
Avoid disaster	13	4.6
No reason	107	37.8
Total	283	100.0

Source: Field Data (2015)   N=283

It was however, observed that 12 per cent of the responses categorically stated that they have nothing to do because they think they do not have the

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capacity and ability to tackle climate change. More importantly, many of them (approximately 40 %) of the respondents said they have no reason behind their absence of intention to fight climate change or even if they intend to tackle climate change, they have no clear cut reason for what they will do.In an attempt to make more meaningful analysis, a comparison between the respondents' acceptance of climate change and action responses gathered so far was made.A chi-square test of independence was conducted to establish if there is any significant difference between the respondents' readiness to take action and their actual action (intention) responses. The test result($x^2 = 42.283$, $df = 25$, $\alpha = 0.05$, $p\ value = 0.017$) shows that the readiness of the respondents with regards to the fight against climate change is statistically different from the action responses expected of them. This result clearly supports the fact that respondents' acceptance and assimilation are not being transferred into action.

Having noted the divergence in knowledge and intentions and the fact that the respondents have already indicated they do not think climate change isneither over-hyped, politicized, miscommunicated nor concocted, it was worthwhile to determine whether the respondents have just opted to defer responsibility by avoiding personal action. A chi-square test was run to seeif there is any difference between respondents' general knowledge about how climate change should be battled and their personal action responses.

The test result was very significant at$x^2 = 68.744$, $df = 20$, $\alpha = 0.05$, $p\ value = 0.000$. This means that the personal action responses given by the respondents were very different from their generalknowledge responses which they know as the scientific solutions to tackle fighting climate change.

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Since the research had already recorded the scientific knowledge base of the respondents and had documented their general knowledge about how to tackle climate change, it went on to cross-check to find out if their action intentions are informed by their knowledge base or what they claim to know are actually being transferred into their actions. A cross-tabulation (Table 29) was prepared to compare the proportions of responses on these two issues.

It was realised (from Table 29) that about 11 per cent of the respondents who have no intentions to fight climate indeed have no idea about the response mechanisms to climate change.This same proportion of respondents is also doing nothing however they know educating and creating awareness helps to tackle climate change.Similarly, approximately five per cent of the respondents know that proper waste and tree management are effective mechanism to battle climate change but they do not care to do anything at their personal levels. The research also revealed that the action intentions of some of the respondents were different from what they actually know about climate change mitigation or adaptation. For instance, about five per cent and three per cent who know reducing emissions as the panacea for climate change are actually intending to embark on education and sensitization; they think they do not emit gases. In addition, 3.8 per cent and 4 per centof those who know that emission reduction and tree management are respectively, the remediesfor climate changeactuallyhave the intention to engage in waste management practices.Although most of the respondents know different ways of mitigating climate change, they think education and information is the best, practicable and easy medium for them to tackle personal action (See table 28). These researches

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give an indication that personal actions are not informed by their general

knowledge.

Table 29: A cross tabulation comparing respondents' general responses and personal action to climate change

		General responses										
		Education		Emission reduction		No idea		Trees management		Waste management		Total	
		No	%	No	%	No	%	No	%	No	%	No	%
	Nothing	29	10.9	25	9.4	29	10.9	13	4.9	12	4.5	108	40.5
	Education	40	14.1	14	4.9	5	1.8	7	2.6	3	1.1	69	25.7
Personal	Waste management	9	3.4	10	3.8	2	0.7	11	3.9	1	0.4	33	12.4
Action	Appliance	15	5.6	10	3.8	3	1.1	6	2.1	4	1.5	38	14.2
	Afforestation	6	2.3	4	1.4	3	1.1	4	1.4	2	0.7	19	7.1
	Total	102	36.0	63	22.3	53	18.7	42	14.8	23	8.1	*267	100

*Less than the number of the respondents because of non-response   N=283

Source: Field data (2015)

It is very difficult to translate awareness and understanding to personal and individual actions even though there may be an awareness of risks as Breakwell (2010) and Jaspal et al (2014) opine. A person or group of persons may accept the hegemonic representation of anthropogenic climate change and theoretically accept the necessary behaviour implications but disassociate them from their own behaviour (Breakwell 1986). When this situation happens, it means there is a tendency that the individual or the group are expecting other persons, institutions or agencies to take responsibility of the issue; otherwise known as deflective strategy.

Since this research has not been able to establish a connection between personal actions (intentions) of the respondents and action expected of or anticipated from them, it went further to find out from the respondents who they think should be responsible to tackle climate change. This was to ascertain whether deflective strategies are been employed by the respondents.

Respondents' opinions on entities responsible to tackle climate change

The previousanalysis had clearly noticed /predicted that the respondents may have some inherent deflective intention towards the fight against climate change. Climate change has been compartmentalised by the respondents; implying that they have refused to assume the position of taking active role to tackle the issue. Based on this result, it was worthwhile to assess who the respondents' think should be responsible to take action on climate change. The results are presented in Figure 8.
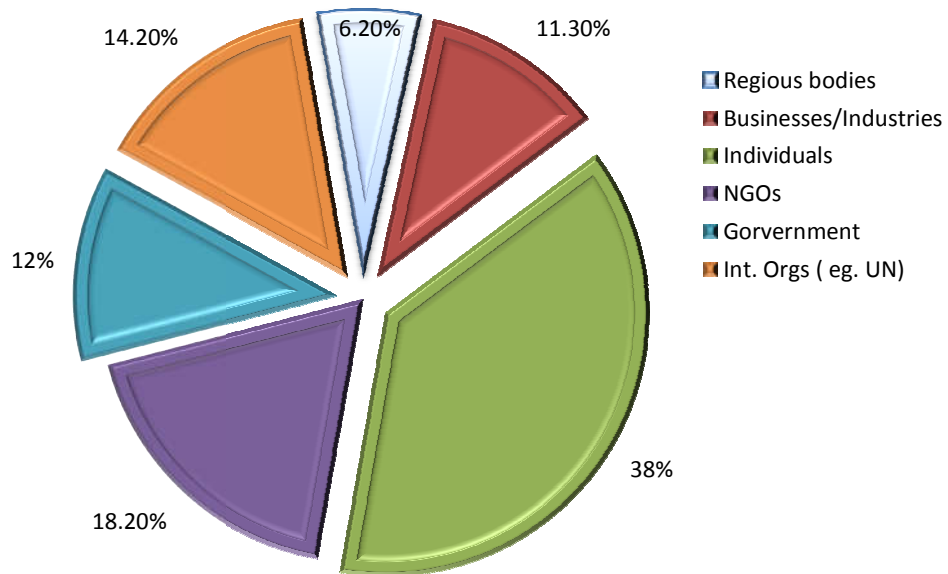
Figure 8: A pie chart showing responses on who should be responsible to combat climate change

Source: Field data (2015)

Majority (38%) of the respondents think individuals should take full responsibility to fight climate change. This was somehow not expected given the kind of responses they gave with respect to what they are doing or intends to do; it clearly shows that respondents are "running away" from their own responsibilities. Some genuinely deflected their responsibilities. For instance, 6 per cent are of the opinion that religious bodies should take responsibility to fight climate change. These respondents expect Christians, Muslims and all the other forms of religion to synchronise their faiths, rituals and doctrines and "normalise" climate change. Only 12 per cent opted in favour of governments to tackle climate change. However, relatively higher proportions; about 18 per cent and 14 per centpointed fingers at Non-Governmental organizations (NGOs) and International organizations (such as the UN, UNEP etc) respectively. These

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results add up to suggest that there should be a shared responsibility among all stakeholders to tackle climate change.

Engagement in pro-environmental behaviours

A school of thought in environmental sustainability is the preservationists or the deep ecologists. They posit that problems such as climate change can only be tackled effectively when people reduce their consumption of resources (energy for instance) by using mass transport services, bicycles or walking. These are seen as very common and easy habits which, when people engage in, will go a long way to solve the climate change problem. The study sought to gather data on what the respondents think about some of these issues, bearing in mind their implications on identity construction and self-image. The results were tobe used as a basis to judge the extent to which the respondents agree with this school of thought and how they are helping (intending) to mitigate climate change. The research focused on two main issues; energy conservation habits of respondents and walking and cycling.

The result (as summarized in Table 30) demonstrate that most of the respondents do not bother about having to take up the habit of conserving energy nor resorting to low-consuming energy sources of transportation; and that even if they do it will not be for the sake of climate change. While more than 85 per cent (54.7 %+ 30.9 %) indicated they do not conserve energy for the sake of climate change, almost about 70 per cent also indicated they do not use (and are not going use) bicycles or walk all in the name of climate change. .

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Table 30: Attitude towards selected pro-climate change behaviours

Level of agreement or otherwise	Energy conservation		Cycling and Walking	
	No	%	No	%
Strongly agree	2	0.7	22	7.9
Agree	23	8.3	54	19.3
Disagree	152	54.7	132	47.2
Strongly disagree	86	30.9	57	20.4
Cannot tell	15	5.4	15	5.4
Total	*278	100	*280	100

*Less than the number of the respondents because of non-response   N=283

 Source: Field data (2015)

Energy conservation is one of the common and easy pro climate change habits being disseminated all over the world. It is believed that these behaviours (the use of more efficient energy use, energy conservation, cycling and walking have a long term positive impact on mitigating climate change.

Source of respondents' knowledge and disposition on climate change

The knowledge base of an individual is as equally important as its source. In this research, almost half (45.6 %) of the respondents were found to be pointing fingers at High School Education (JHS and SHS) when they were asked to indicate their major source of knowledge on climate change. Indeed there has been a general conception that climate change issues in the Ghanaian educational curricula have been focused at the Pre-tertiary level of education. It is no surprising that Ozor (2009) recommends an urgentinclusion of climate change issues in the curricula of universities.

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The media and University education have played lesser roles in increasing the knowledge base of the respondents on climate change as compared to High school. This is because whiles only 18.6% per cent attributed their knowledge to University education, those who acknowledged the media were about 17 per cent. The government, NGOs and research publications are far less recognisedas contributing to the construction of climate change knowledge. (see Table 31).

Table 31: Respondents' major source of climate change knowledge

	Frequency	Per cent
JHS/SHS	250	45.6
University	102	18.6
Family	21	3.8
Media	94	17.1
Environmental NGOs Groups	35	7.4
Internet	26	6.4
Government agencies	4	0.7
Publications	18	3.3
Total	*550	100.0

*More than the number of the respondents because of multiple responses N=283

Source: Field data (2015)

The World Bank (2002) has stated that tertiary education institutions have a critical role in, building societies and driving sustainable economic growth through knowledge. In the view of (Weenen, 2000), university students

are humanity's best hope and most effective resource in the quest to achieve sustainable development. University institutions are therefore expected to impart more into the students in order for them to contribute meaningfully to sustainable development especially in an era where environmental changes are becoming threats to development.

Data gathered (Table 32) from the respondents concerning the medium which has most influenced their disposition about climate change revealed quite a different picture.

Table 32: Major source of disposition about climate change

	Frequency	Per cent
Media	136	26.1
Religious bodies	22	4.2
Observations	103	19.8
Experiences	71	13.6
Political	20	3.3
Academic knowledge	145	27.8
Others	4	.8
Total	*521	100.0

*More than the number of the respondents because of multiple responses

Source: Field data (2015)   N=283

The research reveals that though most of respondents acquired their knowledge about climate change from the classroom, they equally appreciate the role media has played as far as assimilation, acceptance and exposure is

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concerned. About 27 per cent actually praised the media for its role in influencing their disposition about climate change. Approximately one-fifth also said their personal observations have influenced their disposition whiles 14 per cent indicated experiences.

A chi-square test of independence revealed a significant difference between the source of knowledge of respondents and the source disposition on climate change $(x^2 = 255.280, df = 56, \alpha = 0.05, p \quad value = 0.000.$ (Table 33). This also reveals that increasing communication does not mainly have to rely on classroom impartation.

Table 33: Chi-Square tests of difference between source of knowledge and source of disposition on climate change

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	255.280[a]	56	.000
Likelihood Ratio	104.146	56	.000
N of Valid Cases	*550		

*More than the number of the respondents because of multiple responses

Source: Field Data (2015)   N=283

Though the media has been much criticized for the poor understanding, uncertainty and public engagement (Corbett & Durfee, 2004), it is not to be blamed for the poor understanding among the respondents as most of them have been enlightened through scientific, curriculum based source of knowledge. Accordingly, it is easy for the respondents to reject the realities behind what they are being taught because it may seem to be a form of

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"knowledgeimposition" on them. It is not surprising then that the respondents are employing deflective strategies to deny action

There have been an increasing recognition of barriers people face when encountering and processing scientific climate change information (Kollmuss and Agyeman (2002) see also: Lorenzoni, Nicholson-Cole, & Whitmarsh (2007); Ockwell, Whitmarsh, and O'Neill (2009). According to Kirchhoff et al (2013), not all scientific knowledge is equally suitable to practice and for adaptation. So the fact that Ghana is building formal knowledge base on climate change ought not to necessarily be expected to elicit high responses from the respondents.

The study further solicited the respondents' opinion on which source of climate change information they trust most.

Table 34: Respondents' trust in sources of information about climate change

Source of information	Frequency	Per cent
Family	22	7.8
Climate scientists	54	19.2
Lecturers	39	13.8
Publications	40	14.2
Government	25	8.9
International organizations	30	10.7
NGOs	29	10.3
Media	42	15.0

Source of information	Frequency	Per cent
Family	22	7.8
Climate scientists	54	19.2
Lecturers	39	13.8
Publications	40	14.2
Government	25	8.9
International organizations	30	10.7
NGOs	29	10.3
Media	42	15.0
Total	*281	100.0

*Less than the number of the respondents' non-responses   N=283   Source:
Field data (2015)

The result (captured in Table 34) shows that the number of respondents who trust information from climate scientists was a little above 19 per cent.13.8 per cent said they trust information from lecturers; a percentage marginally lesser than those who trust in the media. It was noted that the government may be ineffective if it engages in communicating and conveying climate change information since most of the respondents do not trust climate change information from it.

Effective communication is essential in the climate change adaptation and mitigation agenda. But the problem is how that effective communication can be ensured (Moser and Dilling 2007; Dilling and Farhar 2007). There are so many factors which ensure effective communication. These factorsincludesappreciating people's concerns which also include how and who

they think is credible to deal with the communication of the issue (see Ockwell et al. 2009). They are very good signals to predict whether information will be communicated and appropriate feedback will be given. In this respect, if people, for example, think that the government is not to be trusted because of certain reasons, it will be difficult for them to accept information from them irrespective of how credible the information may be. Effective adaptation and mitigation responses will, in effect, be extremely difficult to stimulate.

Respondents' suggestion for climate change adaption and Mitigation

As part of giving more meaningful recommendations in this research, the researcher gave the opportunity to the respondents to give suggestions to the climate scientists' community. Almost 60 per cent suggested that scientist should intensify research whiles about 33 per cent think they should directly be active in communication and information dissemination (Table 35).

Table 35: Respondents' suggestions to climate scientists

Suggestion	Frequency	Per cent
Increased research	127	59.7
Communication and Information	69	32.4
Formulate policies and laws	17	8.0
Total	*213	100.0

  *Less than the number of the respondents non- responses   N=283

Source: Field data (2015)

The role of the scientific community in the fight against climate change is well acknowledged by the respondents. The scientific societyremains the

pillar upon which accurate research and information about climate change is expected (Weart 2003). To be sure that people understands climate change implies an equally important focus on scienti c information (Crona, 2006, Salick and Byg, 2007, & Finucane, 2009). The UNEP (2014) indicates that science and knowledge enables society to understand and respond to threats posed by climate change and has entreated decision makers to seek sound information on issues which are grounded on the best science available.

Some of the respondents equally think the media is not working effectively as much as expected both with respect to efforts to educating the masses and conveying accurate and credible information to the public. Table 36 reveals that majority (73.2%) of the respondents think that media information dissemination role is insufficient. They suggestthat the media should increase communication and information. The remaining 27 per cent of the respondents also think the media is most at times giving inaccurate information about climate change. These respondents expect the media to ensure that accurate information is send into the public domain.

Table 36: Respondents' suggestions to the media

Suggestion to media	Frequency	Per cent
Accurate information	60	26.9
Increase communication	164	73.2
Total	*224	100.0
*Less than the number of the respondents non- responses	N=283	

Source: Field data (2015)

According to Leiserowitz (2007), the media is expected to take very active role in the climate change agenda; to increase people understanding and knowledge through intense communication. It has however, been criticized on diverse grounds (Moser, 2010; Carvalho,2007; Boykof, 2007; Dirikx & Gelders,2008; Nisbet, 2009). It is in this light that the research considers the suggestions by the respondents very essential.

Table 37: Respondents suggestions to the government

Suggestion to Government	Frequency	Per cent
Policies and laws	101	47.0
Funding organizations	44	20.5
Investments in projects	32	14.9
Political independence	10	4.7
Education and information	28	13.0
Total	*215	100.0

*Less than the number of the respondents non- responses   N=283

Source: Field data (2015)

Though successive Government in Ghana have made some efforts to give some national and institutional responses to climate change. The respondents seem not to recognise or appreciate these efforts. For instance, though a national climate change and environmental policy has been formulated, nearly 50 per cent of the respondents still think the government should formulate climate change policies and laws and supervise their effective implementation. This gives a clear indication that government communication machinery is

ineffective. In addition, some of the respondents also suggest that the government should invest infrastructure, support organizations and educate the public on climate change. However, some (about 5%) per cent, expect the government to have a clear, independent focus and not compromise on any external or internal influence towards fighting climate change. They suggest climate change issues should not be politicised (see Table 37).

CHAPTER FIVE

SUMMARY, CONLUSIONS AND RECOMMENDATIONS

Introduction

The chapter focuses on the summary of the study, the conclusions drawn from the findings and corresponding recommendations. The final section of this chapter looks at this study's contribution to knowledge and areas for further research.

Summary

Climate change has become a contemporary global problem which the world is battling with. It is destroying properties and lives, worsening poverty and annulling developmental gains. It has become necessary and justified on the need for proactive mitigation and adaptation responses. One important necessity in the adaptation and mitigation process is by ensuring that the very people who supposedly cause it, and are affected, understand and appreciate the nature of the problem.

The study set out to assess the knowledge and understanding of and responses to climate change among students at the University of Cape Coast. Specific objectives were to; examine student's experiences and perception of climate change, examine students' understanding and knowledge of Climate Change; determine students' level of acceptance and assimilation of climate change as an environmental issue ; describe the students' responses to climate change messages, adaptation and mitigation issues; establish how   their

disposition about climate change is constructed and make appropriate recommendation for communication, adaptation and mitigation purposes. These objectives were curved out after a rigorous review of concepts and theories to give the research a clear focus.

To achieve the objectives set in the research, a sample of 350 students was selected from a student population of 10503 from the Natural Sciences, Agriculture, Health and Allied Sciences, Education Humanities, Education Foundations, Education Science and VOTEC. Proportional sampling, stratified and simple random samplings were used to constitute the sample size. Due to issues of student absenteeism and difficulty in tracing the selected students coupled with the time frame allotted for the data collection process, the resultant sample size was 283 which were lesser than the theoretical/predetermined sample size of 380. A quantitative approach was chosen for the study. Data were collected from the students through the use of questionnaires. Data were analysed and presented by the use of percentages, frequencies and chi-square to examine the relationships of the variables in the study.

The main findings of the study

- Most of the students (95.6 %) have heard of climate change before but few of them are unaware of climate change.

- There is a high level of perception and feeling of a changing climate among nearly 92 per cent of the respondents. Changing rainfall and temperature patterns take up the topmost reason for the students' feeling of a climate change. Other experiences include occurrence of disasters, extinction of species and new dimensions in diseases.

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- There is no statistical association between respondents' perception of climate change and their age levels. ($x^2 = 12.469$, p $value = 0.255$, $\alpha = 0.05$)

- Almost all the respondents agree that climate change is certainly happening. They also think the climate has changed for the past few years; feel that temperature levels in recent times are high, rainfalls are reducing and at the same time becoming destructive and that dry days are increasingly increasing.

- Less than 25 per cent of the respondents strongly believe that industrial pollution is the main cause of climate change

- Significant difference exists between the students' perception about the role of human beings towards climate change and the contribution of industrial pollution. ($x^2 = 214.034$, p $value = 0.000, \alpha = 0.05$).

- Quite a significant proportion of the respondents (15.9 %) think climate change has no effect on them whiles a countable few cannot also tell about the impacts of climate change on them.

- Approximately 28 per cent of respondents indicated that climate change is posing a lot of unfavourable and uncomfortable situations in their daily lives. Some also feel insecure because of potential hunger, health problems and disasters.

- Majority (58.7%) of the students admit that human beings are the causes of climate change

- The meaning of climate change is not well understood by the students. About 57 per cent interprets it in terms of climate variability whiles 17 per cent have no idea about it.

- There is no difference between students' academic background and understanding of climate change

- There is no statistical difference ($x^2 = 21.046$, $p\ \ value = 0.636$, $\alpha = 0.05$) between students'academic background and understanding about the causes of climate change. however, it was identified that students know the main causes of climate change.

- The respondents understand that climate change has negative impacts on agriculture production, health related problems, depletion of ozone layer, desertification, disasters and high temperatures.

- A relatively higher proportion (36%) of the respondents understands that increased awareness and education is the best remedy to mitigate climate change. Afforestation, change in waste behaviour and reduction in emissions were also mentioned.

- Climate change issue is seen to be very important to the respondents; they are concerned and ready to do something to fight it.

- Whiles more than three-quarter (76.9%) of the students says climate change issues should be discussed now because it is looming, quite a significant proportion of the respondents (59.1%) are also scared about it. The fear of climate change was seen to differ among male and female respondents ($x^2 = 7.954$, $df = 3$, $p\ \ value = 0.047$, $\alpha = 0.05$)

- It was realised that the issue of climate change has been well represented among the respondents. A significant majority (79.3%) agree that the issue should be taken serious by Ghanaians whiles about 80 per cent do not agree that the climate change issue is a fallacy. They do not accept

the fact that climate change is either being pushed deliberately on by the western world, politicized or misconstrued by scientists.

- It is realised that the respondents' perception about media portrayal of climate change information is normal. About 71 per cent disagree that climate change issue are over-hyped in the media.

- More than one-third (40.4%) of the respondents think they had got nothing to do to either mitigate or adapt to climate change. However, about one-quarter of them expressed their intention to educate .

- Nearly 30 per cent of the respondents do not have any reasons to explain their action/inaction intentions.

- A chi-square test revealed that the readiness of the respondents to tackle climate change is statistically different from the action responses expected of them ($x^2 = 42.283$, p   value $= 0.017$, $\alpha = 0.05$)

- The research established that respondents' acceptance and assimilation is not being transmitted into action.

- It was revealed that the personal action responses given by the respondents differed significantly from the general knowledge they have on fighting climate change. ($x^2 = 68.744$, p   value $= 0.000$, a $= 0.05$)

- A simple majority (38%) of the respondents think individuals should take full responsibility to fight climate change; they do not expect businesses and industries to take leading roles in mitigating climate change.

- The study revealed that inactions in terms of pro-climate change behaviours such as walking, cycling and energy conservation were prevailing.

- About half of the respondents acquired their knowledge on climate change from High School (JHS and SHS). However, their dispositions about climate change aremostly sourced from theirpersonal observations and experiences.

- A significant difference was recorded between the source of knowledge of respondents and the source disposition on climate change at ($x^2 =$ 255.280 , p value $= 0.000, \alpha = 0.05$)

- The respondents are indifferent to any entity for information on climate change though a relatively high proportion of them trust information from scientists.

- Climate scientists are entreated to do more research. The media is also expected to give accurate information and as well intensify efforts in information dissemination. The government has been advised to increase funding, formulate policies and laws and remain politically neutral in efforts to fights climate change.

Conclusions

The research can conclude that most of the students have heard of climate change but they seem confused about the meaning of climate change. Their understanding of the science of climate change is far below expectations as compared to internationally accepted definitions such that given by the IPCC. This is because while they are sure that human beings are the major cause of climate change, they don't seem to get it clear how human beings cause it.

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Nonetheless, they can tell the various problems and impacts that come along with climate change but the students' knowledge concerning mitigation mechanisms for climate change is very discouraging.

Contrary to the poor scientific understanding of climate change, it was realized that most of the students perceive climate change as something very real. Their perceptions are justified by their experiences with recent temperature and sunshine levels, levels of rainfall and dry seasons. The study concludes that whiles the students do not really understand the science of climate change; they are much aware and able to consciously, perceive the various events which the issue is bringing out feelings and experiences.

Climate change acceptance is realised to be socially and individually represented but assimilation was the problem. Students' exhibit unconvincing assimilation of the science of climate change but their perceptionshas helped them to gain some level of consciousness with the issue. They accept the fact that climate change is happening and that it is not overhyped, forged or concocted by anybody. It can be concluded that there is a good degree of representation of climate change among the university students.

Their respondents have not made, or do not intend to engage, in any efforts to fight climate change nor take personal responsibilities to fight climate change though they think the issue should be tackled. In fact they themselves do not seem to know the actual strategies for fighting climate change. They know, at least in theory, some strategies which can be employed to curtail the menace. Most of them are looking at employing education and sensitization as the best approach to help fight climate change thougheducation may not in itself guarantee any action.

In actual fact, whiles most of the students acquired knowledge on climate change in the classroom probably due to the fact that social studies and the integrated science syllabi at the high school levels contains climate change issues in them, it can be inferred that that their experiences and observations have intensely shaped their stance about the issue. It is very surprising and somehow indicting then, for the students to suggest that climate change can best be tackled through education and sensitization given the fact they themselves have been educated about it.

The research can also conclude that it will be very difficult to think, suggest or even predict that the students will put in any significant or meaningful action responses to mitigate climate change. The students' cognitive and emotional responses to climate change are quite significant unlike their behavioural or practical action responses which are insignificant and volatile. The reason being that most of the students expect other individuals and entities to take action and not themselves. They simply employed a deflective strategy.

The students expect scientists to do more communication of climate change. However, they are indifferent to other sources of information and communication sources such as the media, classroom, NGOs etc. Most of the students do not really care where information will be coming from but are more interested in accuracy and reliability.

The students believe that not enough is being done by climate scientist, the media, and even the government. They believe the media is not doing enough discussions and dissemination of climate change issues. The media is thus expected to be accurate, truthful, unbiased and timely in information dissemination. The study also concludes that the governments should show more

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seriousness and commitment towards the fight of climate change by investing more resources, empowering organization, intensify public education and more important exercise these responsibilities under no external or internal political interferences.

Recommendations

The following recommendations are made based on the findings and conclusion of the study

- The information deficit gap is clearly seen as a problem, hence more information and education must be conducted and be made relevant to peoples' experiences and perceptions.

- University authorities in the country should consider including climate change issues in, at least, every programme of study. Curriculum contents and pedagogy, at all levels, should be developed from the realities of peoples' perceptions and values butnot necessary be "dumped" on the students.

- There should be more research in climate communications

- The various academic institutions should take environmental communications very serious.

- The media is also encouraged to present consistent, factual information.

- The Government of Ghana should ensure that the climate change related issues policy and other pro-environmental policies, with their accompanying bye-laws and behaviour expectationsare effectively disseminated.

Suggestions for further research

The research suggests that further research be conducted to find out

- The level of understanding and dispositions of policy makers and top government officials.

- The mode of communication and transmission of information about climate change within the general public.

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APPENDIX A

QUESTIONAIRE

UNIVERSITY OF CAPE COAST

INSTITUTE FOR DEVELOPMENT STUDIES

RESEARCH QUESTIONNAIRE

Introduction

I am pursuing an M.Phil. (Development Studies) at the Institute for Development Studies, University of Cape Coast. This research is aimed at assessing the knowledge and understanding, perception and experiences of students on climate change and their responses thereof. It also intends to raise suggestions for stakeholders to help fight climate change. This survey is important because it will help contribute to knowledge on climate change and help promote a meaningful and sustainable national development through policy implementation.

My Expectations

I would be grateful if you could fill this questionnaire to enable me gain the necessary data to complete my research and help solve the problems which the research seeks to. Your responses in this regard, will be very necessary for the continuation of the research. I wish to emphasise that your responses will be managed confidentially and anonymously. I also entreat that you PATIENTLY answer this questionnaire based on the truth, sincerity and importance. Kindly indicate "NI" at any question you think you have no idea about.

Counting on your unwavering co-operation. Thank you.

SECTION I: Demographic data

1. Sex: Male [   ]   Female [   ]

2. Age: Below 21 [   ]   21-30 [   ]   31- above [   ]

3. Level :   100 [   ]   200 [   ]   300 [   ]   400 [   ]

4. Department/School/Faculty/College

    Education (Humanities)   [   ]   Education (Science)   [   ]

    Natural Science   [   ]   Agriculture   [   ]

    Health & Allied Science   [   ]   VOTEC   [   ]

    Educational (Foundations)   [   ]

SECTION II: Understanding and Knowledge about Global Climate change

5. Have you ever heard of climate change?

        Yes   [   ]   No [   ]   don't remember [   ]

8. How do you understand climate change?

    ………………………………………………………………………………

    ………………………………………………………………………………

    ……...…

9. Who/what can climate change be attributed to?

    ………………………………………………………………………………

    ………………………………………………………………………………

10. How do (does) the person (s) /object(s) in stated in 9 above contribute to

    climate change.

    ………………………………………………………………………………

    ……………………………………………………………………………….

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11. What impact(s) do you know climate change has/have?

…………………………………………………………………………………

………………………………………………………………………………

12. What is (are) the way(s) of tackling climate change?

…………………………………………………………………………………

…………………………………………………………………………………

SECTION III   Perception and Experiences of Climate change

13. Do you personally think or feel there has been a change in climate?

Yes   [ ]   No   [ ]

14. Please give reason(s) to your response in question 12 above? Give

example if possible.

…………………………………………………………………………………

…………………………………………………………………………………

15. Please indicate the extent to which you agree or disagree with the

following. Note:

SA=Strongly Agree, A=Agree, D= Disagree, SD= Strongly Disagree,

CT= Cannot tell

Perceptions about the realities of climate change	SA	A	D	SD	CT
I am certain climate change is really happening					
The climate has changed for the past five years and more					
Industrial pollution is the main cause of climate change					
Climate change is as a result of human activities					

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16. Please indicate the extent to which you agree or disagree with the

following

Perceptions about temperature	SA	A	D	SD	CT
Hot days have been increasing					
The sun shines too much these days/years					
There has been a lot of changes in temperature					
Cold days are becoming very few in a year					

17. Please indicate the extent to which you agree or disagree with following

occurrences.

Perceptions about rainfall	SA	A	D	SD	CT
It has been raining heavily these days					
The quantity of rains have been reducing					
The rains come with a lot of problems					
Dry days are increasing					

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18. Please indicate the extent to which you agree or disagree with the following.

Perceptions about the impacts of climate change	SA	A	D	SD	CT
Agriculture production is falling due to climate change					
Energy problems are as result of climate change					
Most natural disasters are due to climate change					
People are migrating geographically because of climate change					
New diseases are emerging because of climate change					
The climate these days are not life supporting					

19. Do you think climate change is something that is affecting or going to affect you?

    Yes [   ]   No [   ]

20. Give reason(s) to your answer in question 18.

    ……………………………………………………………………………………

    ……………….……………………………………………………………………

Section IV: Students assimilation and acceptance of global climate change

21. Please indicate the extent at which you agree or disagree with the following;

Assimilation of climate change	SA	A	D	SD	CT
The issue of climate change is very important to me					
I am ready to do something or anything to stop climate change.					
I think climate change should not be taken serious by Ghanaians					

22. Indicate the extent of agreement or disagreement with the following

Acceptance of climate change information	SA	A	D	SD	CT
Climate change is a myth					
Climate change is a political issue					
Scientist are deceiving the public about climate change					
Climate change issues are over- hyped.					
Climate change is something that frightens me					
It is too early to say whether climate change is really a problem					

Section V: Students responses to climate change adaptation and mitigation

23. What have you are you doing or intends do to help fight climate change?

……………………………………………………………………………

……………..………………………………………………………………

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24. Please give reason(s) for your response in question 22 above.

…………………………………………………………………………

…………………………………………………………………………

25. Who should be responsible to fight climate change? Please rank them in

order of importance. (please tick only one)

Religious bodies [ ] NGOs [ ]

Businesses/Industries [ ] National Government [ ]

Individuals [ ] International Org. [ ]

Others (please specify………………………………………………

26. Please indicate how much you agree or disagree with the following

statements.

Personal actions	True	False	CT
I have been conserving energy due to climate change			
I like walking or cycling because of climate change			

Section IV. Source of knowledge construction and disposition on climate

change

27. What has been the major source of your knowledge about climate

change?

Environmental groups [ ] Media [ ]

University Education [ ] Friends/ family [ ]

Government agencies [ ] Internet [ ]

Publications/academic journals [ ] JHS/SHS Education [ ]

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Other   (Please write)…………………………………………………

28. Which of these has most influenced your state of mind about climate

change? (Please tick only one)

Media   [   ]   Experiences   [   ]

Religious believes   [   ]   Political affiliation   [   ]

Observations   [   ]   Academic Knowledge   [   ]

Any other (please specify)……………………………………

Section VI: Suggestions to climate change communicators and stakeholders

29. By ticking one box on each row please indicate who you would **trust**

information most about climate change among the following entities

Family and Friends   [   ]   Climate Scientist   [   ]

Lectures   [   ]   Research Publications [   ]

Government   [   ]   International Org.   [   ]

NGOs   .   [   ]   Media   [   ]

Any other (Pleasespecify)……………………………………

30. What suggestions would you give to the following entities for

adaptation, mitigation and communication purposes?

a.   Climate Scientists

…………………………………………………………………

…………………………………………………………………

b.   The media

…………………………………………………………………

c.   The government

…………………………………………………………………

…………………………………………………………………

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