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UNIVERSITY OF THE WITWATERSRAND
SCHOOL OF GEOGRAPHY ARCHAEOLOGY AND ENVIRONMENTAL STUDIES

Print Media: Influencing behavioural responses towards climate change?

A Dissertation submitted to the Faculty of Humanities University of the Witwatersrand, Johannesburg
in fulfilment of the requirements for the degree of Master of Arts

Laura Beth Goodman
0710536R

Johannesburg,
6 August 2014

Supervisor: Cheryl Chamberlain

Declaration

I Laura Beth Goodman declare that this thesis is my own, unaided work which is to be submitted for the degree Master of Arts at the University of the Witwatersrand, Johannesburg. This work has not been submitted before for any degree or examination in any other university.



Laura Beth Goodman

6 August 2014

Abstract

Climate change has affected the global population including South Africans. Changes in weather and climatic patterns are increasingly observed (IPCC, 2007a; IPCC, 2013). It is also important to address climate change in order to maintain the production of resources in South Africa to protect the livelihoods of its citizens (South African National Climate Change Response Green Paper, 2010). The media's role is to relay information (in this instance, of climate change) to the public in a way that they are able to understand (Burgess, 1999). The purpose of this research is to determine the way newspapers report on climate change and to determine whether or not these media messages affect public perception of climate change. More specifically this research investigates how climate change is reported in newspaper media; what the effects of media messages on the public are and what other factors influence the public's perceptions of climate change.

This research was completed in Johannesburg, Gauteng, South Africa between 2011 and 2014. There are a number of research papers which address the relationship between climate change and media in a northern hemisphere/developed world context but there is little research which shows this relationship in a southern hemisphere/developing countries context. There is also a dearth of research which illustrates how the relationship between climate change and the media affects public perception of climate change in a southern hemisphere/developing word context. Newspaper articles were collected from the internet archives of three newspapers – The Star, BusinessDay and Mail & Guardian - between Jan 2011 and January 2012. Thereafter, questionnaires were emailed to 120 newspaper readers with 40 respondents representing each newspaper.

The newspaper analysis shows that climate change reporting has a political focus. The newspapers report on who should be responsible for addressing climate change. The findings highlight that government, the corporate sector and individuals should be responsible for addressing climate change. Furthermore, the newspapers often portray climate change to be caused by anthropogenic activities and infrequently report on climate change as a natural cycle. The newspapers often report on climate change in conjunction with recent weather events that are assumed to be associated with climate change highlighting the associated environmental concerns. The newspapers hardly ever report on climate change from a religious or moral standpoint. The newspaper analysis illustrates that climate change has an effect on various financial issues and the green economy.

The newspaper readers understand that climate change is a natural cycle which has been affected by anthropogenic activities. Media has affected the newspaper readers' perceptions of climate change but they rely on a number of other media sources as well. People have made positive lifestyle and behavioural changes to address climate change. However the readers will only make changes that they can afford and mostly for their own benefit.

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I would like to thank my supervisor, Ms Cheryl Chamberlain for agreeing to supervise me in my second and third years of research and supporting me and seeing me through the completion my Master of Arts degree. I would also like to thank my first supervisor, Zarina Patel, for assisting me with the start of my Master of Arts degree before leaving for Cape Town.

I would like to thank Mr Dickon Jayes from the Mail & Guardian newspaper for assisting me in acquiring a data base of respondents and their contact details in order to complete the questionnaires for this research.

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Chapter 1: Introduction

Climate change is the most concerning environmental issue that the world is currently experiencing (South African National Climate Change Response Strategy for South Africa, 2004). “Climate change is a challenge that has consequences for all South Africans and if unmitigated it is likely to have serious consequences for our patterns of production and consumption, our livelihoods and the allocation of national resources” (South African National Climate Change Response Green Paper, 2010, 30). Climate change and environmental issues have become increasingly important in the public sphere because the climate appears to have been changing and its impacts directly affect people and the environment (Burgess, 1999; UNEP, 2002). A result of the changing climate is that a debate has evolved which specifically focuses on the causes of climate change. The climate change debate fluctuates between two contrasting views: the first view is the belief that the Earth is going through its natural cycle where natural fluctuations in the climate are observed; and the second view is that people are seen to be the major contributors to climate change through their daily activities which release carbon emissions (Leach, Mearns and Scoones, 1997; Baron, 2006; Houghton, 2009). Depending on whether people feel climate change is a natural cycle or anthropogenically induced, different responses or behaviours will be constructed accordingly.

The media has helped portray scientific claims and concepts to the public in a way that can be easily understood. Although the media has an important role in reporting on such scientific claims, it is interesting to determine the impact the media has on the public’s knowledge and behaviour changes with regard to information of high value (Burgess, 1999). This research will determine how climate change is reported in the media and how environmental awareness regarding climate change is raised through the media. This research will also examine to what degree the newspapers influence public perception of climate change, what influences public behaviour and whether there are other external influences which affect the public’s decisions and behaviour regarding climate change. There are many case studies that illustrate the relationship between the media and climate change in a northern hemisphere, first world context, but few demonstrate the relationship between the media and climate change in a southern hemisphere, third world context. Therefore, it is important to research the relationship between the media and the behaviour of the public in a South African context as there are few researched examples of this relationship.

It is interesting to note that information from the media is becoming integrated into formal documents and decision making agreements. Specific focus is being drawn to communicating and educating the public of global climate change through various media forms. Communicating the problem of climate change through education and media can be an effective way of highlighting the significance of this issue (National Research Council of the National Academies, 2010). The media is a good way to distribute basic information regarding scientific issues (National Research Council of the National Academies, 2010). The media has a great influence with communicating and educating issues of

climate change to the public. Introducing the media into documents and papers encourages society to become involved with addressing climate change.

The purpose of this research is to determine the way the South African print media (specifically newspapers) report on and raise awareness of climate change. The research also investigates the relationship between society and the media by determining what affects public perception of climate change and what results in behavioural changes towards addressing climate change. The study was conducted in Johannesburg, South Africa. Three local newspapers were chosen for this research, The Star, Mail & Guardian and BusinessDay, to see how climate change is represented in the media in order to determine the public's perception of climate change and environmental behaviour.

Aims and Objectives

The aim of this research was to examine the relationship between the newspaper media and its portrayal of climate change in three local Johannesburg (Gauteng) newspapers, and then to determine what influences public perception and individual action to address climate change. This research addressed three research questions:

1. How is the climate change contestation represented in the media?
2. What effects do climate change media messages have on the public?
3. What are the other factors that influence public behaviour to address climate change?

Newspaper articles relating to climate change were collected, between January 2011 and Jan 2012, from three South African newspapers – The Star, Mail & Guardian and BusinessDay. People who read these newspapers were each invited to complete a questionnaire which determined how the media affects public perception of climate change. The questionnaire also investigated where the public acquires their climate change information, and what influences them positively to change their behaviour, attitude and lifestyles to address climate change. Content analysis was then carried out in order to determine what messages are portrayed to the public through this form of media.

Through this study, the way in which the media (specifically The Star, Mail & Guardian and the BusinessDay newspapers) report on climate change is investigated. The study sheds light on the information which the newspapers are relaying to the public regarding climate change. Following on from this, the researcher was also able to determine what climate change information the public received from the selected newspapers and how this affects their perceptions of climate change.

Chapter 2 looks into existing **literature** on climate change and related climatic processes and the media's coverage of climate change. Case studies are provided which look at media reporting on climate change in Germany, Australia, the United States of America and the United Kingdom. Finally the literature describes potential influences which may affect people's perceptions of climate change.

Chapter 3 explains the **methods** that have been used to complete this research project as well as the methods used to analyse both sets of data. The secondary and primary data is discussed as well as

how the data sets were collected and analysed. Included in the methodology is a description of the respondents, who participated by completing questionnaires, and the ethics of completing the research.

Chapters 4 and 5 present the outcome of the secondary and primary data analysis. The analysis of newspaper articles is described in **Chapter 4**. The focus is on the common frames (adapted from Dirikx and Gelders, 2010) and the associated themes in the newspaper articles reporting on climate change. A frame is used to categorise the main topics and ideas of an issue (Carvalho, 2007). **Chapter 5** examines questionnaire responses from the newspaper readers and the readers' understanding of climate change is explored. The newspapers' influence on the readers' perceptions of climate change are examined and the other factors which influence the readers' climate change perceptions and lifestyles are described. **Chapter 6** is describes the key findings of this research.

Chapter 2: Literature Review

The literature review follows four main themes: climate change; the relationship between society and climate change; the representation of climate change in the media; and factors which make people aware of climate change.

2.1. Climate change

This first theme is an introduction to the climatic system (including the carbon, energy and water cycles with the role of the biosphere) and climate change and its relation to the greenhouse effect. Included in this introduction are global warming, climate change and climate variability, followed by the importance of climate change; future projections of climate change and the misconceptions regarding climate change.

2.1.1. The climate system

The Earth's climate system itself consists of a number of elements which include the atmosphere, land, snow, ice, oceans and all living creatures as well as the associated biological, physical and chemical interactions between these elements (IPCC, 2001; IPCC, 2007a). Therefore, climate is the state of this whole interactive system (IPCC, 2001). This interactive system is illustrated in Figure 1 below.

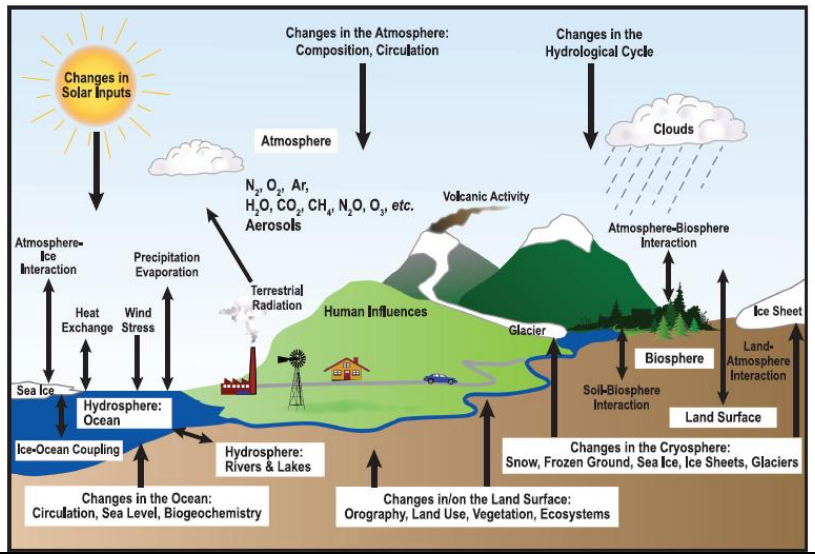


Figure 1: Schematic view of the components of the climate system, their processes and interactions. (IPCC, 2007a, 104).

Weather describes the atmospheric conditions (temperature, wind, humidity, pressure, cloud cover, precipitation, and weather events) which are present in the atmosphere at a particular place and time (IPCC, 2013). **Climate** is associated with and defined according to a noticeable change in the average weather over a period of time ranging from months, years, and centuries to millennia, all of which is studied and used to define particular events such as drought (IPCC, 2001; IPCC, 2007a; Webber, 2010; IPCC, 2013). The climate is influenced by a natural internal balance as well as external influences known as 'forcings'. These forcings can be volcanic eruptions, solar radiation and anthropogenic changes (IPCC, 2001; IPCC, 2007a).

Noticeably scientific studies have shown that since the industrial revolution, the impact of anthropogenic activities has affected the climate system and the impact has been felt globally (IPCC, 2001; Nicholson-Cole, 2005; IPCC, 2013). Anthropogenic emissions add to the greenhouse effect as there is an increase in the concentration of carbon dioxide (CO_2) from the burning of fossil fuels particularly since the start of industrial production (IPCC; 2001; IPCC, 2007a). The release of greenhouse gases and aerosols affects the composition of the atmosphere which in turn affects the ability of long-wave radiation to return back to space (IPCC, 2001; Ahrens *et al*, 2011). Through studies on the air trapped in ice-cores, results have shown a dramatic increase in carbon dioxide, methane and nitrous oxide compared with pre-industrial periods (IPCC, 2007a; IPCC, 2013). The climate is affected by the varying concentrations of greenhouse gases and the greenhouse effect (IPCC, 2007a).

There are observed changes seen today that are associated with the changing climate and anthropogenic activities. These changes include an increase in the temperatures, sea level increases, sea ice melt, and precipitation changes (IPCC, 2001; IPCC, 2013). Science has proven the occurrence of anthropogenic climate change through the study of atmospheric, oceanic, land and cryogenic systems (IPCC, 2013). The IPCC (2001; 2013) confirmed that there has been a consistent increase in global ocean and surface land air temperatures through the 1900s. The 20th century (particularly towards the end of it) is seen to be unnaturally warm and as a result it is considered to be the warmest century of the past 1000 years in the Northern Hemisphere (IPCC, 2001). Scientists explain that these changes are associated with anthropogenic climate change (IPCC, 2013).

There have also been temperature changes in the upper atmosphere. The apparent decrease in day time temperatures is closely associated with the increase in cloud cover. Clouds have a greenhouse type effect because they absorb and emit solar radiation. However, because they are light in colour they largely reflect insolation and have a cooling effect (IPCC, 2001; IPCC, 2007a). A result of the increased temperature is that glaciers have retreated; decrease in snow and a decrease in the duration of iced rivers and lakes have been noticed as well as the decrease in the thickness or volume of Arctic sea ice in summer and autumn since the 1980s (IPCC, 2001; IPCC, 2007a). This melt is not only from natural forcings but anthropogenic forcings have had a noticeable impact on sea ice melt (IPCC, 2007a). The changes in precipitation are from increased water vapour and temperature which in turn affects the hydrological cycle. This change in precipitation also affects the storm intensity and amount of precipitation falling (IPCC, 2001). An illustration of the increasing

temperature can be seen in Figure 2 (see below) and the changes can be seen in Figure 3 (see page 7).

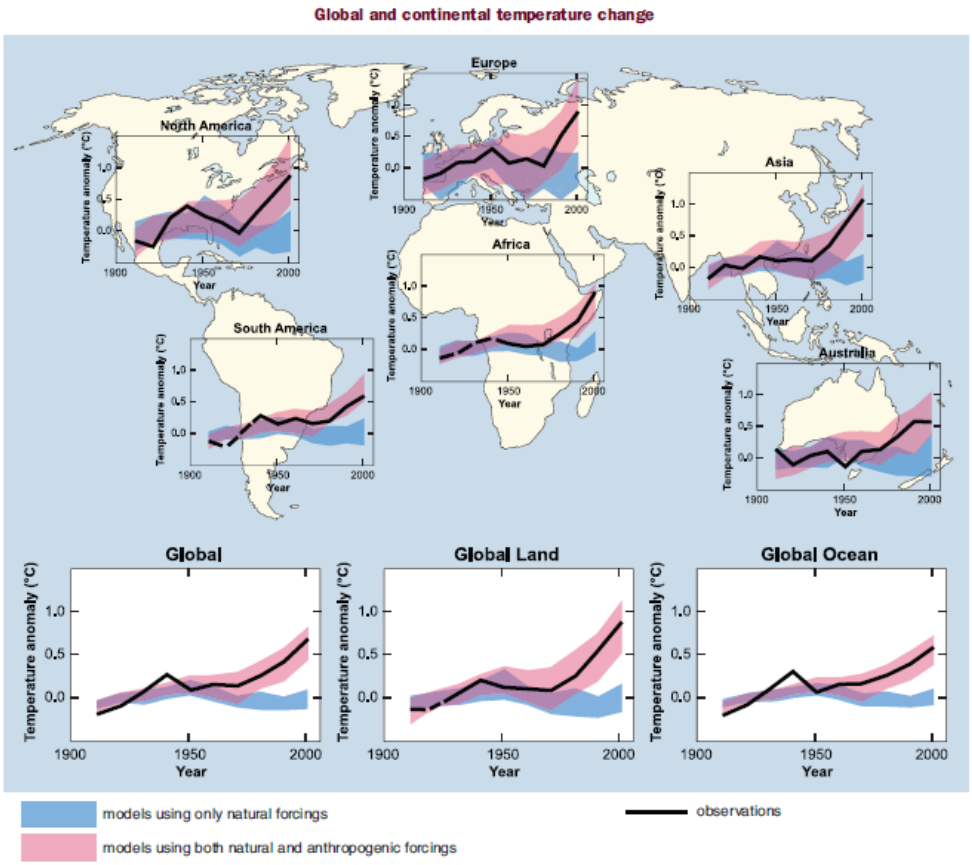


Figure 2: Comparison of observed continental- and global-scale changes in surface temperature with results simulated by climate models using either natural or both natural and anthropogenic forcings (IPCC, 2007b, 40).

Decadal averages of observations are shown for the period 1906-2005 (black line) plotted against the centre of the decade and relative to the corresponding average for the 1901-1950. Lines are dashed where spatial coverage is less than 50%. Blue shaded bands show the 5 to 95% range for 19 simulations from five climate models using only the natural forcings due to solar activity and volcanoes. Red shaded bands show the 5 to 95% range for 58 simulations from 14 climate models using both natural and anthropogenic forcings. {WGI Figure SPM.4}.

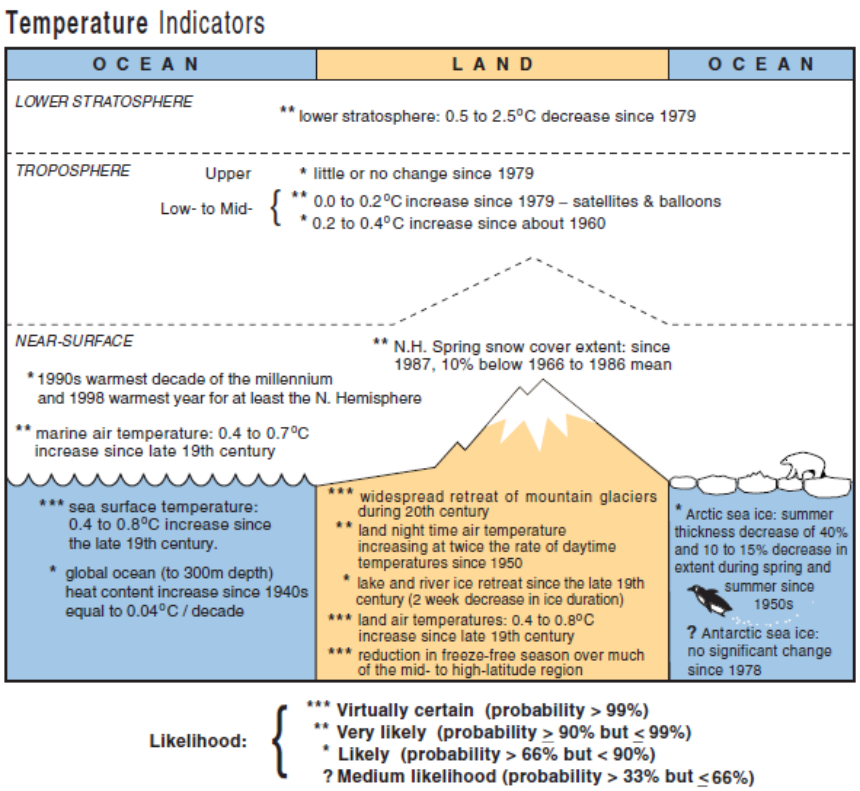


Figure 3: Schematic of observed variations of various temperature indicators (IPCC, 2001, 164).

The carbon cycle

Carbon dioxide is a greenhouse gas which is found in the Earth's atmosphere together with methane, CFC's, nitrous oxide and aerosols (IPCC, 1990). The results from studies on carbon dioxide show that there is more CO_2 in the atmosphere today than there was in the pre-industrial period and these levels are continually increasing (IPCC, 2007a; South Africa's Second National Communication under the United Nations Framework Convention on Climate Change, 2011). Research and studies show that atmospheric carbon dioxide levels have increased significantly over the last 250 years. The pre-industrial carbon dioxide readings were around 275 – 285 parts per million (ppm). The readings taken in 2005 measured 379 ppm. The increase in the first 50ppm was reached in the 1970s. This took about 200 years whereas the second increase in 50ppm was reached in the following 30 years. The period between 1995 and 2005 saw an increase of carbon dioxide by 19ppm on its own (IPCC, 2007a). An illustration of this increase of carbon emissions can be seen on Figure 4 (see page 9).

Studies of the air trapped in ice cores also show the same increase in greenhouse gases since the industrial revolution when people first contributed to the effects of climate change. The ice cores are studied because air containing particles, trace gases and aerosols (such as carbon) is trapped. An ice core is taken from the polar ice-shelf and the air in an ice sample is tested and will reflect the

conditions for a particular time period (IPCC, 1990; IPCC, 2007a). These ice core studies have allowed scientists to study the natural climate variation from thousands of years ago and to determine the more recent increase in carbon emissions (IPCC, 1990; South Africa's Second National Communication under the United Nations Framework Convention on Climate Change, 2011). The ice cores show that from around the 1800s CO_2 concentrations increased and that by the 1900s the carbon readings were even higher. Compared with the natural fluctuations, in the last 200 years, CO_2, has increased by 25%, methane has increased by 120% and Nitrous Oxide has increased by 9%, all from anthropogenic emissions (IPCC, 2007a). These figures indicate that people have affected the natural climate cycle and have contributed significantly to the triggers of anthropogenic climate change through increased carbon emissions (IPCC, 2013).

Scientific studies show that there is a noticeable change in the atmosphere due to anthropogenic activities since the industrial revolution (IPCC, 1990; IPCC, 2007a). The increase in the greenhouse gases is due to anthropogenic activities releasing these carbon emissions (IPCC, 1990). Evidence of these emissions is illustrated in Figure 4 (page 9) where the graph shows an increase in CO_2, methane and nitrous oxide emissions from preindustrial periods till 2005. The current emissions are from anthropogenic activity, mainly from using energy from burning fossil fuels (IPCC, 2001; IPCC, 2007a). Land use change is also considered to have an impact on carbon emissions. Such changes include, deforestation, land use for crops, changes in soil (IPCC, 2001; IPCC, 2007a). The IPCC (2013) describes that land use change (by clearing an area) affects the carbon concentrations released to the atmosphere; alters the albedo of the land; and changes evapotranspiration and longwave emissions. Within South Africa the increase in carbon emissions is from energy usage, industry, agriculture and the waste sector (South Africa's Second National Communication under the United Nations Framework Convention on Climate Change, 2011). Even if the CO_2 levels are restricted today there would still be repercussions by the end of the next century. Therefore, there needs to be a dramatic decrease in current emissions for the emission levels to remain constant in the future (IPCC, 1990).

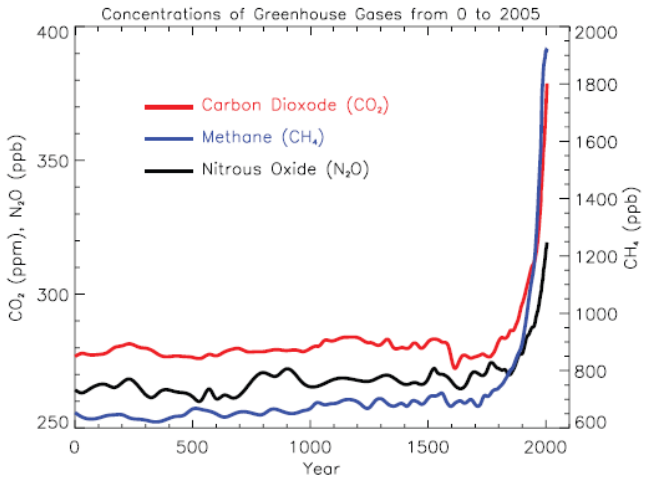


Figure 4: Atmospheric concentrations of important long-lived greenhouse gases over the last 2000 years (IPCC, 2007a, 135).

Increases since about 1750 are attributed to human activities in the industrial era. Concentration units are parts per million (ppm) or parts per billion (ppb), indicating the number of molecules of the greenhouse gas per million or billion air molecules, respectively, in an atmospheric sample.

It is important to record atmospheric gas concentrations and to understand the chemical, physical, geological, biological and social processes which have affected the observed changes. Therefore it is important to understand the interactions between the atmosphere and land ecosystems, oceans and sediments and in what way people have influenced these processes (IPCC, 1990). In order to make projections of atmospheric and greenhouse gas changes, these processes and changes need to be understood (IPCC, 1990).

The carbon cycle itself is one part of the climatic system. Carbon is cycled between the atmosphere, oceans, land and ocean biota, sediments and rocks. The most noticeable carbon exchanges occur between the atmosphere and land as well as between the atmosphere and the ocean (IPCC, 1990). The atmosphere, ocean and terrestrial bodies play various roles within the carbon cycle. Within the atmosphere, CO_2 levels at the troposphere level remains fairly stable as this record is taken over a year. Again the ice core studies have shown an increase in CO_2. The carbon exchange occurs between the ocean (the largest carbon sink) and the atmosphere. This exchange takes place both ways as well as between the upper surface of the ocean and the deeper levels (IPCC, 1990). Terrestrial bodies affect the carbon cycle through processes such as photosynthesis and autotrophic respiration. The carbon balance at this stage is dramatically affected by the human impact, climate change and environmental changes. Finally the anthropogenic effect on the carbon cycle is affected by the burning of fossil fuels and land use change which emit excess CO_2 and aerosols into the atmosphere and changes the albedo and longwave radiation (IPCC, 1990; IPCC, 2013).

The energy cycle

The Earth's climate relies on balance of incoming and outgoing radiation and this is affected by insolation, greenhouse gases, clouds and aerosols. These elements all occur naturally but are affected by anthropogenic activity (IPCC, 1990).

Solar radiation is seen to be the major driving force behind the climate system (IPCC, 2001; IPCC, 2007a; IPCC, 2013). The solar balance is influenced by changing insolation due to the Earth's tilt and orbit or the sun itself; the amount of radiation that is reflected back into space and the longwave radiation going back into space (which is affected by greenhouse gases) (IPCC, 2007a). The majority of the energy reaches the Earth at the tropics and subtropics and is then transported via atmospheric and oceanic processes (IPCC, 2013). The energy that reaches the Earth's atmosphere is mostly reflected back by clouds and air particles as well as oceans, ice and deserts, or areas known as light areas. The balance of the unreflected energy is either absorbed by the Earth's surface or by the atmosphere. Because the Earth has absorbed energy it has to maintain homeostasis by releasing a similar amount of energy in order to regulate a constant temperature. The Earth does this by releasing long-wave radiation back towards space (IPCC, 2001; IPCC, 2007a; IPCC, 2013). The Earth remains warm because the main greenhouse gases (carbon dioxide and water vapour), traps or 'prevents' the long-wave radiation from returning back to space (IPCC, 2001; IPCC, 2007a; Ahrens *et al*, 2011; IPCC, 2013). The return of longwave radiation is what warms the atmosphere and the Earth's surface (IPCC, 2013). This is known as the natural greenhouse effect (IPCC, 2001; IPCC, 2007a). The greenhouse gases absorb and emit the radiation which creates the blanket-like effect (IPCC, 2001). Clouds also have a greenhouse type effect as they absorb and emit radiation as well. However, because they are light in colour they mainly reflect insolation and mainly have a cooling effect (IPCC, 2001; IPCC, 2007a). The presence of aerosols in the atmosphere affects cloud formation as they act as condensation nuclei. Therefore as aerosol concentrations and distributions change, so will cloud formation change thereby affecting the albedo clouds of solar radiation. This affects the warming or cooling effect of clouds in the energy cycle (IPCC, 2007a). Figure 5 (see page 11) illustrates the energy transfer and balance processes that take place within the Earth's atmosphere.

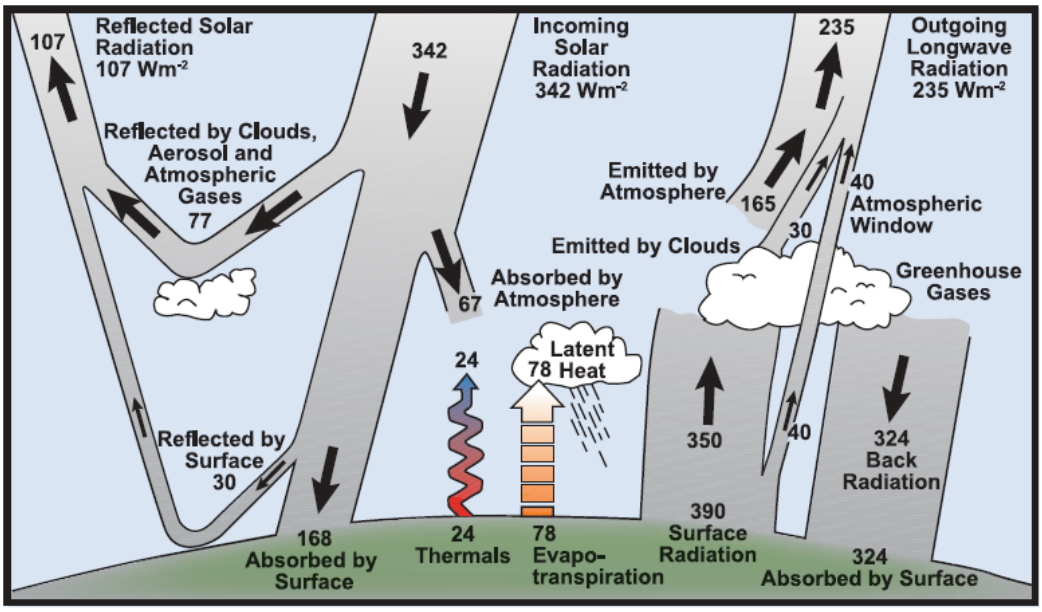


Figure 5: Estimate of the Earth's annual and global mean energy balance (IPCC, 2007a, 96).

Over the long term, the amount of incoming solar radiation absorbed by the Earth and atmosphere is balanced by the Earth and atmosphere releasing the same amount of outgoing longwave radiation. About half of the incoming solar radiation is absorbed by the Earth's surface. This energy is transferred to the atmosphere by warming the air in contact with the surface (thermals), by evapotranspiration and by longwave radiation that is absorbed by clouds and greenhouse gases. The atmosphere in turn radiates longwave energy back to Earth as well as out to space.

Energy that enters the atmosphere is transported to the Earth via the atmosphere through latent heat (when water vapour condenses) and via ocean circulation by wind, rain and evaporation (IPCC, 2007a). The Earth's rotation affects the atmospheric circulation through the different wind belts, and land features affect the local climate. There are positive and negative feedback mechanisms which affect the climate. The IPCC (2007; 2013a) gave an example of a negative feedback mechanism and illustrated the idea that as the Earth warms, snow and ice melts to reveal the dark under-surface. This surface absorbs further energy thereby increasing the rate of ice and snow melt. An example of a positive feedback mechanism is an increase in surface temperature increases the concentration of water vapour. An increase in the concentration of water vapour affects the greenhouse effect which continues to warm the Earth's surface (IPCC, 2013). It is important to recognise that even if carbon

emissions were stopped completely and forcings were set to the present figures, climate change would continue until it reached a balance with those forcings (IPCC, 2013).

2.1.2. Global warming, climate change and climate variability

The IPCC (2007, 96) describes climate as "...a complex interactive system consisting of the atmosphere, land surface, snow and ice, oceans and other bodies of water and living things". In an everyday context the term incorporates average temperature, rainfall and wind over a specified period of time. By observing and comparing these specified time periods that we are able to study climate change and then go on to deduce the factors that cause climate change, whether they be natural events or human impact (IPCC, 2007a; Houghton, 2009).

Global warming, climate change and climate variability are three terms referring to different aspects of the changing climate system. **Global warming** is the natural "...warming of the Earth, based on average increases in temperature over the entire land and ocean surface" (Davies and Joubert, 2011, 16). The regional variations in climate are what differentiate climate change from global warming (Davies and Joubert, 2011).

The IPCC (2007) describes **climate change** as the change in the climate which can be seen in the change in the average or variability of its properties, and that it occurs for long periods of time (decades to hundreds of years). Climate change occurs due to natural internal processes, such as natural variability, and external influences, such as insolation and anthropogenic activities (IPCC, 2007a; Davies and Joubert, 2011). Climate change refers to the "...global and regional responses to those human influences" (Davies and Joubert, 2011, 8). Climate change includes the changes in average temperature, rain, humidity, wind and events all of which impact on people directly (Davies and Joubert, 2011). Through research, scientists have agreed "that there is strong evidence that most of the observed warming of the Earth over the last 50 years is attributable to human activities", thereby suggesting that the natural climatic cycle is seen to be impacted by or caused by people (Antilla, 2005, 338).

Climate variability refers to the variations in the climate associated with season changes and yearly climatic changes. The changes are associated with the "natural internal processes within the climate system" and are influenced by the Earth's tilt, rotation and orbit around the sun (Davies and Joubert, 2011, 16). The difference between climate change and climate variability is that although climate variability may last for seasons or a year, climate change lasts for extended periods of time i.e. decades to hundreds of years (Davies and Joubert, 2011). **Internal variability** is continually present in the atmosphere and the associated processes work on all time scales from immediate changes to years (IPCC, 2001; IPCC, 2007a). Internal variability occurs from different parts of the climate system where oceans and ice-sheets (for example) work together with atmospheric processes (IPCC, 2007a). Internal variability is also created by compounded interactions between various climatic components (such as the oceans, ice-sheets and atmosphere) where phenomena such as El Niño are created (IPCC, 2001; IPCC, 2007a). There is a suggestion that even with no external forcings the climate

would still vary naturally because the system's components themselves are always changing (IPCC, 2001).

As already explained, climate is influenced by anthropogenic activity. The IPCC (2007; 2013a) has concluded that the gas emissions from anthropogenic activities have contributed to more warming than was originally expected. Similarly, the warming changes that have been experienced in the last 100 years cannot be blamed entirely on natural causes because people have affected the climatic system. People have affected the climatic system through the release of carbon emissions, and in some remote areas, the high carbon emission levels are fully from anthropogenic activity (IPCC, 2013). However, the greenhouse gas forcings are likely to have been responsible for most of the global warming (IPCC, 2007a). This implies that excessive greenhouse gases have definitely affected the Earth's climate. Records of surface and ocean temperatures have been taken and show the gradual increase in temperature through the decades (IPCC, 2007a).

2.1.3. Climate change and the greenhouse effect

The greenhouse effect is a phenomenon which is associated with climate change and is either natural or enhanced. The natural greenhouse effect works much like a greenhouse used for growing plants. Incoming solar radiation (insolation) enters the Earth's atmosphere and is reflected back into space by particles in the atmosphere, oceans and lighter areas of snow, ice and deserts, while the remaining insolation heats the Earth's surface (IPCC, 2007a; Houghton, 2009; IPCC, 2013). As insolation is absorbed by the atmosphere and Earth's surface, the Earth has to release a similar amount of energy (longwave radiation) in order to maintain a constant state of being - homeostasis (IPCC, 2007a; Houghton, 2009; IPCC, 2013). Heat transfer is done mainly through convection where air at the surface is heated and then rises, cools and sinks back to the Earth's surface (Houghton, 2009). The natural greenhouse effect occurs where natural greenhouse gases, already found in the atmosphere, (e.g. water vapour and carbon dioxide) absorb outgoing radiation thereby warming the Earth's atmosphere (Houghton, 2009). Figure 6 (see page 14) is a diagram explaining the greenhouse effect.

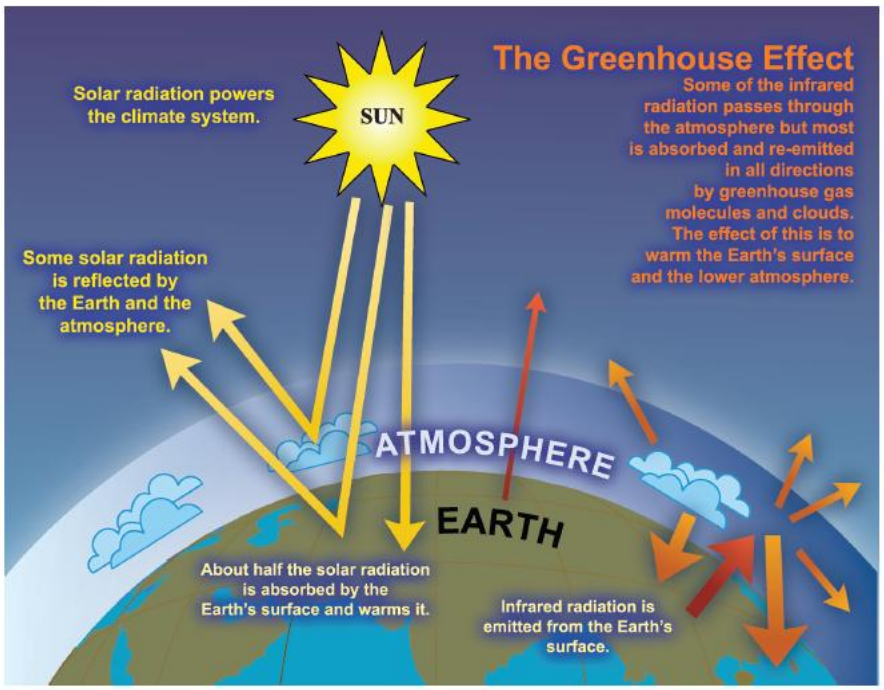


Figure 6: An idealised model of the natural greenhouse effect (IPCC, 2007a, 115).

In the 1990 IPCC Scientific Assessment, McBean and McCarthy (1990) illustrate that with regard to the natural greenhouse effect, people may not become involved with preventing the natural cycle of climate change. What may happen is that research and investigation take place to determine what is happening in the natural cycle, to establish to what extent terrestrial and marine ecosystems affect and impact on climate change to explain the expected natural climate change. The focus is on climate monitoring (McBean and McCarthy, 1990).

The enhanced greenhouse effect is the result of human activity where excess greenhouse gases (carbon dioxide, methane, nitrous oxide and chlorofluorocarbons) are released into the atmosphere (Houghton, 2009; IPCC, 2013). Research has shown that since the industrial revolution there has been a noted increase in the concentration of greenhouse gas emissions being released into the atmosphere through everyday activities like deforestation, burning fossil fuels, and land use change (IPCC, 2007a; Houghton, 2009). However more recently, the IPCC (2013) has stated that there has been a decrease in ozone depleting substances. The release of excess carbon dioxide into the atmosphere has increased the concentration of CO_2 in the atmosphere which makes it difficult for longwave radiation to return back to space (IPCC, 2007a). In this instance there is more radiation entering than leaving the Earth's atmosphere. The result is that as populations increase and industrialisation develops further, more greenhouse gases will be released into the atmosphere (Houghton, 2009).

With regard to action concerning the enhanced greenhouse effect, the more concern there is from society the more likely action will arise. People are more likely to become involved with climate change and reducing the "...risks when the source of harm is human than when the source is natural" (Baron, 2006, 139). Therefore, the enhanced greenhouse effect is more likely to rally the public and encourage environmentally friendly personal changes. People may feel responsible for the damage caused to the environment and may become involved with climate change mitigation in order to minimise their impact on climate change (Baron, 2006). Questions may also arise concerning who should take responsibility for addressing climate change (Gavin *et* al, 2011). The climate change problem is defined differently in certain contexts and therefore the suggested solutions will vary according to what the definition of the problem is (Hajer, 1995). Therefore each person or group has its own worries or issues regarding climate change (Quiring, 2007). If one accepts that climate change is affected by anthropogenic activities, debates will arise as to who should take action and global responsibility. The question is whether the developed or developing nations should take responsibility for climate change. Currently, action should be taken so as to minimise the impacts of human induced climate change (Baron, 2006). Policies and governance will play a huge role and regulation is vitally important.

2.1.4. The importance of climate change

"Global climate change may be the greatest environmental risk of our time. Of all time. It has the potential to affect all of Earth's inhabitants, like previous climate change has, but perhaps in a shorter time-frame and on a larger scale." (Wilson, 2000, 201). Changes in weather and climatic patterns are observed with the frequent occurrence and/or increased strength of extreme weather and climatic events (IPCC, 2007a; IPCC, 2013). Examples of such changes in weather patterns are changes in snow, ice patterns and rise of ocean levels, increased rainfall and period of droughts (IPCC, 2007a). Studies of the interaction between society and the environment have become more important as the environment has become an ever increasing controversial issue (Burgess, 1999). The level of awareness of climate change has fluctuated since the 1960s but has become increasingly important and has gained more attention. (Burgess, 1999; Wilson, 2000; UNEP, 2002). The anthropogenic effects on the climate system first became evident in the 1980s when the consequences of human induced climate change became apparent (Burgess, 1999).

The anthropogenic effect of climate change is most concerning especially with regard to the possibility of people, ecosystems, and species having to adapt to the swift onset of climate change which will affect the availability of resources and impact on livelihoods, health and development (Wilson, 2000; Houghton, 2009). The survival of species and resources depends on the ability for them to adapt to their changing environment. This gradual process is directly affecting society in a negative way (Lebel, 2007). Climate change will be experienced differently depending on where it is experienced and it is therefore important to find ways to reduce and mitigate against the effects of climate change (Houghton, 2009; South Africa's Second National Communication under the United Nations Framework Convention on Climate Change, 2011). The impacts of climate change are seen in changes in water and food availability, sea level rising and extreme weather events (Houghton, 2009).

Although awareness of climate change has fluctuated over the past couple of decades, it was when the dangers and outcomes of climate change in specific geographical areas were realised that most awareness and concern for climate change was created (Carvalho and Burgess, 2005).

2.1.5. What we know (and do not know) about climate change and its implications

There is an incredibly strong agreement among various scientific bodies who explain that climate change is affected by carbon emissions released by human activities (IPCC, 2001; IPCC 2013; Orsekes, 2014). The increasing carbon emissions are the predominant agents responsible for anthropogenic climate change are radically affecting the natural greenhouse effect (Berliner, 2003; Davies and Joubert, 2011).

What we do know is that there are a number of climate change indicators which are the earth's physical responses to the changing climate. These responses include changes in surface temperatures, changes in precipitation, changes in weather events, changes in glaciers, oceanic and land ice as well as increases in sea level (IPCC, 2013). The analyses of various records (ice core studies, atmospheric studies, cryosphere and oceanic systems) illustrate the climate changes that have occurred in the past and what can be expected in the future (South Africa's Second National Communication under the United Nations Framework Convention on Climate Change, 2011; IPCC, 2013). Observations and research have been completed by many scientists in various countries using different forms of technology all show that the climate is changing across the planet (IPCC, 2013).

The climate is important to us because it provides us with resources for food and water, determine where we live and it affects society and the economy (Davies and Joubert, 2011). The implication of climate change is that society and ecosystems will and are being affected by climate change as resources are directly affected and plants and animals are losing their habitats (Oreskes, 2014). Although there is an agreement that climate change is occurring, there is some debate regarding how fast the future climate will change. Within the scientific fraternity, the number of scientists writing on climate change with some sceptical view is minimal. It is the media who focuses on this small group of climate sceptics and gives them a large voice (Oreskes, 2014). A number of these sceptical voices are not recognised climate scientists and therefore criticise climate scientists' work for the benefit of the mass media and public opinion (Oreskes, 2014).

2.1.6. The projection of future climate changes

Projecting the future of climate change is an extremely complex and speculative process (Wilson, 2000; Farbotko, 2005). Global climate models and general circulation models (GCMs) are used to project or describe possible future climates and climatic patterns based on past events and the current understanding of the climate and its associated processes or systems (Wilson, 2000; Tadross *et al*, 2011; South Africa's Second National Communication under the United Nations Framework Convention on Climate Change, 2011). Atmospheric and human interactions are taken into account to produce models projecting best and worst case climatic scenarios (Tadross *et* al, 2011).

Climate change will continue but its impact on people cannot be easily determined (Nicholson-Cole, 2005). The future projections of climate change have a certain level of uncertainty (Houghton, 2009). Uncertainty is an issue for two reasons. The first reason is because the temperature record is too short to be used and therefore accurate data cannot be given (Wilson, 2000). The second reason for the uncertainty of the future climate is due to the future needs and activities of people (Houghton, 2009). The response to climate change will provide new ways to help curb climate change: some at a high cost and others at a lower cost. Alternative energies are currently being investigated and used, while awareness about climate change is being highlighted. Along with this awareness, programmes are being developed to help people change their lifestyles and become less dependent on certain resources to help conserve the environment (Houghton, 2009).

Current scientific studies have shown that there has been a clear increase in average global temperatures over the past century and the last decade has been the warmest recorded. This can only be explained through human activities (Davies and Joubert, 2011; Tadross *et al*, 2011; IPCC, 2013). If climate change occurs at the expected rapid rate, society will not be able to adapt to the change fast enough. Therefore populations and ecosystems will not be able to adapt to these changes easily (Wilson, 2000; Houghton, 2009). The human-induced climate change is most concerning (IPCC, 2001).

The United Kingdom Meteorological Office (2011) says that South Africa will experience a number of changes with the climate. The climate and weather that South Africa currently experiences affects society, and extreme events affects lives, infrastructure and the economy. The captured data in the records that have been compiled from 1960 till 2010 show that there has been a general increase in temperatures in South Africa. Therefore summers and winters will become warmer. The temperature extremes will also change where warmer days and nights will become more frequent and colder days and nights will become less frequent. This is due to the anthropogenic impact on the climate (United Kingdom Meteorological Office, 2011). Specifically it has been predicted that inland temperatures in South Africa could increase by 4^{o}C and at the coastal regions temperatures could rise by 3^{o}C. Rain is also said to be affected by climate change where flooding and droughts will be expected (United Kingdom Meteorological Office, 2011).

2.1.7. Misconceptions associated with climate change

There are several misconceptions associated with climate change. Some studies have looked at people's basic understanding of climate change and found that there is confusion of climate-related terms. Most often the results show that people have varied misunderstandings regarding climate change (Read *et al*, 1994). People know of climate change but hold misconceptions (Wilson, 2000). There are misconceptions between terms such as 'greenhouse effect', 'global warming' and 'climate change'. There is often confusion between the depletion of the ozone layer, climate change and global warming.

There is common confusion between ozone depletion and global warming (Cordero, 2001; Kilinç *et al*, 2008). Ozone depletion is frequently assumed to be related to all climatic processes (Read *et al*,

1994). In this situation, the public assume that because there are 'holes' in the ozone layer, more solar energy is able to enter the Earth's atmosphere and reach the surface thereby causing and adding to the enhanced greenhouse effect by 'trapping' the gases (Read *et* al, 1994; Cordero, 2001). Many people also assume that the 'hole' in the ozone layer lets in more insolation and ultraviolet radiation which subsequently heats up the atmosphere and continually warms the Earth as it is assumed that the heat is not released back into space. There is little mention of the role of the natural greenhouse effect regulating the Earth so that there is the balance of incoming and out-going radiation (Bostrom *et al*, 1994).

Other common confusions are that global warming is caused by the greenhouse effect and the fact that weather and climate are often assumed to be the same thing (Bostrom *et al*, 1994). In Wilson's (2000) study, he describes that there is commonly confusion between climate change, global warming and the greenhouse effect, where all the terms are assumed to refer to the same issue. Kilinç *et al* (2008, 95) say that "the fact that the term 'climate change' has become almost interchangeable with the term 'global warming' means that changes to weather patterns are a well-known consequence of global warming. The misconceived relationship between global warming and the greenhouse effect is that too much insolation reaching the Earth's atmosphere because of the 'holes' in the ozone layer (Kilinç *et al*, 2008). The confusion between the terms can be attributed to the media reporting on climate change and using similar terms interchangeably to refer to the same issue (Bostrom *et al*, 1994; Read *et al*, 1994).

There are a number of other misconceptions concerning global warming. There is an assumption that global warming leads to an increase in the frequency of natural disasters such as earthquakes (Kilinç *et al*, 2008). The participants in the study by Kilinç *et al* (2008) demonstrated that people also believe that climate change will cause a number of diseases including cardiac problems, food poisoning and polluted water (Kilinç *et al*, 2008). Following from this people also think that litter as well as radioactivity could add to the effects of global warming (Kilinç *et al*, 2008). Other misconceptions of global warming suggest that protecting species would help reduce the effects of climate change. The confusion here is that in reality species are threatened by climate change when their habitats are affected by the effects from global warming. Other confusions of global warming among people were that cleaning beaches and reducing pollution in the sea as well as using unleaded petrol and reducing usage of nuclear powered machines would reduce the effects of global warming (Kilinç *et al*, 2008). Therefore, people frequently fail to associate correctly certain events with climate change (Weber, 2010).

2.2. The relationship between society and climate change

The second theme focuses on the relationship between society and climate change and the development of environmental literacy and societal responsibility.

2.2.1. Developing environmental literacy

Environmental education focuses on people's understanding of their intricate and delicate relationship with the environment and people's general grasp of the physical and man-made environment and its relationship in society. It also involves the understanding of the biophysical environmental problems with man and how to solve and take responsibility for these problems and finally creating a concern in order to encourage people to become involved with solving environmental problems (Stapp *et al*, 1969). Therefore the goal is to focus on raising awareness of and sensitivity towards the environment, to develop people's attitudes and skills as well as to encourage society to participate in addressing environmental problems (Hungerford and Volk, 1990).

One aspect of environmental education is environmental literacy. Environmental literacy influences environmental attitudes of the public and encourages them to become environmental citizens. Environmental literacy provides the public "...with the necessary knowledge, skills and motives to cope with environmental needs and contribute to sustainable development" (Hawthorne and Alabaster, 1999, 29). It is difficult for the average person to comprehend fully the intricate details regarding environmental problems (Schneider, 1997). For people to become environmentally literate, society needs to understand the relationship between decision making processes, social processes and the scientific method. When society has this understanding, people are able to ask questions pertaining to what could happen, the chances of the event happening and what information there is to back up the scientific statements (Schneider, 1997).

A further aspect of environmental education is environmental citizenship. There are a number of components to environmental citizenship. These components include the citizen accessing information, the citizen becoming more than familiar with the topic, the citizen's emotional reaction to environmental problems, the citizen's personality affecting his/her level of concern and whether the citizen becomes responsible for addressing environmental issues (Hawthorne and Alabaster, 1999). Other components of environmental citizenship include the socio-demographics of the citizen and to what extent they are able to become involved with climate change. The citizen's environmental education, knowledge and environmental literacy influence his/her environmentally responsible behaviour (Hawthorne and Alabaster, 1999).

It is important to find out the level of the public's climate change knowledge and understanding. The key is to learn how knowledge is different to what people should know in order to take responsibility or for decision making to occur (Bostrom *et al*, 1994). The act of taking responsibility can be seen as the individual being able to create a change, the ability for that individual to help others voluntarily or the belief that the individual is responsible for contributing towards addressing environmental problems. Environmental behaviours can be influenced by incentive-based rewards to solve environmental problems (Hawthorne and Alabaster, 1999).

Therefore, the goal of education is to shape people's behaviour (Hungerfold and Volk, 1990). "Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environmental and its associated problems, aware of how to help solve these problems,

and motivated to work toward their solution" (Stapp *et al*, 1969, 34). Environmental citizenship and environmental literacy are two aspects of environmental education that encourage society to gain knowledge regarding the environment, climate change and achieving a sustainable future (Hawthorne and Alabaster, 1999). As society gradually develops, people's general environmental awareness and everyday activities that are closely associated with natural resources are weakened. A need is created for environmental education and resource management so that people are able to understand their individual and societal dependence on the environment. This will also aid in reconstructing the relationship between society and the environment by providing information on climate change and the environment (Stapp et al, 1969). The lack of information available for the public on the environment is one of the reasons why there are environmental problems (Schneider, 1997).

2.2.2. Responsibility for addressing climate change

Climate change is a phenomenon that is happening on a continual basis and its cause is due to human activity (IPCC, 2007a). However there are varying perspectives regarding who should be responsible for addressing climate change. Houghton (2009) suggests that we should not get caught in the trap of believing that climate change is caused by humans only. This is because extreme events and variations in climate have always been present in our climate system (Houghton, 2009). There is a relationship between natural climatic variability and anthropogenic activities which causes climate change (Lorenzoni and Pidgeon, 2006). Climate change is a phenomenon that impacts on the global population and in turn the global population (both developed and developing nations) will affect climate change (Houghton, 2009).

Focusing on the scientifically proven anthropogenic aspect of climate change, Baron (2006) explains four ways people perceive the reasons for climate change and the ways to address it, viz: naturalism; the polluter pays principle; undoing; and parochialism. **Naturalism** looks at the effects that people have on the Earth's functioning systems. There is a difference in belief between a natural change that will occur and an anthropogenically influenced change. More attention is given to the harmful impact people have on the Earth compared to a natural change that is occurring (Baron, 2006). People are willing to pay, fix and reduce the impact on the environment they have caused. This may be due to an underlying feeling of guilt when people have caused harm. However if they feel that the process is occurring naturally, there is a perception that people do not have the same obligation to minimising the risk. Part of this belief is that it is easier to control and reduce anthropogenic risks rather than natural risks (Baron, 2006). People have always had a strong relationship with the environment and have had some impact on the environment. The dramatic impact on the environment (and climate change) can be associated with people making their own decisions. Only through individual action, behaviour and decision-making one is able to start moulding actions through laws and regulations, thereby reshaping people's approach towards climate change (Leach, Mearns and Scoones, 1997).

The second perception of addressing climate change is the **polluter pays principle** where people feel they should not be responsible for other people's actions. Therefore once this principle has been enforced, people will supposedly cease to cause harm (Baron, 2006). "...The costs of remedying

pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage of adverse health effects must be paid for by those responsible for harming the environment" (South African National Climate Change Response Green Paper, 2010, 6). The problem here is that people are not always aware of the harm they cause or they feel that they do not cause any harm (Baron, 2006). Climate change was first proposed almost a century ago by Svante Arrhenius, however it was only at the start of the 1980s where the changing climate was acknowledged and taken seriously (Hoffert *et al*, 2002; Baron, 2006; Boykoff and Rajan, 2007).

The idea of **undoing** refers to the principle that says '…it is better to undo the harm one has caused than to do more good in some other way' (Baron, 2006, 140). This principle of undoing suggests that the parties involved with creating the harm should undertake making the necessary repairs closest to undoing the original harm created. However, concerning climate change and global warming, companies may be able to do more by helping people through economic development rather than focusing on preventing the effects of climate change (Baron, 2006).

People look for situations and circumstances that benefit themselves directly or benefit their community exclusively to the disadvantage of outsiders or other people (Baron, 2006). This introduces the last concept of **'parochialism'** which is the '…tendency of people to favour a group that includes them, at the expense of outsiders and even at the expense of their own self-interest…" (Baron, 2006, 141). The concept of parochialism suggests that it is difficult to determine who is directly affected by climate change and therefore who would ideally benefit from reducing the effects of climate change. In order to reduce the effects of climate change, people often think that any sacrifice they make for their group will be worthwhile if they get some sort of benefit individually, even if the reward is small (Baron, 2006). Incentives are used to change behaviours within society (South African National Climate Change Response Green Paper, 2010). However it is difficult to encourage people to cut back on their own lifestyles to help reduce the effects of climate change. To achieve this people need to be educated through programs, persuasion, incentives and the implementation of policy and regulations (Burgess, 1999).

As important as these four aspects are in outlining the importance for raising awareness of anthropogenic climate change, there are other aspects that help raise awareness. The environment is constructed and shaped according to the way people interact with it (Leach, Mearns and Scoones, 1997). The environment and society will consequently affect climate change and the associated perceptions of climate change that are developed. People interact with the environment and affect climate change on both a small scale and large scale, whether it be intentional or unintentional (Leach, Mearns and Scoones, 1997). People construct reality according to their social interactions, beliefs and their upbringing. Therefore in the same way that society is socially constructed, so is the environment and therefore climate change (Jones, 2002). It could be questioned as to what extent climate change is socially constructed within society and how true the construction is.

In the same way, reality can be described as a social construction within society. The same construction of reality can be applied to climate change. Reality can be divided into two categories: subjective reality and objective reality (Jones, 2002). Subjective reality looks into people's beliefs regarding the world, and objective reality is the world in its socially unconstructed form (Jones, 2002). Objective reality may be harder to understand as we have developed in an environment where everything is interpreted and explained through meanings and context. Society relies on the subjective reality. There are differing groups of people that make up society and therefore it is difficult to decide whose reality should be acknowledged, i.e. whether reality is socially constructed, scientifically based or indigenous knowledge (Jones, 2002). This illustrates the idea that when a problem such as climate change is addressed, each group will come up with their own definition of the problem and their own solution to deal with the problem (Hajer, 1995). So problems are interpreted differently according to the group dealing with it.

Scientific and lay knowledge is important when dealing with climate change. Knowledge is derived from previous statements made and is constantly being generated (Burgess, 1999). However, knowledge is also created by a select group of authoritative figures who classify and describe the core issues. Lay knowledge is often completely disregarded even if society has real hands-on personal experience and understanding of the topic (Hajer, 1995).

The public's opinion regarding climate change can be attributed to the information they receive. The public is then able to compare statements made concerning climate change (Burgess, 1999). Statements are generally made by scientists, where they portray 'true reality' and give out facts regarding climate change based on new discoveries. It is evident that what the public perceives to be reality changes easily, and science, in this instance, has control over the current reality (Hajer, 1995).

2.2.3. Roles and responsibilities of society relating to climate change.

The South African National Climate Change Response Green Paper of 2010 states that there are two groups in society, namely government and social society, which will manage the issues of climate change in South Africa. Government plays an important role and its roles and responsibilities do not change (South African National Climate Change Response Green Paper, 2010). Government has a deadline to achieve certain goals in specific time frames, mainly ensuring that strategies, policies and regulations all adhere to the national climate change response strategy (South African National Climate Change Response Green Paper, 2010). South Africa's Second National Communication under the United Nations Framework Convention on Climate Change (2011) is an example where focus is placed on policy development and implementation to address climate change.

Society incorporates the non-governmental groups including industry, business, labour and civil society (South African National Climate Change Response Green Paper, 2010). Society is able to work together with government to address the climate change crisis. Involving this group with government will ensure that all groups and people in society are included. Building this relationship between civil society and government will have a positive outcome in educating and empowering people regarding the choices and control over climate related solutions (South African National

Climate Change Response Green Paper, 2010). Participation with government ranges from reducing energy output in industry to encouraging society to become involved with various climate initiatives; and from raising awareness in civil society of the importance of reducing emissions, to involving the scientific community in providing projections, impacts and solutions to climate change issues (South African National Climate Change Response Green Paper, 2010).

2.3. Climate change as represented in the media

The third theme looks at how climate change is represented in the media and the media's role in society; the relationship between the media and science and the relationship between the media and climate change. Six case studies concerning how the media represents climate change are described.

2.3.1. The role of the media in society

Communication, including the production and consumption of information, has always been vitally important to society. No matter the subject, the media has always influenced public perception and understanding of the matter concerned (Boykoff and Rajan, 2007). The media (and particularly newspapers) is an important source for people to gain knowledge (Antilla, 2005). The public is heavily reliant on the media (mainly newspapers and television) to receive political, economic and scientific information as well as other news stories. As a result the media has a huge influence over public perception, opinion and understanding (Boykoff and Rajan, 2007). People are reliant on the media to report on issues beyond what we deal with on a daily basis, including issues of risk (Smith, 2005). The media plays an intricate role in society where meanings are encoded by an elite group of producers of information and decoded by the listening and viewing audiences (Burgess, 1990). The public decodes the messages from the media according to their own frame of reference (Carvalho and Burgess, 2005).

The media represents reality, using symbols, images and words, while at the same time targeting the interest of a specific group of people (Burgess, 1990; Carvalho and Burgess, 2005; Smith, 2005). The media creates this reality by shaping stories in a particular way (Smith, 2005). The representations of reality change as society changes, and as a result the new symbols, meanings, and codes have to be re-evaluated, adapted or changed completely in order to accommodate this new reality (Burgess, 1990).

The media does not always portray a true reflection of reality. The stories which the media report on do not necessarily provide the reading audience with factual information (Wilson, 2000). More often than not the symbols and meanings which the media use are reworked to represent reality in a slightly different light (Burgess, 1990). This distortion of reality is what often takes scenarios out of context and consequently reality may be misrepresented and/or miscommunicated.

2.3.2. The relationship between the media and science

The media and science have a strong relationship and have provided the world with stories and new discoveries. Climate change is often reported and gradually over the past decades more attention has been given to environmental issues and climate change. Even though this relationship is useful, the media does not always give a true reflection of what needs to be portrayed by science (Burgess, 1990). Science can be poorly portrayed by the media because the media oversimplifies scientific information in order to engage the audience continually (Wilson, 2000). Science helps bridge the knowledge gap by correcting and adding factual information to people's general knowledge. The media's role and responsibility in this process is to act as the carrier of this information by translating and providing the information on this complex issue for a lay audience in an understandable and available form (Weingart, 1998; Wilson, 2000). This is done by translating and relaying a particular view-point to the public by representing '…the discoveries of science in an adequate, popular and appealing form to the public…' (Weingart, 1998, 870). It is evident that in this relationship, scientists and the media are perceived to be purely providers of information, while the public are the receptors of scientific information (Weingart, 1998; Carvalho and Burgess, 2005).

The media currently plays an important role as they selectively choose knowledge (including the sciences) for society to read (Carvalho and Burgess, 2005, 1458). Information is transferred across a number of levels in order for it to reach the public and specific target groups. At each level of information being provided, from science to the media to the public, it is evident that the information may be distorted and presented in a slightly different way from its original state, thereby affecting the reliability of the source of information and the information itself (Weingart, 1998). The media first constructs stories from information received from scientists and it is then the public who decodes the information (Carvalho and Burgess, 2005). As the media becomes more influential in portraying scientific information, the population becomes concerned as a topic is highlighted. Scientists align themselves with the media in order to prove their credibility and will therefore find ways for the media to report on their work. At the same time the media relies on scientists for information. The media may exaggerate the information they receive from the scientists. Therefore the media and scientific community are reliant on each other (Weingart, 1998).

Most recently however the media brought to light the 'climate-gate' scandal. This really shook the science and climate change community when it was revealed in 2009 that there were inaccurate data and projections regarding climate change published in the 2007 IPCC Fourth Assessment Report (Tollefson, 2010). In this instance the media was able to portray the reality of the falsifying of facts and data in the science and climate change field. Boykoff (2007) highlighted a second instance where scientific documents were found to be manipulated by one individual after they had been peer reviewed. When data is manipulated, some doubt around scientific reporting is created. Despite this, current scientific evidence shows that anthropogenic activities have affected the increased emissions and temperatures over the last 100 years which has affected anthropogenic climate change (IPCC, 2013).

The media and science have a strong bond and each has a purpose for the other. However, as positive as this relationship appears to be, scientific information and the perspective provided by the media may not always be what the scientists originally expected (Weingart, 1998). There are a number of problems with the relationship between the media and science. The media has the ability to build the reputation of science but the credibility of science may very well remain a contested issue (Weingart, 1998). There is a difference between the way science and the media need to portray their information. One reason why the media do not always portray science, or reality, in its true light and misrepresents information is because the media '…construct their own reality in the same way as science does' as both construct what they believe to be the truth (Weingart, 1998, 870). Scientists in some instances may even provide information that they believe the media wants or they will find ways for the media to include their work. The generation and manipulation of information is a popular practice for scientists so that they are able make science more media orientated and media dependant (Weingart, 1998).

If journalists do not have a strong scientific background with regard to climate change knowledge, it is difficult for them to simplify this complex issue (Wilson, 2000). Unchecked and unproven scientific claims reported in the media creates scepticism among the public (Boykoff and Rajan, 2007). Therefore representing climate change in a true reflection is complicated (Gavin *et al*, 2011). The most accurate journalists do have a scientific background and will use scientists as direct sources of information. Some other journalists do not use scientists as their sources of information and rather use other newspapers and information that has already been published, for their sources for information (Wilson, 2000; Smith, 2005). The public requires information from the media which is accurate and understandable however the public receives information which is sensationalised, technical, hard to comprehend, and which does not allow people to become involved as individuals (Wilson, 2000).

In order to report on a story 'objectively', journalists need to be able to represent the many sides to a story equally. This is known as balanced reporting (Boykoff, 2007). Journalists frame issues in specific ways to relay a message but specifically opt to include particular facts or perspectives (Brossard *et al.,* 2004). Balanced reporting determines how stories are reported on and how they are framed. Journalists will quickly check the authenticity of different scientific claims if they do not have the time or relevant scientific background to go through the information thoroughly (Boykoff, 2007). Journalists are also known to rely on secondary sources for information to report on instead of, for example, using primary data from interviews (Brossard *et al*, 2004). The media frames climate change as uncertain by highlighting the debates between scientists which gives journalists the opportunity to appear objective in their reporting. Journalists will include opinions from experts to provide balance in their reporting. Journalists often do not have sufficient understanding regarding the technical aspects of climate change and will therefore use different voices (scientists, politicians, groups) to report on and balance the different sides of climate change (Roser-Renouf and Mibach, 2010). However the scientific field is seen to be divided in this climate change issue (Antilla, 2005). All of this leads to

miscommunication and confusion of climate change as information and further details portrayed by the media appears to be sceptical.

A third reason for scientific information being misrepresented is because scientists themselves are uncertain about climate change and the possibilities that it brings (Houghton, 2009). Scientists need to minimise these climate uncertainties and give information that is truly reflective of what is happening in reality (Houghton, 2009). Like the general media representations, climate change has been distorted when specific announcements, events and risks related to society have been over exaggerated to attain a good response from the public (Burgess, 1990). The response that is expected when stories regarding climate change are discussed in the media is that a new level of concern is raised regarding the current issue which will raise questions, discussions and debates. The current issue will continue to gain media coverage until a new problem is highlighted (Baron, 2006). Other non-environmental issues, such as terrorist threats, can take priority over science and environmental issues in the media and can draw the public's attention away from these concerns if the new issue poses a big enough risk to society (Smith, 2005; Baron, 2006). It is clearly evident that the media is a useful tool in relaying information but the media is not always taken seriously as the information they relay is sometimes inaccurate (Burgess, 1990).

As scientists learn how the media works, they may be less willing to provide the media with information as the scientists may lose their credibility of publishing 'so-called' factual information if the media manipulates it and portrays it incorrectly (Smith, 2005). Scientists are also not willing to work with the media if there is lack of interest from the media. Smith (2005) says that the media shows a weak understanding of the issue being discussed by scientists and this leads to weak coverage from the media when information may be over exaggerated. Smith (2005) says the media does not always take climate change seriously when information is casually put together for a scientific perspective to be presented in the media.

2.3.3. The relationship between the media and climate change

Over the last few decades there has been a general increase in the reporting of climate change in the media as concern increases regarding climate change and its effects as more emphasis is placed on this issue (Bostrom *et al*, 1994; Carpenter, 2001; Carvalho and Burgess, 2005). "Climate change has woven its way into the general consciousness worldwide, with awareness and concern about the issue present among most publics..." (Lorenzoni and Pidgeon, 2006, 76). The types of media involved with reporting on climate change has grown as has the frequency and what is addressed (Carpenter, 2001). The influence of the media on science is vast and the media has a role in portraying climate change and its effects. It is important to make people aware of environmental problems such as ozone depletion, deforestation and land use change, pollution and global warming to name a few and the media has helped raise awareness of such issues and help people develop and add to their environmental knowledge (Burgess, 1999).

Coverage of climate change in the media has fluctuated (Boykoff and Rajan, 2007). Climate change events (El Niño and other natural disasters) and meetings have also added to the fluctuating

coverage of climate change in the media (Wilson, 2000). The peaks in media coverage of climate change correlates with climate change and weather events (Carpenter, 2001; Boykoff, 2007). "Environmental news, like any other sort of news, is actively constructed, shaped by the professional, technical and economic demands of each medium" (Burgess, 1999, 142). However, because the media does not continually focus on environmental issues and climate change, the coverage of climate change varies (Burgess, 1999). When climate change is reported on, there is a perception that the media does not provide sufficient information on climate change. This may lead to ignorance of this issue among the public as there is an information deficit (Smith, 2005). This could explain why climate change may be miscommunicated by the media.

One reason why climate change may be miscommunicated is because climate change is an intricate issue which has much uncertainty and is a difficult topic for people to grasp. The difficulty is that climate change is a long term process that people cannot easily relate to their daily existence (Houghton, 2009; Lorenzoni and Pidgeon, 2006). Climate change cannot be felt immediately but has to be observed over a period of time. For this reason climate change does not have the same public impact that, for example, conservation has, with regard to people joining a cause to protect the environment. People often feel that climate change is concerning but they feel that they are unable to do anything about it (Wilson, 2000). This difficulty in understanding climate change may also be related to a lack of experience in understanding and dealing with its possible consequences (Spence *et al*, 2011). Miscommunication is also likely to occur because the lay audience may not have sufficient education and understanding of the climate science (Quiring, 2007). Environmental issues are not seen to be exciting from the public's perspective and the stories need to capture the reader's attention (Brossard *et al*, 2004). At the same time, people find it easier to understand local issues rather than global issues (Cordero, 2001).

A second reason why climate change is miscommunicated by the media and misunderstood by the public is that there are challenges in reporting on climate change. The information received from the science field is technical therefore making it difficult for journalists to relay or explain the topic in a concise way for the public to understand (Boykoff and Rajan, 2007). Misconceptions also occur due to the misuse of terminology as the scientific language used to explain climate change is complex and difficult to understand (Wilson, 2000). Also, because climate change and weather events are difficult to predict, the journalists' reporting of climate change is tricky (Gavin *et al*, 2011). Due to a number of reasons such as time constraints, when reporting on climate change, journalists cannot always check to see if a certain scientific claim is legitimate or not. This has an impact on the validity of the statement and how the public perceives it (Boykoff and Rajan, 2007). Also, if the media loses interest in raising awareness of climate change, the journalists will focus on other aspects of climate change such as the economic consequences or how people have been affected by climate change and 'related' events (Gavin *et al*, 2011).

Climate change is subjective as it is defined according to the context and the population who define it (Farbotko, 2005). The media may redefine climate change and therefore creates and shapes the public's understanding, perceptions and experience of climate change (Carvalho and Burgess, 2005;

Farbotko, 2005). A story that is prominent in the media will preoccupy the public therefore the way an issue or story is framed will affect the way society will perceive it (Gavin *et* al, 2011). The difficulty for the media is to shape people's knowledge about the long-term changes that are expected with climate change. The fact that climate change is a long term process explains why climate change coverage fluctuates in the media's coverage of it (Burgess, 1999). The difficulty with regard to reporting on climate change is to simplify a complex topic in such a way that the general public can understand the problem. The degree to which society responds to an issue (in this case climate change), depends on how well each individual understands the topic (Carvalho and Burgess, 2005). At the same time, news in the media is prioritised according to global scale (local then global) as well as subject category (Smith, 2005). Climate change is both a local and global issue and is hard to categorise as it fits into a number of subject categories (Smith, 2005). Evidently, there are various perceptions of climate change and "one of the reasons we disagree about climate change is that we receive multiple and conflicting messages about climate change and we interpret them in different ways" (Hulme, 2009, 215).

There is scepticism among some individuals concerning climate change. Antilla (2005) describes how scientific bodies often disagree about the reality of anthropogenic climate change. The media tends to portray climate change as uncertain and the seriousness of climate change is not highlighted (Antilla, 2005). Often attention is given to sceptics thereby giving the minority group the largest voice (Roser-Renouf and Mibach, 2010). At the same time the media constructs climate change as a social problem. There is a lack of communication between different sectors of society (government, public and science) as the government also denies the concern of anthropogenic climate change, and in this instance this issue is lightly passed over to make climate change appear less serious (Antilla, 2005).

In a study looking at American public's belief about climate change, Abraham and Nuccitelli (2013) showed how each media company reports on climate change differently, thereby affecting people's belief of climate change. For example they explain that news programs, such as Fox news, have a tendency to affect public belief in the scientific claims of climate change negatively (distrust of climate scientists) while the non-conservative media, such as CNN, the New York Times, positively affect the public's belief in the scientific claims of climate change (trust in climate scientists). Some of the reasons for such differences in reporting are that top scientists are portrayed to be biased, the journals are often criticised, scientific papers are seen to be associated with politics, climate scientists are presumed to be manipulating data and publishing it and climate change science is seen to be its own religion (Abraham and Nuccitelli, 2013). The trigger for this sort of climate scepticism and different reporting stances is that politics affects how a subject is reported on. There has been a change in that more and more people are pressurising the political authorities demanding responsibility to be taken for addressing and providing solutions for climate change (Abraham and Nuccitelli, 2013).

There are people who are sceptical about climate change due to the way the media has represented it (Gavin *et al,* 2011). A question arises whether the media hypes up climate change or does the scientific community do it as well (Carpenter, 2001). There are perceptions of climate change being

over exaggerated; that is it not what it is portrayed to be; and that climate change is reported in a way to shock the public (Gavin *et al*, 2011). As a result climate change is seen to be not urgent, often sensationalised, over exaggerated and therefore miscommunicated (Gavin *et al*, 2011). Often, if a natural disaster or obscure weather phenomenon occurs that is out of the ordinary, the media will immediately tack that onto climate change implying and reportedly 'proving' that the climate situation is become more serious. The seriousness and severity of climate change is further supported by the scientists who state that climate change is rapidly worsening (Gavin *et al*, 2011). Ultimately the link between climate change and weather events with the media is that it is a means to create the necessary platform for people to learn about climate change. However, the public needs to be aware that climate change claims made by the media are sometimes sensationalised and over exaggerated (Gavin *et al*, 2011).

Film makers can play a role in raising awareness of climate change (Hulme, 2009). The example he gave was the film *The Day After Tomorrow* where the Earth's climate changed drastically to an Ice Age over a short period of time. Even though the film was clearly over-exaggerating climate change and what we can expect, a certain level of paranoia was achieved in society regarding climate change (Hulme, 2009). Films like this can spark debate amongst many sectors in society including scientists, politicians and organisations as to what can be done to help prevent the effects of climate change (Hulme, 2009). This film was able to show the necessity to start changing people's lifestyles and perceptions in order to create a change big enough to make a difference (Hulme, 2009). Through demonstrating the climate change issue, its importance and its causes can easily be relayed to masses of people at one time in a way that is easily comprehensible. These media representations are effective in highlighting and raising awareness of climate change even if the story or phenomenon is highly exaggerated (Hulme, 2009).

A second example of film being used in media was the film *An Inconvenient Truth* which is about Al Gore's efforts to raise awareness of climate change (Gore, 2009). Quiring (2007) says that the film was successful in this regard of raising awareness of climate change and explaining the processes behind it. He also agrees that there are a few scientific errors, inaccuracies and over exaggeration in the film but for the most part the basic science is in fact correct. Part of the reason why the film was so successful was because it was able to reach the viewing audience on an emotional level which moved the public into action against climate change (Quiring, 2007). The film uses 'shocking images' which have an impact on the people watching them especially with regard to landscapes that are changing. An example used in the film is the glaciers melting on Kilimanjaro and in the Himalaya mountains at incredibly fast speeds (Gore, 2009). The problem here however was that the film tried to use separate events, such as Hurricane Katrina, to prove that global warming is happening (Quiring, 2007). In the film, Gore (2009) suggests that people can do something to reverse the environmental and climatic changes that are experienced. In this film, Gore (2009) speaks of climatic changes and says that 10 of the hottest years recorded have been felt in the past 14 years. He mentions that there has been an increase in ocean temperatures which has affected the occurrence of hurricanes. The change in rainfall has affected the increase in flood and drought severity which has also impacted on

disease spread. The noticed habitat loss has lead to species extinction. Gore (2009) speaks of scientists agreeing that global warming is a proven phenomenon, however media often portray it as an unproven phenomenon which suggests that there is a miscommunication within the media of climate change related phenomena.

Some claims made in *An Inconvenient Truth* are explained by Stefan Lovgren (2006). Seven claims were discussed: the concern that a double of category 4 and 5 hurricanes are being experienced; that heat waves are becoming more frequent and intense as temperatures increase. More of the claims looked at how the human population and species will be affected. These claims addressed the number of deaths that could be experienced from global warming over the next 25 years (projection given at up to 300 000 people per year); the exorbitant number of species that have become or are becoming extinct within the next 500 years and that global warming was seen to cause the introduction of new species. Other claims look at sea level rise as there will be a dramatic increase in sea level (six metres) due to sea ice melt which includes a decrease of ice in Greenland and Antarctica. All this added water volume will cause damage to low-lying coastal regions. The last claim is that the Arctic Ocean could be ice-free by 2050 (Lovgren, 2006).

Another example of how awareness of climate change and people's perceptions of the world can be changed is by using an image of the Earth from space. Images of the Earth have been used as a tool to show the fragility of the Earth (Hajer, 1995). These images have a huge impact on the global population regarding the relationship between society and nature. Since, this image of the Earth has also been used in politics where various books and reports were issued to show that people couldn't rely on resources at the rate society was using them. This extreme use of resources would deplete quickly unless other solutions were made (Hajer, 1995).

Hajer (1995) and Hulme (2009) have shown that the media has helped to highlight the relevance and importance of climate change and the issues relating to, and causing climate change. There have been both positive and negative representations of climate change that have been developed by the media. These representations aim to broadcast the issues that people are dealing with and are held responsible. Hajer (1995) and Hulme (2009) have demonstrated how the media has been successful in portraying climate change even when this subject is taken out of context. However, it should be noted that people will each view a climate change related image with different perceptions based on their own previously acquired knowledge (Nicholson-Cole, 2005).

2.3.4. Communicating climate change

Communication is "...a process of transmissions – that is, the scientific facts are assumed to speak for themselves with their relevance and policy significance interpreted by all audiences in similar ways" (Nesbit, 2009, 14). Climate scientists explain that climate change is the largest issue society has to deal with and it need an immediate response (Roser-Renouf and Maibach, 2010). Since the start of anthropogenically influenced climate change, there has been an increased need to communicate climate change clearly and effectively (Boykoff, 2007; Nesbit, 2009; Moser, 2010). Unfortunately, information regarding climate will most likely target an audience that is already

engaged with the issue (Nesbit, 2009). The media has improved public awareness of climate change however the concern and urgency of climate change reporting varies and understanding of the underlying causes of climate change is still lacking (Moser, 2010). The current understanding of climate change is that it is anthropogenically induced and will affect the resources that society and species need to survive. Therefore to address climate change, responses such as policy implementation, technological development and behavioural change need to be introduced (Moser, 2010). The sources (or communicators) relaying these climate change messages are trying to reach more of the public by using a range of forums, channels, messengers and frames (Moser, 2010).

To communicate climate change effectively, one needs to understand people's motivations in order to relay adequate and useful information to aid them in making climate friendly decisions. People use climate change information for social interactions (conversation) and because the information is useful to them (Roser-Renouf and Mibach, 2010).

Communicating climate change involves engaging the public on the issue (Lorenzoni, Nicholson-Cole and Witmarsh, 2007). Climate change is becoming increasingly recognised as a matter of concern but there is a general lack of knowledge and personal engagement with this issue by society (Whitmarsh, Seyfang and O'Neill, 2011). There is a definite need within society to change behaviour and values directed towards climate change (Lorenzoni, Nicholson-Cole and Witmarsh, 2007). As society's knowledge of climate change increases, the likelihood of changing behaviour increases as well (Roser-Renouf and Mibach, 2010).

To involve the population and communicate the climate change issue, one needs to distinguish between public understanding, perceptions, and engagement (Wolf and Moser, 2011). **Understanding** climate change is important for people to acquire factual information on climate change and influence their response towards addressing this issue. This may include supporting policies to reduce carbon emissions, daily activities and lifestyles (Wolf and Moser, 2011). Introducing policies will directly affect society and individuals' lifestyles, expenses and local communities (Nisbet, 2009). Although there is a consensus that climate change is occurring, the most concerning effects can still be mitigated by introducing policies and encouraging individuals to change their actions towards climate change in order to address this issue by reducing carbon emissions (Roser-Renouf and Maibach, 2010). Understanding may be influenced by a limited knowledge background, however, people do have some comprehension that changes are occurring and that these changes will affect their lives (Wolf and Moser, 2011).

Perceptions of climate change looks at how people interpret climate change based on their own experiences, backgrounds and understanding of the issue. Therefore, the level of influence of climate change information may depend on how involved people are with the environment and what they understand (Wolf and Moser, 2011). Climate change perceptions are influenced by various demographics (age, social status, race, gender etc). Perceptions are also affected by images and framed stories which arouse positive or negative emotions towards climate change (Wolf and Moser, 2011). **Engagement** illustrates the importance of involving the individual in addressing climate

change. This is the personal connection that people have which affects behaviour. The strategy is to find ways in which to invite people to address climate change by appealing to their emotions and cognitive responses (Wolf and Moser, 2011). Therefore if people feel responsible for contributing to the effects of climate change, they may feel they need to address climate change (Wolf and Moser, 2011). Engagement partly relies on the provision of information to the public for them to understand climate change but it also involves a behavioural aspect to address it. Therefore engaging the public with climate change is more than just receiving and understanding information, individuals need to personally care and feel motivated to take action (Lorenzoni, Nicholson-Cole and Whitmarsh, 2007).

The media is an important medium to interpret and convey environmental issues. Climate change science is specialised and as a result often technical language is used which needs translation for the media to use this information (Boykoff and Boykoff, 2007). There are journalistic norms which the media uses to report on climate change. There are first order journalistic norms and second order journalistic norms. The first order journalistic norms provide the base for what is selected as news and its associated contents. These norms are personalisation, dramatisation and novelty (Boykoff and Boykoff, 2007). Personalisation includes the personal stories or aspects (trials, tragedy, and triumph) in an event. Here, stories should be personalised and news should be about people. Dramatisation emphasises an event and determines if a story is covered or not. Often alarmist or sensationalised reporting is used in these stories. Finally novelty determines what new news is favoured by journalists. In this instance, long term environmental issues are not always told as journalists favour crisis related stories in the media (Boykoff and Boykoff, 2007). Second order journalistic norms are derived from the first order norms and contribute to informational bias. There are two second order journalistic norm: Authority-order bias and balance. Authority-order bias uses authority or authoritative figures in the news feeds to confirm that safety and security of an issue will be address. This often leads to the public accepting political and expert figures as truth. Balance looks at how to report on a story by presenting all views and giving these view equal attention (Boykoff and Boykoff, 2007).

There are seven elements to the communication process. The first element of the communication process is that it is important to determine the scope of communication. It is essential to enlighten the public about climate science, its causes, impacts and solutions. There is a need for engagement and action by influencing behaviour and encouraging people to act. There is also a need to redefine or change what is standard in social norms and cultural values by influencing behaviour through processes like education by showing a new lifestyles and values which are considered environmentally friendly (Moser, 2010). Second communication element is determining the audience. The audience will need a specific type of information that is framed in a manner that appeals to their values and behaviour. Therefore audiences need specific frames, messages and messengers to learn about climate change (Nisbet, 2009). People select content on an issue based on their pre-existing knowledge. Messages need to be framed in a way that resonates with the audience and identifies with their values and beliefs (Roser-Renouf and Maibach, 2010). The third element of communication is framing, which is an important way to communicate an issue to people as it provides a position from which to address an issue. Specific words, symbols, images, signs, symbols are used in frames in

order to target a specific audience (Moser, 2010). Framing an issue like climate change in a way that targets a significant portion of the population through multiple sources, may engage the public which could have a positive impact on addressing climate change by implementing measures like policies (Nisbet, 2009).

Fourth element of the communication process addresses the messages that need to be sent to the audience. The messages that are relayed are dependent on the listening or viewing audience, the messenger, what sources are used for transmitting information, the place and context of information that is received, the processing of messages and the goal of communication (Moser, 2010). It is important that the relayed message is consistent and the purpose is to help people understand the issue by creating the reality of what is happening through using images, words and music which creates an emotion which aims to get the public's attention while targeting and encouraging certain behaviours (Moser, 2010). Fifth element of communication are the messengers who sending the information to the listening and reading audiences. This is important how the issue is framed and it gives credibility depending on the source used. Some messengers like scientists and environmental groups will be more trustworthy than others (media). The credibility of the source will also affect how the public will interpret the information provided (Moser, 2010). The sixth communication element is the modes and channels used for communication. Written, verbal and non-verbal ways of communicating are used. The channel used to relay information affects whether or not the communication modes can occur at the same time and how many people are involved with receiving the communication. The modes, channels and communications selected affect what can be communicated, how it can be relayed through what medium, the time and space it will use. The seventh element of the communication process is assessing the effectiveness of communication as it is important to determine if the goal of communication is achieved (Moser, 2010).

2.3.5. Challenges of communicating climate change

The sources which relay climate change information need to question what information needs to be provided to the public. This is because climate science is not well understood. Although the public acknowledges the seriousness of climate change, there are still varying beliefs and mixed views of climate change (Roser-Renouf and Maibach, 2010). The risks of climate change are not seen as a serious issue amongst the public and many feel that the serious effects of climate change will only be felt at a later stage and that other more immediate issues are more important to tackle. People who do believe climate change is currently happening now understand that people are the major contributors and that they have the ability to address climate change. While communicating climate change the media will often use tactics of fear to instil awareness of the associated dangers however the audience may feel hopeless or deny what is happening altogether. Therefore it is important to illustrate the dangers and provide suggested solutions in order to engage society (Roser-Renouf and Maibach, 2010).

While communicating climate change is important, there are a number of challenges and barriers to communicating climate change. Generally speaking, the public's understanding of climate change and

its mitigation needs are poor, action taken to address climate change is affected by politics, media coverage of climate change focuses on the minority group of sceptics viewpoints creating controversy about climate change and that climate change will not become a high priority issue unless this controversy is cleared (Roser-Renouf and Maibach, 2010).

Moser (2010) explains that there are nine challenges of communicating climate change. **The first challenge of communicating climate change is the invisible causes of climate change.** She explains that the air pollutants responsible for anthropogenic climate change cannot be seen and their effects on health cannot be easily felt when compared with something like water pollution. Therefore climate change is seen to have invisible causes. **The second communication challenge is that the impacts one sees are distant.** The impacts of climate change are felt 'elsewhere' as there is a distance created between the cause and effect of climate change. Moser (2010) explains that emissions produced by an individual are small but the accumulation of many individuals' emissions has an impact on climate change and the systems which affect climate change. The indicators of climate change are felt in distant places where people do not live (geographically distanced or isolated) i.e. in the Arctic, places of higher altitudes and coral reefs. **The third challenge of climate change communication is that people are insulated from their environment.** A disconnect is created between society and nature as people do not interact with the environment intensely (stay indoors most of the day and travel in vehicles) and therefore they do not have the exposure and sensitivity to notice the gradual climatic changes, extremes and variability. **The fourth challenge of communicating climate change is that there is a delayed or absent gratification for taking action.** There is a delay in effect between the reduction of emissions, the response of reducing emissions and seeing the changes which results in a delayed acknowledgement for action (Moser, 2010).

The fifth climate change communication challenge is the technological overload. Moser (2010) explains that a part of society still does not believe that anthropogenic climate change is occurring. Today people live in a society where there is a technological and informational overload. So, people focus on what is occurring immediately and do not look to what could occur in the long term. There is a sense that society needs convincing that anthropogenic climate change is in fact happening and that people need to come up with solutions in order to address climate change (Moser, 2010). **The sixth challenge of communicating climate change is that it is complex and uncertain.** The climate change issue is essential but complex and uncertain due to the limited amount of information. The scientific authorities have helped provide information for understanding climate change (i.e. the IPCC reports), but when communicating climate change this issue is still presented as uncertain to explain the delayed action for addressing climate change. The issue may also be portrayed more more or less severe than originally presumed. The underlying issue here is that people will never fully understand the extent and vastness of climate change, its uncertainties and the complexity of this issue (Moser, 2010).

The seventh climate change communication challenge is that there are inadequate signals indicating the need for change. There are not enough signals to show the need for a behavioural

change in society. Nature already shows the need for a change in behaviour (Moser, 2010). **The eighth challenge of communicating climate change is the self-interest of society.** Some people are insisting on keeping everything as it is for self-interest. There are two groups of people involved here: those that defend their comforts and motivations not to act and those who act address climate change as a personal responsibility and duty (Moser, 2010). **The final challenge of communicating climate change is that there is an implication for climate change communication.** Climate change is a difficult issue for the general public to perceive and understand, therefore a foundation needs to be laid for processing climate change information. Climate change is presented to the public as an ambiguous problem which needs good signals to encourage the necessary changes to address climate change. Education is important for climate change awareness and communicating this issue, but one cannot assume that people lack climate education, information and understanding. If knowledge gaps could be filled then people would be able to understand climate change findings and therefore change behaviour and reduce their emissions. Scientists themselves need to become familiar with the way in which media works, as they are the providers and interpreters of climate change information (Moser, 2010).

The attention given to sceptic's views in the media allows information on the reality of climate change to be misrepresented thereby creating doubt amongst society. The scientific communication of climate change from scientific bodies and the public's poor knowledge contribute to the doubt that is spread concerning climate change. It appears as if there is a general understanding that climate scientists are unsure of climate change themselves. Most recently the divide in perceptions or of viewpoints seems to be dwindling (Roser-Renouf and Maibach, 2010).

Society has varying levels of climate change literacy and there is a need to educate the public regarding anthropogenically influenced climate change and the severity of its effects (Lorenzoni, Nicholson-Cole and Whitmarsh, 2007; Whitmarsh, Seyfang and O'Neill, 2011). There is confusion within society regarding climate change. This confusion stems from the media which has difficulty translating technical information provided by recognised scientific bodies. This results in the barriers that the media face when reporting on climate change. There is a consensus that as societal knowledge of climate change increases, there is an increased likeliness that behaviour towards climate will change as well (Roser-Renouf and Maibach, 2010).

2.3.6. Case studies of the media representing climate change

There are a number of case studies that have looked at how the media has represented climate change. The case studies are from both developed and developing world contexts. All these case studies illustrate that climatic and political events affect the frequency of climate coverage in the media and that the media uses these events to report on and raise awareness of climate change. Case studies from Germany (Weingart *et al*, 2000), Australia (Farbotko, 2005), the United States of America (Boykoff and Boykoff, 2007), the United Kingdom (Carvalho and Burgess, 2005), Britain (Carvalho, 2007) and France and Netherlands (Dirikx and Gelders, 2010) have been selected for this report.

2.3.6.1. The German case study of climate change communication

The German case study completed by Weingart *et* al (2000) is a project that covered a period of twenty years between 1975 and 1995. The research looked at the media, science and politics and how each of these discourses represents and communicates about climate change (Weingart *et al*, 2000). There were a few good outcomes resulting from the media's reporting of climate change. The media helped government develop policies that regulate people's actions and lessen the effects of climate change (Weingart *et al*, 2000). The media has enabled the public to gain more knowledge with regard to what climate change is, why it is important, and what causes it. In this way people are able to learn about the issues at hand in an understandable way and when sufficient concern is raised, become active participants in reducing the effects of climate change (Weingart *et al*, 2000).

Information regarding the severity of climate change is often miscommunicated, because it is either too scientific or the media needs a story. In Germany significant landmarks that were affected by a natural disaster (such as the flooded Cologne Cathedral) were used in the media to show the impact climate change has and will have on everyday life (Weingart *et al*, 2000). However these images can be taken out of context to catch the public's attention which naturally creates a level of concern and hype regarding the issue of climate change (Weingart *et al*, 2000).

Images are specifically selected to get a specific reaction in order to raise awareness of climate change. The media has used images showing severe drought and polar ice caps melting and melting causing devastation along the German coast lines and plains (Weingart *et al*, 2000). Blame cannot be placed only on the media for over exaggerating climate change. It has been questioned as to how much influence scientists have on raising the public's attention when publishing scientific data and information (Weingart *et al*, 2000).

If both science and the media exaggerate climate circumstances, it is evident that the public needs to question the information that is being relayed to them no matter if it is from a scientific, political or mass media background (Weingart *et al*, 2000). The authoritative science community will lose its credibility if they miscommunicate this issue, politicians will use over-exaggeration to their advantage in order to aid decision making and to create new policies. The mass media creates stories based on information given out by scientists and based on situations, such as natural disasters and extreme weather events, which people are affected by.

2.3.6.2. The Australian case study of climate change reporting in local Australian newspapers

A study in Australia was completed in 2005 by Farbotko using newspaper articles between 1990 and 2005. Farbotko (2005) looked at how the *Sydney Morning Herald* reported on the island state of Tuvalu and how it is affected by climate change. The report introduced the concern that the island state is going to be affected by climate change and sea level rise resulting in communities being displaced. The findings in the research showed that the *Sydney Morning Herald* often made comparisons between Australia and Tuvalu. Farbotko (2005) found that the newspaper would report on the two nations where Tuvalu is seen as peripheral, and Australia a help to Tuvalu, with regard to environmental and climate change problems. When the *Sydney Morning Herald* reported on Tuvalu it

was with great seriousness, stating that the island nation would eventually be drowned because of sea level rise and that there is a poor future for the island (Farbotko, 2005). Reference was made to the destruction of the 'paradise' destination and that it is 'a place to visit before it is too late' (Farbotko, 2005, 285).

Australia was reported as resilient when compared with Tuvalu (which was seen as vulnerable and insecure). The concern was that the island would be "gone before they can prove to the developed countries the consequences of their actions" (Farbotko, 2005, 285). There were differences in the reporting of climate change between Australia and Tuvalu in the *Sydney Morning Herald*. The first was that climate change would affect Australia in time to come whereas it is an immediate problem for Tuvalu (Farbotko, 2005). The second difference was that the *Sydney Morning Herald* reported that Tuvalu is in a predicament and that the local people's only option is to move to Australia or New Zealand when the sea levels rise. Each government was represented differently as there was a contrast between the authoritative Australian government and the Tuvaluan government who needed support from the Australian government (Farbotko, 2005). Overall the civilians of Tuvalu were reported on as 'climate change victims' (Farbotko, 2005, 287) and that the island is a place with no future and people are victims with few solutions and nowhere to move (Farbotko, 2005).

2.3.6.3. The United States of America case study of how journalism shaped media coverage of climate change

A case study in the United States by Boykoff and Boykoff (2007) looked at how journalism shaped the mass-media coverage of anthropogenic climate change. The study looked at the messages being portrayed by the media over a 17 year period between 1988 and 2004. Television and newspaper segments covering climate change and global warming were studied (Boykoff and Boykoff, 2007). They found that the coverage of climate issues in the media fluctuated over this period. Scientists claimed that greenhouse gas emissions would alter the climate.

There was a delayed response to the scientists' claims until 1988, when there was a noted increased coverage of climate change (Boykoff and Boykoff, 2007). The increased coverage in the media was also attributed to ecological, political and scientific factors. The ecological factor was that the USA was experiencing drought at the time. The political factors were that Margaret Thatcher stated that climate change would affect politics and that the USA was going through elections. George Bush stated in his campaign that climate change would be dealt with. The last scientific factor leading to increased coverage in the media was that the Intergovernmental Panel on Climate Change was formed and had its first meeting in 1990 (Boykoff and Boykoff, 2007). The following years saw similar reasons why there was increased coverage on climate change in the US media. The reasons for increased climate change coverage in the 1990s were because of the creation of the IPCC, the lead-up to the Rio summit and the start of the United Nations Framework Convention on Climate Change (UNFCCC) at the UN Conference on Environment and Development in Rio in 1992 and the third Conference of the Parties where the Kyoto Protocol would be signed. The 2000s had an increase in climate change media coverage with the G8 summit in Italy, the climate talks in Germany, the announcement that President Bush would not sign the Kyoto Protocol and the World Summit on

Sustainable Development hosted in SA. The last major increase in climate change coverage was in November 2004 when Russia approved the Kyoto Protocol (Boykoff and Boykoff, 2007). There were a few periods where there was less coverage of climate change. The 1990s had a decreased coverage of climate change although there were still a few reports covering the 1995 'Berlin Mandate' which would become the Kyoto Protocol. In 2000 the IPCC published another Special Report on Emissions Scenarios. This decreased media coverage was blamed on the use of different journalistic norms which "affect what news is considered to be 'fit to print'" (Boykoff and Boykoff, 2007, 1201).

The US media uses journalistic norms that determine what will be included and reported on. It appears from this study that most of the reports in the US media are politically situated with scientific and ecological influences as well. Often the newspapers would dramatise and personalise some of the climate issues as a way to frame the reports and develop the stories (Boykoff and Boykoff, 2007).

2.3.6.4. The United Kingdom case study of newspaper reporting on climate change over three phases

The fourth case study is from the United Kingdom by Carvalho and Burgess (2005) where the media texts (newspapers) were studied between 1985 and 2003. The reporting of climate change was organised into three phases, 1985 – 1990; 1991 – 1996 and 1997 – 2003. The first phase (1985 – 1990) saw much attention shown toward climate change as the newspapers used reliable information from "scientists [who] were the exclusive definers of the issue for press, but their capacity to influence the media agenda...remained very limited..." (Carvalho and Burgess, 2005, 1462). Although the media reported on climate change as a threat, it was not seen as catastrophic, as no climate-related risks were reported. However, there was a slight change in the reporting of climate change when Margaret Thatcher mentioned the seriousness that climate change could have. There was an increased coverage of climate change after her speech, which showed the influence politics had over the media reporting (Carvalho and Burgess, 2005). From this point on, reports were more sceptical regarding climate change as it appeared as if there was too little evidence and the media had over exaggerated the climate change issue. Through the first period of this study, the IPCC released their first report which also saw climate change being reported on with more danger (Carvalho and Burgess, 2005).

There was a decline in the media coverage on climate change in the U.K. in the second phase between 1991 and 1996. There were a few fluctuations in 1995 of climate change reporting with CoP 1 in Berlin and the subsequent publishing of the IPCC report and the second IPCC report. There was no specific climate catastrophe and it was hard to sustain a dramatic storyline as the climate change risks were seen to be unimportant at this time (Carvalho and Burgess, 2005).

The last phase between 1997 and 2003 saw another increase in climate change coverage in the British press as the dangers of climate change were realised in specific geographic locations (Carvalho and Burgess, 2005). Specific events such as the Kyoto Protocol and the idea of Sustainable Development caught the attention of the media. Once again the politics behind climate change was controlling the media coverage and there was more understanding of the international politics of climate change. Lastly there was more urgency with regard to the climate change risks

being reported as the phenomenon was happening faster and would eventually affect everyone (Carvalho and Burgess, 2005). There was more coverage as specific areas were experiencing heat waves which were linked to climate change. This appears to be the first time that the media reported that weather events were directly linked to climate change (Carvalho and Burgess, 2005).

The U.K. case study was similar to the U.S.A case study in that their media coverage of climate change fluctuated over an extended period. Again, politics seemed to control what was reported on and when it would be reported. There was a noted change in attitude towards climate change through the three phases as climate change became seen as a more serious issue.

2.3.6.5. The British case study on the representations of climate change sciences in newspapers

The fifth case study was done by Carvalho (2007). She completed a critical discourse analysis on three British newspapers to determine how the construction of scientific claims in the media is associated with ideological standpoints. The newspapers used for this study were *The Guardian*, *The Independent* and *The Times* and covered a time between 1985 till 2001 (Carvalho, 2007).

In the early years, newspapers reporting of climate change often portrayed climate change as a definite issue. Climate scientists were respected and as such seen as reliable providers of information who defined climate change. The scientists' claims were unchallenged. During this time climate change was seen as a problem that could be easily addressed (Carvalho, 2007).

Towards the end of the 1980s, the portrayal of climate change began to change as politics and media were introduced into the equation. 1990 saw the First IPCC report being published. From this time there was uncertainty, scientific claims were doubted, the risk for future generations became apparent and there was support for the precautionary principle towards climate change. Within the media climate science was ranking lower as there was suspicion of climate change and the issue was often sensationalised and dramatised. At this stage, climate scientists had lost their authority to define climate change and the greenhouse effect in the media. (Carvalho, 2007). At this stage, the British government took control and created a new context and understanding of the greenhouse effect. Therefore politics had taken over the media's role of reporting on climate change.

When the Second Assessment Report was published in 1995, the IPCC agreed that people were having an impact on changing the climatic system and suggested some methods to mitigate against the effects of climate change. Although the science was accurate and reliable, the newspapers published articles that portrayed different viewpoints of uncertainty and disagreement of the climate science. There was still a strong relationship between politics and the media and at the same time, the authors that were asked to write for the papers had a strong influence over how climate change would be portrayed. As a result the newspapers would not portray the claims made in IPCCs Second Assessment Report in its true light thereby creating some suspicion and mistrust towards the science and reporting on climate change in an alarming way (Carvalho, 2007). Overall the newspapers each portrayed a different message of climate change depending on the author. Some newspapers would

promote the IPCC while others would focus on the doubts of climate change claims. Some conveyed climate change as a crisis and an issue that is urgent to rally public concern by focusing on how people would be affected by the issue. Responsibility was suggested in some articles by illustrating what people could do to help mitigate against climate change (Carvalho, 2007).

Towards the end of the 1990s, there was yet another change in focus in the newspapers. The articles look at the politics and scientific issues surrounding climate change, and not just reporting on the facts related to climate change. The newspapers reported that some of the goals and commitments made by the parties involved addressing climate change. There was particular focus in the newspapers on the introduction of the Kyoto Protocol in 1997 and the publication on the Third Assessment Report in 2001. There was particular interest in the newspapers of the decision making processes of addressing climate change. There was still some uncertainty regarding anthropogenic climate change even though the IPCC Third Assessment Report had confirmed that climate change is affected by anthropogenic activities (Carvalho, 2007).

2.3.6.6. The Dutch and French case study of how climate change is framed in newspapers

The last case study completed by Dirikx and Gelders (2010) is a research project which took place between 2001 and 2007. This research looked at how newspapers in Netherlands and France framed climate change through the annual Conferences of the Parties (CoP). Two newspapers from each country were studied: *De Volkskrant* and *NRC Handelsblad* from Netherlands and *Le Monde* and *Le Figaro* from France. A deductive frame analysis was completed on the newspaper articles to determine the frequency of five generic frames that are frequently used in newspaper articles (Dirikx and Gelders, 2010). The five frames are described below.

The *Responsibility frame* describes the responsibility or blame for climate change as well as the causes or solutions placed on authorities and individuals or groups within society. Because the climate change debate focuses mainly on the anthropogenic impacts, it is assumed that this frame would be used most frequently. The *conflict frame* looks at the conflicts between groups and the stresses the climate change debate between climate change 'defenders' (who believe climate change is caused by people and that something should be done to mitigate the effects of climate change) and the 'sceptics' (who believe that climate change is a natural phenomenon). This frame should be balanced where both sides have equal attention in the media, however studies have revealed that each newspaper will frame this differently. This frame is assumed to be used less often (Dirikx and Gelders, 2010). The *(economic) consequences frame* describes how people will be (economically or financially) impacted by climate change. This frame tends to focus on the negative of climate change being a disaster or a catastrophe rather than the positive. This frame is frequently used. The *human interest frame* addresses climate change from a personal point of view and personalises the problem by determining how people have been personally affected by climate change. Again in this frame the media will most likely focus on the negative aspects or consequences by reporting on a region or city. Using alarmism personalises the story for individuals through shock tactics. This frame is not used often. The last frame is the *morality frame*. This frame presents climate change from a religious or moral standpoint. This last frame is not frequently used (Dirikx and Gelders, 2010).

The results from this research found that the media reports on climate change when important meetings occur (such as CoP). Dirikx and Gelders (2010) suggest that it is through the meetings that public understanding of climate change can improve. Although the articles mainly focus on policy associated with climate change, there are a few which contain information on climate change (Dirikx and Gelders, 2010).

There was little difference between the Dutch and French newspapers use of frames. As predicted, concerning the frequency of the frames found in the articles, the morality frame was found to be used the least. The *responsibility frame* and the *consequences frame* were used most often. The articles associated with these frames emphasised the need for urgent action or solutions and who should take responsibility to address the issue. When climate change is seen to be an urgent issue and people feel threatened, they will be motivated to do something about addressing climate change. However, if the issue is portrayed to be too big, it is less likely that people will want to do something about addressing climate change if they feel the situation is hopeless. If climate change was reported as controversial in anyway, the public reading the articles may be less certain of climate change (Dirikx and Gelders, 2010). The results from this study show that the *human interest frame* was not used often. The *conflict frame* was used less often than the *responsibility frame* and the *consequences frame,* but used more often than the *human interest frame* (Dirikx and Gelders, 2010).

2.4. Awareness of climate change

The final theme discusses the factors which may influence climate change awareness amongst the public. Hajer (1995) describes how people's attitudes towards climate change have changed since the industrial revolution. It is during this period where people began to exploit natural resources and develop technology to produce energy and make life more efficient. Therefore, through increased urbanisation and developing industry, people gained control over nature and a particular mindset and certain human behaviour was developed towards how the environment is used, whether it is detrimental to the environment or not (Hajer, 1995). What society experiences now is that people realise the damage of their past actions. What needs to be done now is to form a new positive relationship between nature and society so as to shape people's behaviour in order to help minimise the impacts of climate change and the environment (Hajer, 1995).

2.4.1. Education to inform the public about climate change

For people to become better informed about the environment and climate change, they need to be informed through an education process presented by authoritative figures (Houghton, 2009). There are a number of highly influential authoritative figures that enlighten people with regard to their behaviour and lifestyles. These are namely scientists, the media and government leaders. However community-based action has not been fore grounded. This small scale community group has enough power to rally action against climate change; to motivate their own community to join as a group and to change their own behaviour slowly. This sort of movement has enough power to motivate and influence other communities. Everybody is affected by climate change and therefore everybody

should take some sort of individual responsibility to become better informed and become ambassadors for influencing other people in making wise climate decisions (Houghton, 2009).

2.4.1.1. Teachers as climate change educators

Educators at all levels relay information to children and they mould acceptable behaviour and influence the type of information their listeners absorb. Religious leaders, teaching organisations and the media communicate information to public groups (Houghton, 2009). Educators provide information on climate change, its causes and what can be done to help prevent further impacts (Houghton, 2009). Therefore, educators are able to explain the current global situation and challenge local communities to change their lifestyles gradually to more environmentally friendly options. One concern about climate change education may be in the teachers' confidence of teaching this broad topic. Their own knowledge and understanding will affect their ability to teach this subject (Kilinç *et al*, 2008).

2.4.1.2. Government leaders as climate change educators

Baron (2006) described earlier that it is possible to change the public's attitude and behaviour towards climate change through laws and regulations in order to achieve a desired outcome. A person is able to address the public and have a certain degree of impact depending on his/her level of authority. Often at larger climate change meetings, smaller countries try to raise their concerns regarding how climate change will affect them, but often there is little or no support for their issues or situations (Farbotko, 2005). Although governance is a way to mitigate and raise awareness of climate change, it is important for all countries to become involved with climate change mitigation as part of a global governing body. Small or individual countries have introduced their own national adaptation and mitigation strategies to increase awareness of climate change impacts that would affect them (Farbotko, 2005). There is an agreement that climate change needs to be addressed through decision-making processes which involve different levels of authority, and understanding and acceptance from the public (Lorenzoni and Pidgeon, 2006).

The South African government acknowledges that climate change is an issue which has an impact on a number of governmental departments. In order to start addressing climate change from a governmental level, the South African government has understood that the various governmental departments need to work together. Part of this coming together of departments is becoming familiar with the impacts of climate change and creating policies which address climate change adaptation (South Africa National Climate Change Response Strategy for South Africa, 2004). The South African government has developed a response to the climate change crisis and in it there are outlines of what is planned in order to reduce carbon emissions through various strategies and policy implementations. The South African government acknowledges that South Africa is affected by climate change and the population adds to this problem due to the economy being heavily reliant on fossil fuels (South African National Climate Change Response Green Paper, 2010). In order to lower the emissions, South Africa needs to make a number of changes to reduce gas emissions. The policy development in South Africa shows that like other countries, South Africa has agreed to become responsible for reducing its emissions. Secondly it will be necessary "...to adapt to the unavoidable

impacts of climate change through the management of risk and reduction of vulnerability" (South African National Climate Change Response Green Paper, 2010, 4). Lastly there will always be a cost with regard to reducing emissions but there are advantages to committing to reducing emissions, mainly a good competitiveness between countries with regard to achieving a low-carbon economy (South African National Climate Change Response Green Paper, 2010). It is important for government to develop an effective response strategy and policy when dealing with climate change. The Green Paper Policy for South Africa aims to commit to stabilising greenhouse emissions and protect the population from the harmful effects of climate change by developing and enhancing the required low-carbon economy (South African National Climate Change Response Green Paper, 2010).

2.4.2. Technology and innovation for addressing climate change

Technology and innovation are easy tools for people to use to reduce emissions and mitigate against climate change. People can have easy access to technology depending on what it is and its cost. Technology may relate to information transfer but more importantly environmentally-friendly technology and innovation is necessary to help curb climate change (Houghton, 2009). The focus is on reducing and stabilising carbon emissions through improving energy efficiency (Hoffert *et al*, 2002). Examples of these new technologies are alternative energy and fuel sources (Houghton, 2009; Hoffert *et al*, 2002). This is a relatively new industry which develops technologies that could provide the incentive for people to change to these alternative options.

In South Africa, Eskom, together with the Department of Energy, sponsors technology and innovation awards that encourage different sectors of society to find ways to reduce energy consumption through innovation and technology successfully. Applicants for the technology development competition range from scholars, to residents and industrial and commercial sectors. This is also a part incentive-based programme for the entrants, that rewards the winners and runners-up with a cash prize (eta awards, 2010).

The use of technology also allows people to access to information. In this information age, people are able to access information easily over the internet, radio, television and via other media sources. People are able to better their own knowledge based on what they are able to access on their own and then judge the quality of information that they accept (Houghton, 2009). There is a hint of introducing alternative technology which focuses on reducing carbon emissions (Hoffert *et al*, 2002; Houghton, 2009).

2.4.3. Culture and climate change

Climate change affects all societies but it is the way in which each group or culture interprets it that will influence the associated climate change behaviour (Hajer, 1995). Each group has its own perspective regarding the environment and climate change and it is each group's beliefs, background and everyday experiences that make up each group's reality and therefore prescribes certain behaviour (Hajer, 1995). Ethnocentricism is the way in which we view other people's ways of life in terms of our own cultural assumptions, customs and values (Delaney, 2006). Therefore in terms of

climate change, some cultural practices may be viewed differently to what the rest of society believes, but what people may not understand is that some cultural practices may be more environmentally friendly than others (Delaney, 2006).

Individual groups will be able to influence their own community as well as teach other groups about good environmental practices that address climate change in a positive way. Here people will '...group around specific story-lines..." or a common belief "...that they employ whilst engaging in environmental politics...' and other environmental related topics (Hajer, 1995, 13). These groups share a common belief or perspective that will interpret their story in a particular way (Hajer, 1995).

2.4.4. Incentives and motivation for addressing climate change

Incentives and motivation may be a way to encourage people to address climate change. People look for situations and circumstances that are beneficial to them or can benefit their community exclusively and often to the disadvantage of outsiders or other people (Baron, 2006). As introduced earlier, the thought of **'parochialism'** describes the '…tendency of people to favour a group that includes them, at the expense of outsiders and even at the expense of their own self-interest…" (Baron, 2006, 141). The idea of 'parochialism' suggests that it is difficult to determine who is directly affected by climate change and therefore who would ideally benefit from reducing its effects. But in order to reduce the effects of climate change, people often think that any sacrifice they make for their group will be worthwhile if they get some sort of personal benefit, even if the reward is small (Baron, 2006). Incentives are used to change behaviours within society (South African National Climate Change Response Green Paper, 2010). However it is difficult to encourage people to cut back on their own lifestyles to help reduce the effects of climate change. To achieve this, people need to be educated through programs, persuasion, incentives and the implementation of policy and regulations (Burgess, 1999).

Therefore parochialism can encourage a change in behaviour by using incentives and motivating the public (Baron, 2006). It is important to question to what degree people are willing to change their lifestyles to benefit them or their groups to address climate change. Parochialism is often incentive based and will benefit certain groups of people over others (Baron, 2006). The South African government describe the importance to introduce various incentives in order to create a change in society's behaviour towards climate change and the environment. Therefore the introduction of incentives may result in a reduction of carbon emissions and achieving the required low-carbon economy (South African National Climate Change Response Green Paper, 2010).

Chapter 3: Methodology

3.1. Introduction

Research is collecting data through a "process of synthesising separate elements so that things fall into place or questions open up" (Badenhorst, 2008, 90). In order to determine how one conducts research, a methodology must be planned to capture information easily and efficiently (Badenhorst, 2008). Research can be divided into either **quantitative research**, with the final outcome relying on numbers and figures of statistical data, or **qualitative research**, which looks into the meaning and description of information gathered from the participating subjects (Badenhorst, 2008).

This research project is a qualitative project where the researcher collected primary and secondary data. The primary data required the construction of questionnaires for the public to complete so that their actions and attitude towards climate change could be determined. The secondary data collection was in the form of newspaper articles. Both the primary and secondary data were analysed using thematic content analysis.

This research focused on three questions:

1. How is the climate change contestation represented in the media?
2. How do media messages on climate change affect peoples' perceptions of climate change?
3. What external factors influence people's behaviour and attitude towards addressing climate change?

Kitchin and Tate (2000) describe how each research question requires a unique approach and methodology to answer it (see Table 1 on page 46). Table 1 is a summary of the methodology showing each research question, the data that was necessary to answer it and how the data was collected and analysed.

Table 1: A table showing the methodology of this research project.

Research Question	**Data Required**	**Method of Data collection**	**Analysis**
How is the climate change contestation represented in the media?	Secondary data – Newspaper articles with climate change in title or information related to climate change	Articles collected from newspaper internet archives	Frames for analysis adapted from Dirikx and Gelders (2010)
How do media messages on climate change affect peoples' perceptions of climate change?	Primary data – Responses from readers of newspapers	Questionnaires	Thematic content analysis
What external factors influence people's behaviour and attitudes towards addressing climate change?	Primary data – Responses from readers of newspapers	Questionnaires	Thematic content analysis

Figure 7 (see page 47) shows the research process. Newspapers articles from The Star, BusinessDay and Mail & Guardian (secondary data) were collected first, followed by the questionnaires (primary data). The questionnaires which were used to collect the primary data consisted of closed-ended and open-ended questions. Data analysis (thematic content analysis) began with the newspaper articles followed by analysis of the questionnaires.

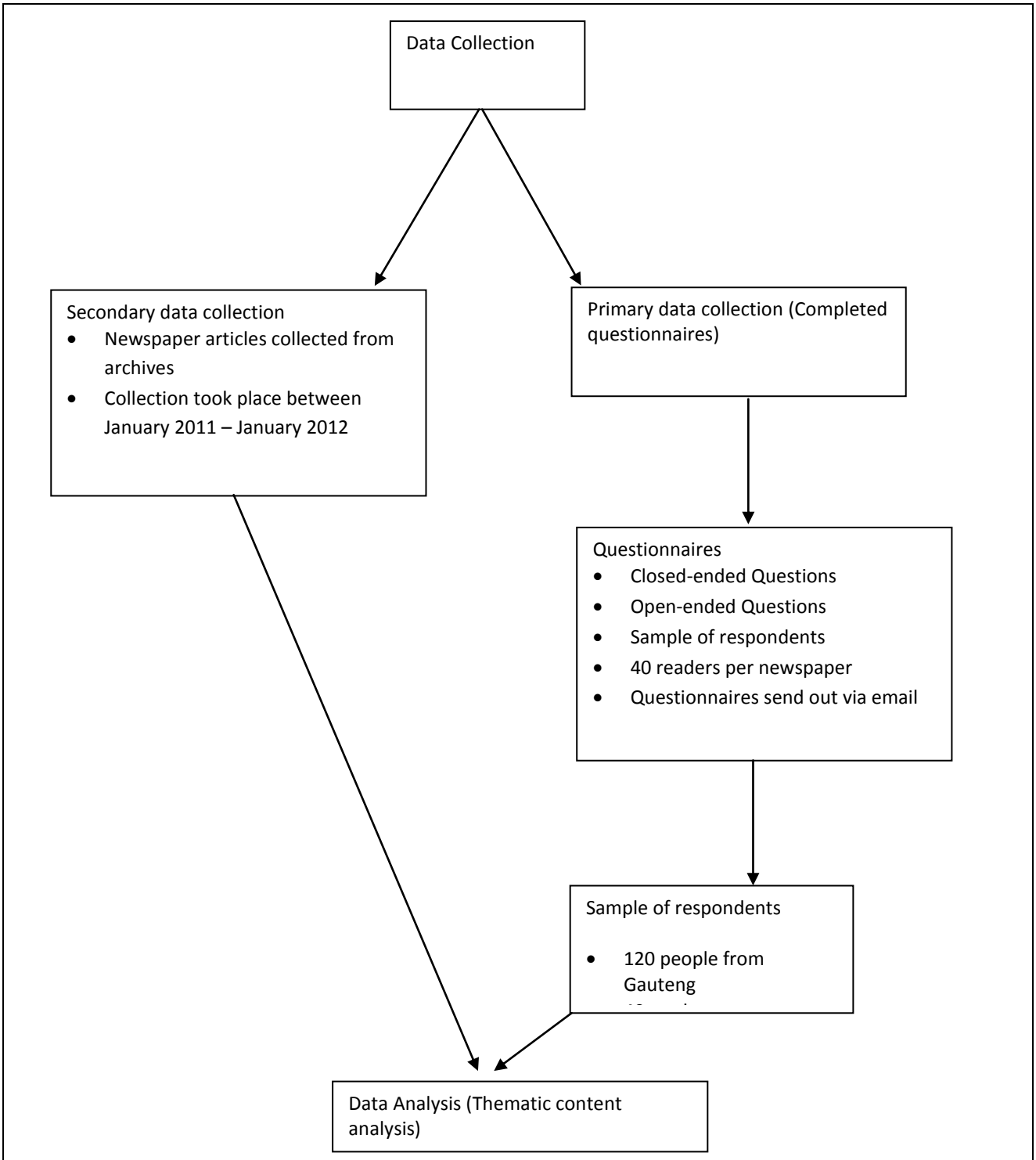


Figure 7: The research process.

The research process describes the primary and secondary data collection and the method of analysis. First, the data collection will be described i.e. secondary data collection of the newspaper articles and primary data collection of the questionnaires and the sample of the respondents. Thematic content analysis was used to analyse both the primary and secondary data. Finally, the ethics surrounding the research are discussed.

3.2. Data Collection

Data collection took the form of secondary data (which included the collection of newspaper articles) and primary data (which included the questionnaire which contained closed-ended and open-ended questions).

3.2.1. Secondary data collection – Newspaper articles

Burton (2000, 352) explains that there are four types of secondary data:

- Published articles in journals, books, newspapers or magazines;
- Statistical data generated from government and other sources;
- Data purchased from business publishing houses, market research companies or advertising agencies;
- Data generated by a result of day-to-day operations

Secondary data was used in this thesis to determine how climate change is reported in the media. Newspaper articles on climate change were collected to determine how climate change is represented in the media. Newspapers were chosen for this research because "...they are an interesting source of information on climate change usually giving more elaborate information than other media outlets..." (Dirikx and Gelders, 2002, 735). Each newspaper has "...important power of agenda-setting for the public and other media..." (Carvalho, 2007, 226). Each newspaper has its own targeted readership and because of this each newspaper adopts its own frame with regard to reporting on climate change (Carvalho, 2007; Hammett, 2011). A frame is used to categorise the main topics and ideas of an issue (Carvalho, 2007). In this research, climate change was the subject which was categorised.

There are a number of advantages to using newspapers as documentary sources. Using newspaper articles rules out the limitation of data being influenced by other people or sources (Hoggart *et al*, 2002). The data already exists so another advantage to using newspapers is that they are readily available in the newspaper archives thereby making the articles on environmental and climatic events easy to access and collect (Sanders and Pinhey, 1983; Sørensen *et al*, 1996). Because the data is easily accessible and it already exists, the time taken to collect the data is much less compared with primary data collection (Sørensen *et al*, 1996). An advantage with regard to collecting data over a long time frame (such as a year or more) is that any unexpected changes in the reporting in the articles can be recorded in the research (Hoggart *et al*, 2002).

However, secondary data is problematic in that the selection, quality of the information and as well as how it is collected by the archivists is not necessarily fully comprehensive and is therefore not determined by the researcher (Sørensen *et* al, 1996). A limitation to using newspapers as documentary sources is that they may be biased in that the information shared with the public may be limited (Hoggart *et al*, 2002).

For this research, newspaper articles that covered climate change were collected over a predetermined time frame of one year (January 2011 till January 2012), which included the 2011 CoP17 meeting, from a select group of newspapers. Collecting data over a year allowed for any changes in the data to be recorded and the reporting style of these newspapers to be observed and recorded. The number of climate change articles (leading up to and after CoP 17) was examined as well. For this project, newspaper articles that included climate change in the title, as well as articles that contain information on climate change were collected. Letters to the editor were also included for analysis. The newspaper articles pertaining to climate change were collected using the internet archives for each of the newspapers. Comparisons between these newspapers were made in order to determine their perspective on climate change and the information portrayed to the public about climate change. If there was more than one article published on the same day within one newspaper, concerning climate change, each article was referenced with a letter in order to identify each article i.e. The Star, 1/12/2011a; The Star, 1/12/2011b; The Star, 1/12/2011c etc.

The Star, Mail & Guardian and BusinessDay newspapers were chosen for this research as they span a specific sector of the social spectrum and they represent a very distinct group of the South African population. The selected newspapers are read by people who belong to a specific sector of society, specifically the middle to upper socio-economic sector. These newspapers will further categorise this section of the population from the cheaper The Star to the more expensive Mail and Guardian with the BusinessDay being represented between these two newspapers. This allowed for a cross-section of the South African population to be represented. There are web based archives for all the papers allowing for easy access to climate change articles to complete the data set.

There is a limitation to using these newspapers. The newspapers come from the same geographic location (Johannesburg, Gauteng) and may be considered to have a similar targeted readership. The analysis of the newspaper articles over one year together with the similar readership may not show a diversity of climate change in the newspaper articles and of the readership understanding of climate change. Carvalho (2007, 226) and Hammett (2011) describe how a newspaper will have its own targeted readership and because of this each newspaper will adopts its own frame with regards to reporting stories on climate change and each paper has "...important power of agenda-setting for the public and other media...".

The BusinessDay is a national daily newspaper that is printed through the week, Monday to Friday, in South Africa. The newspaper began print in 1985 and took an interest in reporting on national and international news (BusinessDay, 2013). The BusinessDay specifically focussed their reporting on the South African economy and business sector, companies and the financial market. This newspaper has an influential opinion section and also reports on sport, travel, arts and entertainment (BusinessDay, 2013).

The Mail & Guardian is part of one of South Africa's largest publishers and is an internationally recognised newspaper that has won many awards (Mail & Guardian, 2013a). This paper was first published in 1985 and was originally known as "The Weekly Mail". Because this newspaper focused

on South African politics, it caught international attention and gained many national and international readers particularly for its criticism of apartheid which later lead to its suspension by the government in 1988 (Mail & Guardian, 2013a). This newspaper later changed its name to 'Mail & Guardian' as 'The Guardian' (printed in the UK) joined this newspaper agency. This newspaper is well known for its investigative reporting and its international credibility (Mail & Guardian, 2013a). This newspaper has described its readership as a niche market whose interests lie in politics, arts and current affairs (Mail & Guardian, 2013b).

The Star was first published in 1871 in the Eastern Cape as the 'The Eastern Star'. The newspaper was first published in Johannesburg in 1887 when it was moved to the Johannesburg area by its owners. Two years later, in 1889, the newspaper's name was changed to 'The Star', which is still in use today. The newspaper is distributed throughout Gauteng, and is also circulated in Limpopo, KwaZulu Natal and Mpumalanga provinces (South African History Online, 2013). The Star has described that it reaches a wide group of South Africans, most of whom live in Gauteng. This newspaper tries to report on all the news that it can, even throughout the restricted and troublesome times of apartheid. This vast scope of reporting on news has continued through to the present day (Superbrands, 2008).

3.2.2. Primary data collection – Questionnaires

To determine the effect media messages on climate change have on public perception of climate change the collection of primary data was necessary. It was also important to determine the external factors which influence peoples' behaviour and attitude towards climate change. The primary data was collected using questionnaires with both closed-ended and open-ended questions (see Appendix 4 on page 158). In-depth answers were needed so the majority of the questions on the questionnaire were open-ended.

"Questionnaires are an indirect method of collecting data; they are substitutes for face-to-face interaction with respondents" (Lee, 2006, 760). Conducting questionnaires "is a data collection method that asks questions of a sample of respondents, generally at a single point in time, using either a questionnaire or interview" (Sanders and Pinhey, 1983, 127). It is important to determine the goal and purpose of the questionnaire in order to obtain the relevant information for the research (McBurney, 1998). The construction of a good questionnaire helps the researcher to avoid asking questions of a sensitive nature and assists the researcher to ask well-constructed questions. It is important to ensure that the questions are not too broad or ambiguous as these are considered to be poorly constructed. Therefore the questions need to be able to draw out relevant information from the respondents (Peterson, 2000). To be able to construct effective questions, Peterson (2000) describes a seven-step process for creating a questionnaire (see Figure 8 on page 51).

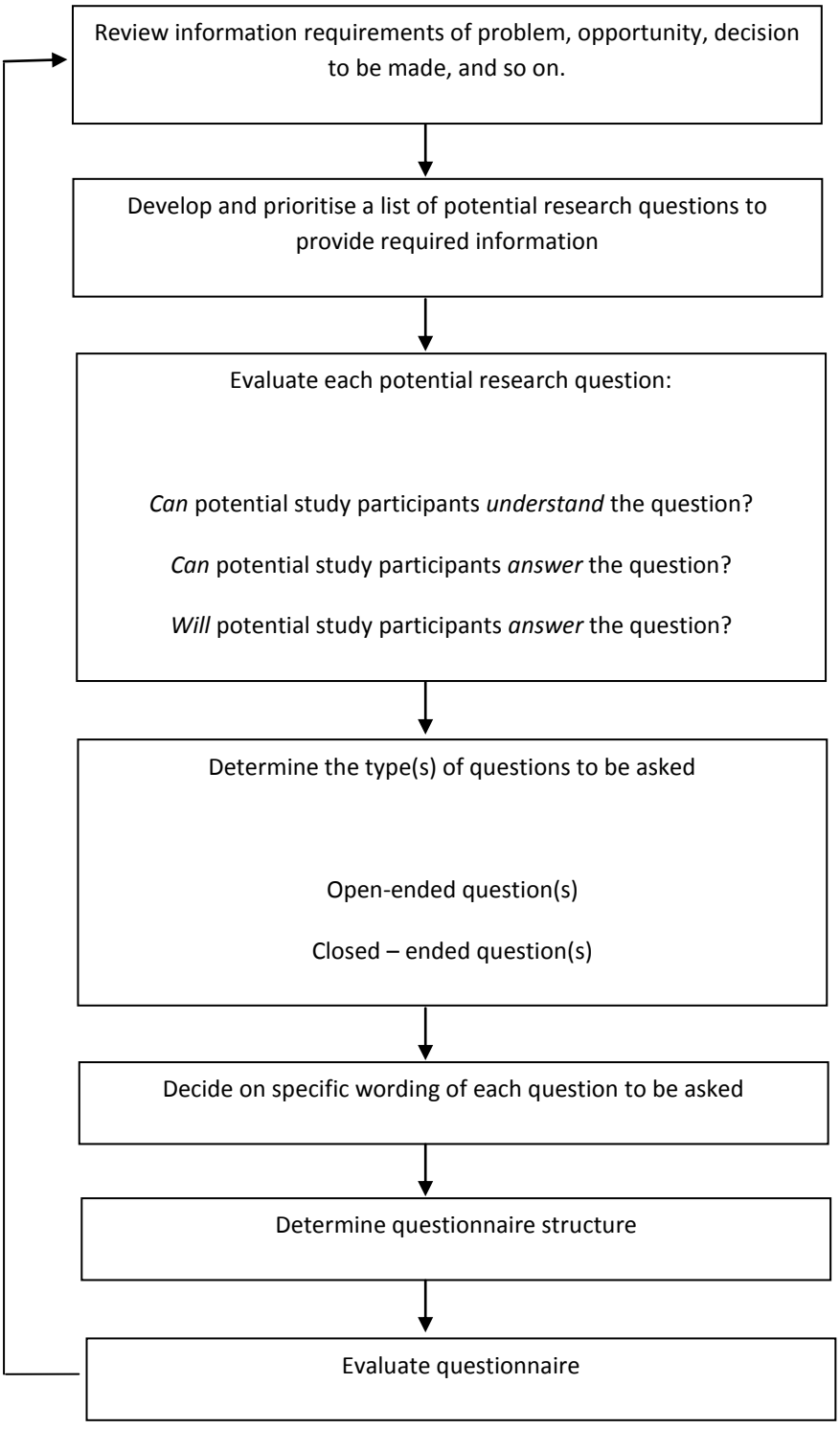


Figure 8: Steps in constructing a questionnaire (Peterson, 2000, 14).

This model described by Peterson (2000) helps the researcher decide the information that is necessary to complete the research and from there the researcher is able to draw up the questionnaire according to the information required.

Questionnaires are able to show general trends that are suited for quantative data (Hoggart *et al*, 2002). An important characteristic of questionnaires is that they are standardised, ensuring the questions are asked in the same way each time the questionnaire is administered. They are completed individually by each respondent (Sanders and Pinhey, 1983). It is important to make sure that the questionnaires are easy to comprehend. Questionnaires are used to determine the publics' feelings, attitudes, behaviour, beliefs and preferences, therefore it is important to accumulate a large enough sample group that represents the population fairly (Sanders and Pinhey, 1983; Lee, 2006). The sample group for this study will be discussed later in section 3.2.2.2 on page 48.

There are two ways of answering questionnaires: one is where the researcher aids the respondents in completing the questionnaire in an interview type situation; and the second is a self-administered questionnaire where the respondent completes the questions (Burton, 2000). The advantages of self-administered questionnaires are that they are easy to send out to a large sample group; they are cheaper to conduct; and it is an easy way to gain access to many respondents within a specific area. Respondents also have time to think about their answers in an unpressured situation (Burton, 2000; Lee, 2006). Using self-administered questionnaires removes the potential for bias when the respondents interact with the researcher (Lee, 2006).

Questionnaires have been used extensively in this type of research however they are associated with a number of limitations. Firstly, questionnaires do not give in-depth detail regarding the causality of certain actions and behaviour (Hoggart *et al*, 2002). Another limitation of using self-administered questionnaires is because there is no direct contact with the respondents, the respondents may not necessarily complete the questionnaire in as much detail as an interview situation. Interviews could obtain more in-depth information from the respondents. The respondents may not complete the questionnaire correctly and there is no limit to how in-depth a response should be for a question (Burton, 2000). Because the respondent is able to read all the questions upon receiving the questionnaire the respondent is able answer the questions in any order. Therefore each question would not be answered independently from one another but rather answered in relation to the other answers already given (Burton, 2000).

3.2.2.1. Types of questions in a questionnaire

Using questionnaires is a suitable way to understand the respondents' knowledge of climate change and determine the changes they have made to their lifestyles. This research project involved determining the public's opinion regarding their behaviour and attitude towards climate change. There are two types of questions used to draw up questionnaires. In this research project both closed-ended and open-ended questions were completed by the respondents in the questionnaire.

Closed-ended questions

The general format for a questionnaire with closed-ended questions follows a concise format. The respondent is given questions to complete and each question has a set selection of answers to choose from. This requires that the respondent selects the answer that best represents his/her view regarding a certain issue (Sanders and Pinhey, 1983; Lee, 2006). The questions may require the respondent to select answers either from a scale, multiple choice or yes/no answers (Burton, 2000).

Advantages of using closed-ended questions are that dealing with sensitive issues such as income, age, employment status and medical conditions are easier (Sanders and Pinhey, 1983; Lee, 2006). A large sample can be obtained, where many questionnaires can be completed and analysed in a shorter time than it would take for open-ended questionnaires to be completed. A benefit with regard to the data collected is that the answers will always relate to the research and it is easier to code the answers for analysis (Sanders and Pinhey, 1983; McBurney, 1998; Lee, 2006). Closed-ended questions ensure that the questionnaire is exactly the same for each respondent. Standardising the questionnaire also makes it easy to compare the respondents' answers (Lee, 2006). It is important to ensure that the questionnaire is concise so that it can be easily understood and it cannot be too long in case people are put off from participating in the research (Sanders and Pinhey, 1983).

A limitation of closed-ended questionnaires is that there can be too few categories for the respondents to choose from. If too many categories are provided to choose from, the respondents may become confused. The selection of answers provided in the questionnaire may lead or influence the respondent to make certain selections based on what the researcher is looking for. Alternatively the categories provided may not reflect the respondent's position (Sanders and Pinhey, 1983; McBurney, 1998; Lee, 2006).

Open-ended questions

Open-ended questions give the respondents an opportunity to answer the questions using their own words and allow the respondents to use their own personal experiences to complete the questionnaire (Lee, 2006). Unlike the closed-ended question, an open-ended question allows for more detail to be explored regarding contexts and reasons why people have developed certain attitudes, behaviours and actions towards the environment, as the respondents are able to answer the questions without being limited to answers provided (McBurney, 1998; Hoggart *et al*, 2002).

The advantage of using open-ended questions is that the data collected is more in-depth and the data allows intricate issues to be studied (Hoggart, 2002; Lee, 2006). This type of question will not limit the respondents' answers thereby enabling them to answer freely, allowing the respondents to explain their reasoning behind their answers (Sanders and Pinhey, 1983; McBurney, 1998; Burton, 2000; Lee, 2006). Because open-ended questions allow the respondents to answer the questions freely, some unexpected results may be found (Lee, 2006).

The disadvantage of using open-ended questions is that they take longer for the respondents to complete which may deter people from taking part in the study. From the researchers' point of view, the disadvantage is that open-ended questions take longer to analyse (Sanders and Pinhey, 1983; Lee, 2006). Another limitation is that because the answers have more detail than closed-ended questions, the answers provided by the respondent may be irrelevant or may not always relate to the research. Coding and comparing the final responses from the readers may be difficult as well (Lee, 2006).

For this research, both open-ended and closed-ended questions were used to collect the data. The majority of the questions were open-ended thereby allowing the respondents to answer the questions freely with no restrictions on how they answered each of these questions. The closed-ended questions (e.g. yes/no questions) were paired with an open-ended question (e.g. why/why not? or please specify) to allow the respondents to explain further their reasoning behind the answers they selected. Combining a closed-ended question with an open-ended question also allowed the researcher to extract further information from the respondent for the closed-ended questions. (See Appendix 4 on page 158 for copy of the questionnaire)

3.2.2.2. Sample of the respondents who completed the questionnaire

"All samples are representative of something. The trick is to make them representative of what you want them to be" (Hoggart *et* al, 2002, 186). A sample group is used to get a representation of different sectors of the population (Hoggart *et al*, 2002). There are a number of sampling methods that are available, namely probability sampling, cluster sampling, theoretical sampling, statistical sampling and snowballing.

Snowball sampling was chosen for this research. Snowballing is a method that is heavily reliant on an existing social network to find respondents through people who have already participated in the research (Noy, 2008; Burton, 2000). This method starts by collecting the data from one respondent or a group of contacts who are interested and have been selected to take part in the study. The process continues as the original respondents find further people to take part in the study and so forth (Noy, 2008; Burton, 2000). Therefore, gradually respondents create new introductions and social links to more people who are willing to take part in the research. This is a popular method that is often used in qualitative and social science research studies as it is an easy way to find respondents and a useful way to include different sectors of society. It makes it simple for the researcher to choose the people being included in the sample (Noy, 2008). "Snowball sampling...is *essentially social* because it both uses and activates existing social networks" (Noy, 2008, 332).

Respondents living in the city of Johannesburg located in Gauteng, a province of South Africa, were selected for this research. 40 readers for each of the newspapers (The Star, Mail & Guardian and BusinessDay) were selected, giving a total of 120 respondents. Men and women were included in this research. The respondents had to be regular readers of at least one of these newspapers. The respondents' basic details (names and email addresses) were given to the researcher however their

identity remains anonymous in this thesis. Each respondent has been given a pseudonym e.g. Respondent 1, Respondent 2 etc.

After the questionnaire was finalised, the researcher was able to send it out to the respondents via email. However, finding respondents for the Mail & Guardian proved to be difficult. So with the permission of the managing director of the Mail & Guardian, the researcher was granted permission to email the questionnaire to a group of the newspaper's subscribers (See Appendix 2 on page 154 for letter to the editor). For The Star and BusinessDay newspapers, the researcher had a number of personal contacts who were willing to participate in the study. From there the snowballing technique was used to gather more respondents. The limitation of using the snowballing in this way is that there is some bias as the researcher has made use an own existing social network. This suggests that people from similar socio-economic backgrounds would be included in this study. Once the questionnaires were completed, thematic content analysis was used to analyse the responses.

3.3. Data analysis

There are a number of ways to analyse data ranging from categorising data and finding patterns to coding data, all of which attempt to make sense of the collected data (Kitchin and Tate, 2000). Thematic content analysis was chosen to analyse the questionnaires (primary data). The newspaper articles (secondary data) were analysed using analytical frames adapted from a previous study by Dirikx and Gelders (2010). From applying this list of frames to the articles, the themes were then identified.

3.3.1. Thematic content analysis

Thematic content analysis is a method used to analyse verbal and written materials (Sanders and Pinhey, 1983; Braun and Clarke, 2006; Elo and Kyngäs, 2008). Thematic content analysis is also described as "...a search for themes that emerge as being important to the description..." of a specific issue being studied (Fereday and Muir-Cochrane, 2006, 82). Ultimately patterns are documented within the data which are then categorised for analysis (Fereday and Muir-Cochrane, 2006). It can be used in a variety of disciplines and the types of written materials that can be analysed include diaries, literature, magazines, letters and newspapers, and it is also suitable for analysing large data sets and data sets that continue for long time periods (Sanders and Pinhey, 1983; Burton, 2000; Elo and Kyngäs, 2008). Thematic content analysis "...is a method of observation that allows researchers to gain leverage on communication-related phenomena..." (Boykoff and Boykoff, 2007, 1193). It is well suited to many different research areas, especially those involving social behaviour (Sanders and Pinhey, 1983). Thematic content analysis is an analysis method that forms the basis upon which other analytic methods are based (Braun and Clarke, 2006).

Thematic content analysis is used to identify, analyse, categorise and describe common themes within a data set (Braun and Clarke, 2006). Thematic content analysis determines the frequency with which common trends, themes or ideas are used in texts (Hoggart *et al*, 2002; Rosenthal, 2004).

When analysing qualitative data, it needs to be broken down in order to make sense of it by describing it in a way that is easily understandable. This is done by classifying the data by placing it into relevant categories and making comparisons (Kitchin and Tate, 2000). The aim is to compile a concise, yet detailed, description of the issue being studied through the use of categories (Elo and Kyngäs, 2008). This method provides a systematic (but not a linear) way of describing the central topic (Elo and Kyngäs, 2008). The process of thematic content analysis involves using a number of elements which examine a text, in this case the newspaper articles and questionnaires. The units of analysis are the main document/s which are analysed. Scoring units (words, phrases and sentences from the articles and questionnaire responses) record specific details on which the research is based. From this the common themes could be categorised from both data sets. This was done by determining common actions, words, phrases, sentences and stories in the written documents (Sanders and Pinhey, 1983: McBurney, 1998). It is important to determine what themes or ideas relate to each other and ultimately identify what is being expressed (Kitchin and Tate, 2000). After analysing the data the researcher ends up with a "sequence of mutually interrelated themes, which together form a dense network of interconnected cross references" (Rosenthal, 2004, 57). By using thematic content analysis, common climate change themes that were represented in the newspaper articles and the questionnaires were determined.

Braun and Clarke (2006) say that there is no set way to do thematic content analysis however they suggest a six step process on how to do thematic content analysis. They also say that although there are six parts to completing thematic content analysis, it is not a one-way process and that revisiting some steps is important. Table 2 (see page 57), explains the six step process of completing thematic content analysis.

Table 2: The six stage process of thematic content analysis (adapted from Braun and Clarke, 2006).

Steps	**Description**
1. Getting to know the data	Read through and become familiar with the data regardless of how well you know it. This is done before coding but start taking notes on the data. If applicable, transcribing data aids in data familiarity.
2. Generating initial codes	Occurs once familiar with the data and initial thoughts have been noted. The codes identify important features that appear to be interesting and are something that can be analysed. This starts organising the data into meaningful groups.
3. Searching for themes	This entails sorting the list of codes themes and organising the data into the themes. Associations are made between the codes and themes. This is done using tables and mindmaps.
4. Reviewing themes	It is important at this stage to revisit the themes and begin to collapse and separate the themes. It is vital to make sure the data supports the theme. This is done by first reviewing the coded extracts and rereading the data for each theme. Second, there is a need to see how applicable the themes are in relation to the rest of the data set. If the data or themes do not correlate well, rework the themes with the data till it fits. This may require recoding some of the data.
5. Defining and naming themes	Start to define and refine the themes. i.e. describe what each theme is about and what data relates to it. How does it fit within the research? Give each theme a title or name for the report.
6. Producing the written report	The final written report is the final analysis of the data and themes where a story is created describing the data and analysis of themes. Data is used to validate the statements made.

The advantages of using thematic content analysis are that it is an analysis technique that can be applied to many qualitative research projects to obtain deep and detailed meaning from the data (Braun and Clarke, 2006; Elo and Kyngäs, 2008). This can make it easy to use (Braun and Clarke, 2006). For this research thematic content analysis is being used to analyse both the interview responses as well as newspaper articles.

One limitation associated with this analysis technique is that because the method can be applied to a number of research contexts, the meanings derived from the data can be multiple, thereby making it difficult to decide what is important to include, and what needs to be focussed on in the analysis (Braun and Clarke, 2006).

There are two types of analysis that can be utilised: inductive analysis and deductive analysis. Inductive analysis derives concepts out of a data set (Elo and Kangäs, 2008). Inductive analysis evaluates the important parts of the content in a text. A code is applied to the data to aid categorisation and develop themes for interpretation (Fereday and Muir-Cochrane, 2006). The dataset is organised as it is coded and categorised. At this stage the data is read through a number of times and notes and headings describing the content are made on the text being analysed. Thereafter, all the notes and headings are gathered onto coding sheets and categorised at this stage. Where possible, similar categories are grouped together in order to begin reducing the number of headings. The categories are used to describe the content and issue being studied (Elo and Kangäs, 2008). It is important to note that through inductive analysis, the researcher interprets and decides what is associated with specific categories. From there, the researcher is able to describe the issue being studied by using the categories, headings and sub-headings (Elo and Kangäs, 2008).

Deductive analysis applies a framework or method structure from previous research to analyse data in a new context which likely includes testing previous theories, concepts or models (Elo & Kyngäs, 2008). In this instance, an outline of categories is drawn up first and then the data is coded according to this outline of categories (Fereday and Muir-Cochrane, 2006; Elo and Kyngäs, 2008). Further, the analysis may be unconstrained where more categories may be added as the data is analysed or the analysis may be structured where only the content that fits into the categorisation outline is analysed and therefore look at the data which does or does not fit into the categorisation outline (Elo and Kyngäs, 2008).

For this research both an inductive and deductive approach was used. The inductive analytic method was used to analyse the questionnaires as the data was coded and then categories were drawn up to organise the data set. The deductive analytic method was used to analyse the newspaper articles as frames from a previous study were adapted and applied to this study. The content in the newspaper articles was categorised according the frames used in a previous study (completed by Dirikx and Gelders, 2010) and from there further themes were identified.

3.3.2. Newspaper analysis

The newspaper analysis involved using frames adapted from previous newspaper studies and applying them to this research. Table 3 (below) shows a list of the frames from a study completed by Dirikx and Gelders (2010) who researched Dutch and French newspapers covering the CoP conferences.

Table 3: Frames used for newspaper articles by Dirikx and Gelders (2010).

Frame	**Description of frame**
Responsibility	How people have affected climate change and who should be held responsible for addressing climate change?
Conflict	Explains the contrasting views of climate change regarding its anthropogenic or natural cycle causes.
Economic (consequences)	How people will be economically or financially impacted by climate change?
Human interest	"How people have been personally affected by climate change?"
Morality	The religious, spiritual and moral standpoint from which climate change is reported in newspapers.

The frames from the Dirikx and Gelders (2010) study – Table 3 above – were used in this research and additional frames that emerged through the analysis of this study were included. From there common themes (based on the frames) in the articles were identified to see what the newspapers were reporting about climate. The additional frames included in this project are *the finance frame*, *the environmental concerns*, and *the terminology used in newspapers to describe climate change*. The frames used for this research are seen in Table 4 on page 60.

Table 4: Frames used in this research (adapted from Dirikx and Gelders, 2010).

Frame	**Description of frame**
Responsibility for addressing climate change	How people have affected climate change and who should be held responsible for addressing climate change?
The climate change debate	The contrasting views of climate change regarding its anthropogenic or natural cycle causes.
Environmental concerns associated with climate change	The weather events and environmental concerns associated with climate change.
The effects of climate change on people	"How people have been personally affected by climate change?" – Especially with regard to livelihoods, food security and water security.
Climate change reported form a moral/religious standpoint	The religious, spiritual and moral standpoint from which climate change is reported in newspapers.
Financial issues relating to climate change	How climate change affects financial issues including the introduction of the green carbon fund, carbon tax and the need to move towards a green economy?
Climate change terminology used in the newspapers	The use of the terms "global warming" and "climate change" within newspaper articles.

Table 5 (see page 61) shows the total number of newspaper articles studied. The last row illustrates the total number of articles on climate change per month for all the newspapers. The last column marked 'Total' shows the total number of articles collected for each newspaper. The last figure at the bottom of this last column is the total number of articles studied altogether. 374 articles were collected from The Star, 510 articles were collected from the BusinessDay and 64 articles were collected from the Mail & Guardian. Table 5 shows that there was a dramatic increase in the number of climate change articles over November and December 2011 during the time South Africa hosted CoP17. Newspaper articles were collected between Jan 2011 – Jan 2012. CoP 17 was held between 28 November 2011 – 9 December 2011 and fell within the data collection time frame.

Table 5: The number of newspaper articles reporting on climate change monthly and total number of articles studied between January 2011 and January 2012.

	Jan 2011	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan 2012	**Total**
The Star	38	40	45	36	49	64	8	10	8	15	31	35	4	**374**
BusinessDay	28	30	30	25	28	21	24	38	46	49	86	89	16	**510**
Mail & Guardian	4	3	2	1	4	5	3	5	3	4	15	11	4	**64**
Number of articles per month	**70**	**73**	**77**	**62**	**80**	**82**	**35**	**53**	**57**	**68**	**132**	**135**	**24**	**948**

3.4. Ethics

It is important for research to be ethically acceptable whenever the public is participating. Ethics are used to protect people who agree to participate in research (Aguinis and Henle, 2004). If vulnerable groups are involved in the research, ethical clearance is necessary to complete the project. When approaching the respondents, it is important that they know and understand what the research is about and what is required of them. It is also important that they know that they are not being deceived in anyway, that they have full confidentiality and anonymity and that they are volunteering to participate in the research and are therefore able to withdraw from participating in the research project (McBurney, 1998; Kent, 2000; Kitchin and Tate, 2000).

Potential participants are briefed about the background of the research and what their purpose for the research is, prior to the questionnaire being completed (Peterson, 2000; Lee, 2006). This gives the respondents the opportunity to decide whether they would like to participate or not. This is informed consent. It is noteworthy to consider what information about the research is relayed to the potential participants so that they are encouraged to participate. The type of research information which is relayed to the participants may affect whether or not they will participate in the research (Peterson, 2000). The personal details of the respondents should be kept confidential ensuring that the participants are anonymous and that their answers cannot be traced back to them (Peterson, 2000; Lee, 2006). See Appendix 3 on page 156 for the participant information sheet and consent form.

This project involved the completion of questionnaires by readers of the newspapers. This group of respondents are not considered to be vulnerable. Questions of a sensitive nature that could offend or make the respondents feel uncomfortable were not asked. The respondents were requested to complete a consent form to give their permission to take part in this research. The proposal for this research, including the questionnaire, was submitted to the University of the Witwatersrand School of Geography, Archaeology and Environmental Studies (GAES) for ethics clearance. See Appendix 1 on page 153 for the ethics clearance.

Chapter 4: Newspaper reporting of climate change

4.1. Introduction

This first analysis chapter explains the common frames and themes in the newspaper articles published in The Star, Mail & Guardian and BusinessDay. Climate change articles that were published between January 2011 and January 2012 were collected over this period. These newspapers framed and reported on climate change in various ways. The articles are framed in order to organise or categorise ideas around a central issue in the newspapers (Carvalho, 2007). The chapter then describes the frames and themes. The frames used were based on a study by Dirikx and Gelders (2010) to which more frames were added. The frames are: responsibility for addressing climate change, responsibility for not addressing climate change; the climate change debate; the environmental concerns associated with climate change; the effects of climate change on people; the moral or religious standpoint from which climate change is reported on; the way in which finance is affected by climate change and the terminology used to describe climate change. This chapter starts with the total number of newspaper articles studied and frequency of themes used.

4.1.1. Total number of newspaper articles and themes

Newspaper articles were collected between Jan 2011 – Jan 2012. CoP 17 was held between 28 November 2011 – 9 December 2011 and fell within the data collection time frame. Table 5 on page 61 shows the number of newspaper articles studied. The last row illustrates the total number of articles on climate change published per month while the last column marked 'Total' shows the total number of articles collected for each newspaper. 948 articles were studied altogether: 374 articles were collected from The Star, 510 articles were collected from the BusinessDay and 64 articles were collected from the Mail & Guardian. Table 5 (page 61) shows that although the number of articles collected each month fluctuated, there was a 3.7% decrease in climate change coverage in the newspapers from January 2011 to July 2011. From July 2011 till November 2011 there was a 10% increase in the number of climate change articles and a further 0.3% increase in December. The increase in climate change articles reporting on climate change in the second half of the year occurs at the same time as South Africa hosted CoP17. There is an 11.7% decrease in articles covering climate change from December 2011 to January 2012 once the CoP17 conference was over.

Table 6 (see page 64) shows a list of all the themes from the newspapers. The themes in column 2 are the most commonly reported ideas or stories in the newspaper articles. The themes are totalled according to the number of times they were mentioned in the newspapers and are ordered within their frames (column 1) according to the frequency with which they were mentioned (column 6). It is important to note that Table 6 does not reflect the total number of articles studied as an article may be reflected in more than one theme.

As mentioned earlier, some of the frames used in this study were adapted from a study that Dirikx and Gelders (2010) completed. These were: the responsibility frame; the conflict frame; the economic

(consequences) frame; the human interest frame and the morality frame. The finance frame and the terminology frames were not part of Dirikx and Gelders' (2010) original study and are new in this research.

The responsibility frame includes: CoP17 and the Kyoto Protocol; carbon emissions; alternative energy and technology; responsibility for not addressing climate change; authoritative responsibility for addressing climate change; general responsibility for addressing climate change; individual responsibility for addressing climate change; corporate/social responsibility for addressing climate change; adaptation and mitigation; raising awareness of climate change and the scientific reporting of climate change. The conflict frame includes the climate change debate which focuses on the anthropogenic or natural causes of climate change. The environmental concerns include weather events and other environmental concerns associated with climate change. The economic (consequences) and human interest frames look at how people have been affected with regard to their livelihoods, water and food security and the population's use of resources. The moral/religious frame describes whether the articles portrayed climate change from a moral or religious view. The finance frame includes the green climate fund; carbon tax; finance and the green economy. The terminology frame looks at how the terms global warming and climate change were used in the articles (see Table 6 on page 64).

Table 6: The number of times the frames and themes were mentioned in all the newspaper articles (frames adapted from Dirikx and Gelders, 2010).

		Number of times a theme was mentioned in the newspapers			
Frames	**Themes**	**BusinessDay**	**M&G**	**The Star**	**Total**
Responsibility for addressing climate change	CoP17 & the Kyoto Protocol	21	11	37	69
	Carbon emissions	10	11	21	42
	Alternative Energies and technologies suggested for mitigating the effects of climate change	2	6	27	35
	Responsibility for not addressing climate change	1	6	5	12
	Authoritative Responsibility for addressing climate change	14	13	21	48
	General responsibility for addressing climate change	2	5	14	21
	Individual responsibility for addressing climate change	1	4	8	13
	Corporate/social responsibility for addressing climate change	1	2	5	8
	Adaptation and mitigation measures used for addressing climate change	1	4	9	14
	Raising awareness of climate change	1	3	11	15
	Reporting of climate change information published by the scientific community	2	2	3	7
The climate change debate	Anthropogenic causes of climate change	7	12	20	39
	The natural climatic cycle	2	5	4	11
Environmental concerns associated with climate change	Weather events associated with climate change	10	16	33	59
	Environmental concerns associated with climate change	2	4	17	23
The effects of climate change on people	The impact of climate change on people's livelihoods	8	17	29	54
	The impact of climate change on food security	6	15	22	43
	The impact of climate change on water security	1	1	12	14
	Population and resource usage	0	1	10	11
Climate change reported from a moral/ religious standpoint	Climate change reported from a moral/religious standpoint	1	2	4	7
Financial issues relating to climate change	The green climate fund and climate change	8	10	15	33
	The introduction of a carbon tax to reduce carbon emissions	4	3	10	17
	The impact of climate change on a country's finance	3	1	5	9
	Climate change and moving towards a green economy	0	3	5	8
Climate change terminology used in the newspapers	Climate change terminology used in the newspapers	9	8	20	37

4.2. Responsibility for addressing climate change

The first frame is the responsibility for addressing climate change. The themes in the responsibility frame are CoP17 and the Kyoto protocol; carbon emissions; responsibility for not addressing climate change; responsibility for addressing climate change; adaptation and mitigation measures used for addressing climate change; raising awareness of climate change and lastly the reporting of climate change information published by the scientific community.

4.2.1. CoP17 and the Kyoto Protocol

The first theme in the responsibility frame is CoP17 and the Kyoto Protocol. South Africa hosted the 17th Conference of the Parties (CoP17) in 2011. The high importance of CoP17 explains why this first theme was reported on most frequently in all the newspapers. It is likely that there would have been less climate coverage in the local newspapers had South Africa not hosted CoP17. Therefore other important news-worthy stories would have become the focus in the newspapers. The focus on CoP supports the statement made by Baron (2006) that a current issue in the news will continue to gain media coverage until a new problem is highlighted and that becomes the new focus in the news.

Within the CoP17 and Kyoto protocol theme there are five topics. These are: the frequency with which newspaper articles reported on CoP17; the over-simplification of information in the newspaper articles; the underlying politics of CoP17 portrayed in the newspapers; and the portrayal of the previous meetings and expectations for CoP17 and lastly the regulation at the meetings with regard to signing the Kyoto Protocol.

2.4.1.1. Frequency of newspaper articles reporting on CoP17

The first topic discusses the frequency with which the newspapers reported on CoP17 and the Kyoto Protocol. Table 7 (see page 66) shows that articles reporting on CoP17 became more frequent in all the newspapers from the second half of the 2011 year. There was an average of 1 or 2 articles mentioning CoP17 and the Kyoto Protocol every month until November and December when CoP17 took place, which saw the most articles reporting on CoP17 and the Kyoto Protocol. When the conference ended, only a few articles in December mentioned CoP17 and in January 2012 no articles mentioned CoP17 or the Kyoto Protocol. The newspaper articles at the beginning of 2011 mentioned South Africa hosting CoP17 in passing. While the conference was on, details regarding CoP17 and its progress of the discussions were reported. The increasing frequency of reporting on CoP17 was a strategy to make the public aware of the conference and of climate change. The details regarding the history of the CoP conferences were not discussed in depth in the articles and only the goals for CoP17 were reported.

Table 7: The number of newspaper articles reflecting CoP17 and Kyoto Protocol between 2011 and 2012 in the Mail & Guardian, BusinessDay and The Star newspapers.

	Jan 2011	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan 2012
Mail & Guardian	1	1	2	0	0	1	0	0	2	1	11	9	0
BusinessDay	0	2	0	0	0	0	2	3	1	2	5	3	0
The Star	0	0	1	0	0	1	0	4	1	4	9	16	0

4.2.1.2. Over-simplification of information in the articles reporting on CoP17, the Kyoto Protocol and climate change

Over-simplification of information regarding CoP17, the Kyoto Protocol and climate change is the second topic. Weingart (1998) states that information is passed down through various levels from the scientists, who create information, to media and finally to the public, who consumes the information. As the information reaches each level it is modified so that the public can understand it easily. The only information people acquired from the Mail & Guardian at the beginning of 2011 was that the conference addressed climate change and that it was hosted in South Africa. Climate change is a broad topic and there are different observations or solutions to this broad and multifaceted issue which affects everyone (McBean and McCarthy, 1990). The public may not understand climate change as a multifaceted problem and therefore see the conference as a means to finding a solution for global climate change. The Star mentioned that CoP17 was seen as a means to address *"...the tough issue of climate change and its impact, not just on this country but on the world"* (The Star, 24/11/2011b). Therefore, because the newspapers report on climate change and CoP17 with few specific details, it is easy to recognise why the public do not understand that CoP17 focuses on agreeing to address one or two aspects of or issues associated with climate change.

4.2.1.3. The underlying politics of CoP17 portrayed in the newspapers

The third topic is the underlying politics of CoP17 that were portrayed in the newspapers. Two political views were reported in the newspapers regarding countries re-signing the Kyoto Protocol. The first is the deadlock between China and the USA and the second concerns countries refusing to re-sign the Kyoto Protocol. These two political stances were represented in all the newspapers, however each newspaper focussed on one particular political stance.

The first political stance is the deadlock between China and the USA with regard to signing the Kyoto Protocol again. The Mail & Guardian often reported on the developed and industrialised nations with regard to signing the Kyoto Protocol again. As reported in the quote below, the Mail & Guardian emphasised that China and the USA needed to commit to the Kyoto protocol as they are high carbon emitters, but both nations refused to sign. The Star and BusinessDay briefly reported on the deadlock between these two countries stating that *"...The world's top two polluters, China and the US, never signed Kyoto at all."* (The Star, 8/8/2011). The Star suggested that the Kyoto Protocol's terms for binding countries to the contract have caused a global debate over its effectiveness.

> *"...China is already a bigger emitter of greenhouse gasses than the US, and if the Chinese do not reduce their carbon footprint the planet is in trouble. At the same time the US and [other] countries...do not want to commit to too stringent caps because it will kill their economies, leaving China with a huge trade advantage.* ***So every nation is waiting for the others to blink first****."* (Mail & Guardian, 30/9/2011)

The Mail & Guardian illustrates how the important players have challenged other parties on what is ethically and legally correct while other countries implement their own regulation to reduce emissions outside of the protocol.

The second political stance is the issue of countries refusing to re-sign the Kyoto Protocol. The Star and BusinessDay had the most articles reporting on this subject. The BusinessDay and The Star newspapers reported that because of the deadlock between China and the USA, other countries *"...were arguing against a second commitment period for the protocol"* (BusinessDay, 22/9/2011) and they *"...were very likely to pull out because the US, especially, would not join"* (The Star, 23/8/2011). The Mail & Guardian also reported on this conflict concerning which countries would or would not sign the protocol (seen below). All the newspapers reported on the threat of countries pulling out of and not signing a second agreement for the Kyoto Protocol.

> *"Canada, Japan and Russia have already refused to sign on for a second commitment period, objecting to the lack of legal constraints on the world's biggest carbon polluters. Europe says it can accept a continuation, provided China and the US show they are serious about major cuts in the coming years."* (Mail & Guardian, 22/11/2011)

The BusinessDay reported on the urgency of the Kyoto Protocol stating that nothing could be achieved unless there was a full agreement from all parties concerned. Part of the problem represented in the BusinessDay was that there is conflict between countries such as Germany who would agree *"...to sign a second commitment to mitigate against climate change..."* (BusinessDay, 4/7/2011), and others like Canada and Australia who are *"...arguing against a second commitment period for the protocol..."* (BusinessDay, 22/9/2011). The newspapers illustrated that the political leaders who gathered at the conferences showed they wanted to take responsibility for addressing climate change. However there was a reluctance to sign a second Kyoto Protocol commitment as the policy is viewed as flawed because there are no *'...legal constraints on the world's biggest carbon polluters'* (Mail & Guardian, 22/11/2011). The Star and quote below from the Mail & Guardian explain that the Kyoto Protocol is seen as an old and outdated policy and *"...another legal framework into which some of the Kyoto commitments could be put..."* (The Star, 23/8/2011) should be created.

> *"We should...give Kyoto a decent burial and switch to plan B. This turns out to be a looser arrangement in which governments make voluntary pledges to each other."* (Mail & Guardian, 18/11/2011)

The Mail & Guardian and BusinessDay reported that while countries have pulled out of the Kyoto Protocol, their governments are still taking 'individual' responsibility for addressing climate change by implementing voluntary pledges to lower their carbon emissions. Because the newspapers suggest that the Kyoto Protocol is seen to be out of date, CoP17 should have focussed on planning another emissions reduction policy to incorporate all countries rather than trying to force a second Kyoto Protocol commitment.

The Mail & Guardian and BusinessDay reported on the unwillingness of countries to take responsibility for re-signing the Kyoto Protocol and the concern for leaders to continue making practical differences towards addressing climate change. Because the newspapers reported on the unwillingness of countries taking responsibility to re-sign the Kyoto Protocol, the public could question the necessity and productivity of the CoP17 conference as the meeting appears to be more politically orientated instead of climate change orientated. The political focus in the newspapers on CoP17 is firstly due to political nature of the CoP meetings but secondly due to the political nature of each newspaper itself. Regardless of the goals for CoP17, the Mail & Guardian implies that the main focus for CoP17 is to solve the deadlock between China and the USA so that these countries can agree on re-signing the Kyoto Protocol while The Star and BusinessDay focus on the need to re-evaluate the Kyoto Protocol again.

4.2.1.4. Portrayal of previous CoP meetings and expectations for CoP17

The fourth topic related to CoP17 and Kyoto Protocol is the way in which the previous CoP meetings were portrayed and what the expectations were for CoP17. Most often the previous meetings were seen as unsuccessful. Reports stated that because the previous meetings had failed, the same expectation was placed on CoP17. The portrayal of the previous conferences will be addressed first followed by the expectations for CoP17.

The previous CoP conferences were mentioned in the newspaper articles and were used as comparisons for CoP17. The Mail & Guardian and The Star both state that the first CoP meeting in 1997 was the only successful conference as the Kyoto Protocol is *"...the only legally binding agreement it has spawned..."* (Mail & Guardian, 30/9/2011).

> *"...The protocol...was finalised in Kyoto, Japan, in 1997 and came into force in 2005. Nearly all nations that signed the convention have ratified the Kyoto Protocol ...However, the mandatory emission reduction targets do not apply to all nations...Developing countries...do not have mandatory targets. This is because the...bulk of greenhouse gas emissions were produced by the developed nations...So the protocol places a heavier burden on the developed nations, under the principle of "common but differentiated responsibilities..."* (The Star, 22/11/2011)

Furthermore, The Star describes that developed and developing countries had different responsibilities to reduce their emissions. The Star reported that it was only recently, when the

developing nations were pressured into taking responsibility for their own contributions towards climate change, that a change was seen regarding who should commit to the Kyoto Protocol.

The BusinessDay reported that the previous *"...annual UN conferences aimed at lowering emissions [and] have achieved little more than promises from governments"* (BusinessDay, 24/2/2011) and there is a *"...need for a more binding legal agreement..."* for policy implementation (BusinessDay, 24/2/2011). Reporting on the previous unsuccessful conferences can raise doubt amongst the public regarding the necessity and usefulness of CoP17. The BusinessDay explained that 'promises' have been made at the CoP conferences however these 'promises' or agreements appear to have not been followed through. All the newspapers further report that regulation is a weakness which needs attention for future conferences to be truly effective. An implied suggestion to make the conferences successful, and to solve policy implementation after the conferences, would be to ensure that commitments are upheld after the conferences. The newspapers explain that the 1997 conference was successful because countries committed to reduce emissions. The newspapers report that the annual conferences since 1997 appeared to have few commitments to follow through with the policies discussed and agreed.

Secondly, because the previous CoP conferences have been portrayed in a negative light, due to their limited success, *"...the prospects for even a reasonable outcome..."* (The Star, 8/8/2011) were not good for CoP17 especially with regard to re-signing a second Kyoto Protocol commitment and establishing the green climate fund, but there was a small hope for some success (see quote below).

> *"There is near-unanimous agreement that Durban will not achieve a fair, legally binding accord that would tie in all greenhouse gas-polluting nations, but there is growing...optimism that it could approve a broad map for the transition to a low-carbon world and the framework for a comprehensive new agreement in the next few years...Durban will, at best, be a stepping stone on the path towards the ambitious goal of a single, legally binding, global climate agreement signed by all nations..."* (The Star, 21/11/2011)

Therefore the success of CoP17 depended on what was agreed upon and committed to. However The Star and BusinessDay stated that at CoP17 *"...there is zero chance of reaching a binding emissions deal..."* (The Star, 8/8/2011) and that *"the conference is not expected to deliver agreement on a second commitment period"* (BusinessDay, 22/9/2011).

The newspapers have portrayed the progress from the first CoP meeting to be slow and the previous CoP meetings unsuccessful. The disappointing outcomes portrayed in the newspapers of the previous CoP meetings appear to stem from not achieving the goals set out at each of the meetings. The articles showed that responsibility for addressing climate change has not been taken seriously and no one has been held accountable for the poor achievements and accomplishments during and after the CoP meetings. The Star however emphasised the need for CoP17 to be successful and

implied that the success of the conference depended on what was agreed to and upheld after the conference.

4.2.1.5. Regulation and commitment to re-signing the Kyoto Protocol

The last topic relating to CoP17 and Kyoto Protocol is the need for regulation and commitment to signing the Kyoto Protocol. The Mail & Guardian said that *"...the lack of binding constraints over giants...has gravely weakened the efforts to address climate change..."* (Mail & Guardian, 22/11/2011) especially after CoP16. The BusinessDay mentioned that a second Kyoto Protocol commitment is being considered but there needs to be an agreement *"...engaging all parties"* (BusinessDay, 1/12/2011) and regulating the countries who have signed. The flexibility with regard to signing and regulating the commitments appears to be a weakness within the structure of the Kyoto Protocol. Therefore the unified global responsibility to reduce carbon emissions is negated and the seriousness of the climate change situation is diffused as it could be perceived to be unimportant to tackle.

The Star reported below that CoP17 was deemed successful as a new treaty was signed. The newspaper reported that this appears to be the first time since 1997 that a CoP conference has been successful and that a carbon reduction policy including all countries has been agreed to. The Star reported that the inclusion of both developed and developing countries into the policy ensures that equal responsibility is taken for reducing carbon emissions. The regulation at CoP17 allows the political leaders to agree and re-sign the policy. Based on what the newspapers report, saying that the previous conferences have appeared to be unsuccessful, the proof of the CoP17 success will be seen if there is a post conference follow-up ensuring that these countries will uphold their side of the agreement.

> *"The 17th Conference of the Parties...closed in Durban on Sunday...the participating countries finally achieved an agreement to work together on a new international climate change treaty that would include developed as well as developing countries for the first time...It ensures the fair participation of all countries...in the global effort to reduce greenhouse gas emissions..."* (The Star, 16/12/2011)

The CoP17 and Kyoto Protocol theme is politically orientated. The politics raises awareness of the issues relating to CoP 17 and Kyoto Protocol, but responsibility has almost been lost in some instances. This creates an information gap where the public received insufficient information regarding climate change or CoP17 until the conference happened. While the Mail & Guardian focussed on the deadlock between China and the USA, The Star and BusinessDay reported on the politics and the need for all countries to take responsibility and agree to a second commitment for the Kyoto Protocol. The Mail & Guardian and BusinessDay newspapers explained that the previous conferences were unsuccessful probably because there is little regulation during and after the conferences with regard to instructing and signing all countries to the Protocol.

4.2.2. Carbon Emissions

The second theme related to responsibility is carbon emissions. The common topics in the newspapers were: the need to reduce carbon emissions for a low-carbon future; South Africa and its carbon-intensive economy; the strategies to reduce carbon emissions globally and in South Africa and lastly the emission reduction targets proposed by different countries. The carbon emissions theme was reported on negatively whereas the alternative solutions appear to be reported on positively. In all the newspapers, the carbon emissions theme was reported more often than the alternative energy and technology theme as seen in Table 6 on page 64 and the newspapers focussed on how people are responsible for releasing greenhouse gasses into the atmosphere.

4.2.2.1. The need to reduce emissions for a low-carbon future

The first carbon emissions topic is the need to reduce carbon emissions globally to ensure a low-carbon future. The Mail & Guardian and The Star reported the need for all countries to *"...act now to reverse emissions trends"* (Mail & Guardian, 24/11/2011) and *"...to reduce greenhouse gas emissions and mitigate the adverse impacts of climate change..."* (The Star, 24/11/2011b) so as not to cause more damage to the environment, thereby slowly reversing the impact society has had on the climate. The newspapers report that too much carbon is being released into the atmosphere from the global population and something must be done to counter the effects of the population impact. The Mail & Guardian alerts the public to the effects of releasing carbon emissions and highlights the need to move toward a low-carbon future. The newspapers report that the goal is to reduce carbon emissions in both developed and developing countries.

4.2.2.2. South Africa and its carbon intensive economy

South Africa and its carbon intensive economy is the second topic associated with carbon emissions. There were conflicting reports in the newspapers with regard to South Africa's carbon emissions compared with the rest of the world. The Mail & Guardian portrayed South Africa as *"...one of the world's most carbon-intense economies, but...it emits only 1% of total global emissions"* (Mail & Guardian, 25/11/2011) suggesting that South Africa is not one of the higher carbon emitters. However the BusinessDay and The Star contradicted the Mail & Guardian and reported that South Africa was seen to be *"...one of the biggest emitters of greenhouse gases in the world, and by far the worst offender in Africa"* (The Star, 10/11/2011) because South Africa *"...relies almost exclusively on coal for electricity generation"* (BusinessDay, 21/11/2011). The newspapers reported on South Africa's carbon emissions highlighting different perceptions. The Mail & Guardian reported on this issue with little concern for South Africa's carbon intensive economy while some concern was sensed in The Star and BusinessDay as reports suggest something must be done to reverse emissions trends.

4.2.2.3. Strategies to reduce carbon emissions globally and in South Africa

The third carbon emissions topic describes the strategies reported in the newspapers on how to reduce carbon emissions globally and in South Africa. Countries need to start and continue reducing carbon emissions but limits need to be *"...placed on carbon emissions for top polluters, who could face penalties if they do not conform to new regulations"* (Mail & Guardian, 8/11/2011). The Star

reported on the importance to *"...communicate and engage with all stakeholders to reduce greenhouse gas emissions and mitigate the adverse impacts of climate change..."* (The Star, 24/11/2011). The Mail & Guardian quote below explains how Clean Development Mechanisms (CDM's) and the carbon credit system, which are part of the Kyoto Protocol, have been employed as a measure to control and reduce global carbon emissions. The CDM places restrictions on the amount of carbon a country can release and allows for projects to be developed to gain carbon credits that can then be sold.

> *"The carbon market is a "flexibility mechanism" associated with the Kyoto Protocol that enables polluters in rich countries to buy carbon credits to help them to manage their carbon caps. If a polluter knows it is going to exceed its cap, it can buy credits from another polluter to comply with the caps imposed. The carbon market clean development mechanism (CDM) allows emission reduction projects in developing countries to create credits that can be sold. The joint implementation is similar to the CDM, but operates between developed countries only. International emissions trading allow countries that are below their Kyoto Protocol emission levels to sell their "surplus" emission credits to developed countries for them to meet their targets."* (Mail & Guardian, 30/9/2011)

The quote below from the BusinessDay illustrates the introduction of the global carbon budget which is a means to control and reduce each country's carbon emissions. The budget will be implemented globally and divided fairly between the countries involved. The BusinessDay reported that the budget will impact on South Africa and "*because SA's economy is 'emissions-intense', the document proposes a carbon 'budget' for various economic sectors..."* (BusinessDay, 17/10/2011). Therefore a carbon budget is being implemented locally in South Africa as well.

> *"It seems to us that the idea of a global carbon budget makes…sense and gives us all a clear target to work with…There are a number of ways one can calculate each nation's fair share and different countries…have different preferences depending on their past emissions, future development needs, population, and so on…this South African carbon budget must be shared out among all its people and companies…in order to maximise socioeconomic benefits."* (BusinessDay, 20/10/2011)

4.2.2.4. Emission reduction targets proposed by countries

The last topic associated with carbon emissions is the individual emission reduction targets proposed by the countries. Often large figures such as 30%-40% were given, as seen in the quote below. The pressure is on countries with large economies to make the greatest contribution to reduce their emissions. It seems that the reporting of large reduction targets in the newspapers can be a shock tactic to show people the effort needed to reduce carbon emissions, and therefore encourage society to take responsibility for their carbon emissions.

> *"...China was doing all it could and had in 2009 committed to reduce greenhouse gas emissions per unit of gross national product by between 40% and 45% by 2020 compared with 2005 emissions."* (Mail & Guardian, 22/11/2011)

Despite the portrayal of South Africa as a high carbon emitter, The Star and Mail & Guardian reported that South Africa has made a commitment to reduce its emissions *"...by 34% over the next decade..."* (Mail & Guardian, 8/11/2011) and *"...by 42 percent in 2025"* (The Star, 1/12/2011c) even though it is coal dependent. South Africa may have been pressured as the host for CoP17 to lead by example and to prove that they are in the process of reducing carbon emissions.

Although CDM's and the carbon budget were suggested as solutions to reduce emissions, interestingly alternative energy and technology were not suggested as solutions to reduce carbon emissions. Each of the topics was reported on separately. One would assume that a relationship should be seen in the newspapers between alternative solutions and emission reduction, but none of the newspapers chose to make the connection.

4.2.3. Alternative energies and technologies suggested for mitigating the effects of climate change

Alternative energy and technology for solving climate change is the third responsibility theme. Within this theme, the two focus areas are alternative energy and alternative technology. The Mail & Guardian and the BusinessDay newspapers did not focus as much on alternative solutions compared with The Star. The Mail & Guardian reported that South Africa needs to adapt to *"...climate change...and accelerate the development of low-carbon energy sources and technology..."* (Mail & Guardian, 24/11/2011) to ensure a low-carbon and sustainable-energy future. The Mail & Guardian suggested that adopting alternative solutions needs to be done on a local scale as we need to introduce it into our lifestyles as part of an adaptive strategy towards climate change. South Africa is often used as an example for energy and technology alternatives in the newspapers.

4.2.3.1. Alternative energies available for mitigating the effects of climate change

The first focus area is the alternative energies that are available for mitigating the effects of climate change. The BusinessDay and Mail & Guardian newspapers did not give specific examples of available alternative energies but both newspapers mentioned that *"...it was important for the country to embrace green sectors and green technology..."* (Mail & Guardian, 17/1/2011) by moving to *"...a truly green, renewable future as quickly as possible"* (BusinessDay, 14/4/2011) by finding low-carbon alternatives.

The Star reported that *"coal is no longer viable as an energy source. Costs are rising and will continue to rise...Our message is to look to renewables."* (The Star, 2/12/2011a). The newspapers implied that there is a need to move away from coal and invest in alternative energy which is especially applicable to countries, like South Africa, that are reported to have a carbon intensive economy. The Star reported on alternative energy options which are suited for South Africa. Some of the recommended options are solar and wind energy, nuclear energy and natural gas which is accessed by fracking. The

Star reported that South Africa is mainly looking at renewable energies like the *"...100MW wind power station in the Western Cape..."* (The Star, 27/6/2011) and other such projects which are in the process of being developed.

The Mail & Guardian reported on the need to ensure communities have access to energy while at the same time acknowledging the importance of reducing carbon emissions. The Mail & Guardian reported that *"...addressing climate change was not incompatible with enabling energy access; this could be done through implementing standards for energy-using equipment like cars and appliances, focusing on renewable and energy efficiency..."* (Mail & Guardian, 7/12/2011). Alternative solutions are provided so people are able to include them in their lifestyles. No mention is made in the Mail & Guardian regarding where and how the alternative solutions will be established, the cost of such implementation and who should be held responsible for supplying and investing in the alternatives. The newspapers report that at the moment the transition to a low-carbon economy is work in progress and various sectors of society are in the process of exploring what should be done in the energy sector.

4.2.3.2. Alternative technologies available for mitigating the effects of climate change

The second focus area is on alternative technologies that are available for mitigating the effects of climate change. The Mail & Guardian and The Star newspapers were the only newspapers that reported on alternative technologies. However each newspaper took a different view of this topic. The Star provided details on what alternative technologies are being explored globally and whether these technologies can be used by individuals in their homes or whether they would be introduced across the grid for society to use. The Star, for example, reported that *"ENERGY-GUZZLING incandescent lightbulbs are to be banned...quality standards for the more efficient compact fluorescent lamps (CFLs) were being developed so that consumers did not use incandescent bulbs."* (The Star, 7/6/2011). The new CFL lightbulbs are a new low-carbon alternative technology that South Africa has introduced which the public can access easily and use in their households. The Star also reported on transport such as bicycles or hybrid cars which are low-carbon alternatives.

> *"...the more bicycles we use, the fewer the cars on our streets and therefore there would be less emission of greenhouse gases to warm Earth...The coming UN climate change talks in our country can help in conscientising our society...about the necessity to move away from fossil fuels for our energy needs."* (The Star, 3/10/2011)

> *"Sales of fuel-efficient, hybrid cars may have got off to a sluggish start, but ownership is set to explode to account for more than half of all vehicles sold by 2030, as improving models, government incentives and rising petrol costs escalate demand..."* (The Star, 20/1/2012)

The Mail & Guardian took a different angle and reported how businesses were involved in developing cleaner technology, highlighting the need to make coal cleaner particularly for countries that have carbon intensive economies and ultimately to reduce impact on climate change. The Mail & Guardian

newspaper showed how the development of technology is closely associated and influenced by the sector of society that has sufficient resources to develop technology.

> *"Technology has an important role to play, and Anglo American has been involved [in]...many projects that seek to reduce greenhouse gas emissions...coal is an important part of the energy mix and it will continue to drive the economic progress of much of the developing world – and several parts of the developed world...The challenge is to make it cleaner. We are part of industry-wide research into a number of...carbon sequestration technologies that could significantly reduce coal's carbon footprint."* (Mail & Guardian, 21/11/2011)

There are important details about alternative energy and technology that were absent from the Mail & Guardian and BusinessDay newspaper articles. The cost of introducing alternative energies and technologies and how this could impact on how people embrace alternative solutions was not addressed. There was little information in these two newspapers concerning the available alternative options. Reading newspapers is a direct way for society to learn about the energy and technology alternatives and to be informed as to why these are being explored as viable options, and in what ways they benefit society. The lack of information regarding the alternative solutions will not provide people with adequate information regarding low-carbon and green alternatives. Schneider (1997) says that the public's lack of environmental knowledge accentuates more environmental problems. Therefore if people are environmentally literate they should have sufficient information about a specific environmental topic (in this case alternative energy and technology). By becoming environmentally literate, people are able to become active environmental citizens as they become environmentally responsible by adopting the alternatives into their lifestyles (Hawthorne and Alabaster, 1999). If the public does not receive sufficient information they cannot respond to the issue. If the public does not understand or know what is available, society cannot assist in transitioning to a low-carbon future. Newspapers add to people's environmental literacy by shaping 'facts' and preconceived ideas.

4.2.4. Responsibility for not addressing climate change

The lack of responsibility for addressing climate change is the fourth theme and was one of the less frequently reported responsibility themes. As seen in Table 6 on page 64 the BusinessDay had one article, the Mail & Guardian had six articles and The Star had five articles reporting on the lack of responsibility for addressing climate change. There are two emerging topics in this theme. The first is that governments were to seen not to take responsibility for addressing climate change and second is that developed and developing countries appeared not to be doing anything to address climate change.

4.2.4.1. Government not taking responsibility for addressing climate change

The first topic is that governments appear not to be taking responsibility for addressing climate change. The Star and Mail & Guardian both reported that the reason why the effects of climate change are not being reversed is because *"...some governments do not show the political will to act"* (Mail & Guardian, 25/11/2011b) and that part of society believes that *"...the politicians, the corporates and the World Bank..."* (The Star, 2/12/2011a) have failed to take responsibility for addressing climate change. These two newspapers illustrate that people in authoritative positions have the platform and resources to contribute towards climate change mitigation but have little interest in doing so. There are differences between the reporting on this topic.

The BusinessDay had one article which reported that *"...the complacency of our leaders and ignorance of the public should be challenged..."* (BusinessDay, 28/1/2011). Interestingly enough the BusinessDay continued to report that *"...the media has a responsibility..."* (BusinessDay, 28/1/2011) to alert and motivate society towards climate change action. The need for media to alert society about climate change supports Burgess' (1999) statement regarding the importance of making people aware of issues related to climate change while adding to their environmental knowledge.

The Star reported that *"...climate change is a special threat for Africa, because of its poor governance and adaptive capacity"* (The Star, 27/5/2011). The Star illustrates below how leaders should take responsibility and introduce carbon-reduction measures as climate change is a threat. The newspapers report that governments appear to be unmotivated and are not guiding their countries towards solving climate change. The suggested lack of motivation from government reported in the newspapers may not necessarily be because they do not want to solve climate change but rather it could be that decision making processes should to be done in conjunction with climate experts or that making climate change commitments and contributions would be a financial burden on certain countries. Therefore based on the newspaper reports, external help and support is needed for political leaders to address climate change.

> *"Not that the government isn't doing anything about it. As a developing country, South Africa is not technically obliged to reduce its carbon emissions. According to the Kyoto Protocol, that onus rests on the developed countries who put us in this position in the first place."* (The Star, 3/11/2011)

4.2.4.2. Developed and developing countries not taking responsibility for addressing climate change

The second topic is that developed and developing countries appear not to be taking responsibility for addressing climate change. The lack of governmental action may impact on countries becoming involved with climate change mitigation. In the quote below the Mail & Guardian reported that small developing countries should only implement mitigation and adaptive procedures once developed countries have implemented such procedures themselves. If developing countries did not implement such measures developed countries would take advantage of their carbon credits and use them for their own benefit as seen in the example below between China and the USA.

> *"...even if America were to unilaterally cut its emissions, China would be the first to exploit it, rather than follow the good lead. Small nations, too, would be wise to repeat whatever folly the rich and large nations are doing or else risk getting taken advantage of, even if it means doing something stupid and useless like spending billions on nuclear technology or building vast polluting power plants."* (Mail & Guardian, 2/12/2011)

Developed and industrialised countries have impacted on climate change and they have the necessary means to mitigate against its effects. The underlying issue is that poorer countries cannot afford to adapt to the effects of climate change. The newspapers imply that governments are blamed for not addressing climate change. The developing country's position could be a standpoint the newspapers take because South Africa is a developing nation suggesting there could be limited governmental support when making environmental and climate related decisions.

4.2.5. Authoritative responsibility for addressing climate change

Government/authoritative responsibility is the fifth theme associated with responsibility for addressing climate change. The frequency with which this first responsibility topic was reported on could be attributed to the highly politicised 2011 CoP 17 conference. There are three groups of authoritative figures that were portrayed in all the newspapers as being responsible for addressing climate change: political leaders; business and the scientific community.

4.2.5.1. Political leaders responsible for addressing climate change

The first group of authoritative figures taking responsibility for addressing climate change are political leaders. All three newspapers focussed on the need for government to take responsibility for addressing climate change. The Mail & Guardian and BusinessDay agreed that government *"...should not wait for a global deal, they should 'act now'"* (Mail & Guardian, 7/12/2011) and that it is government's responsibility *"...to lobby for consensus on practical ways to mitigate against climate change"* (BusinessDay, 3/8/2011), make commitments with regard to drawing up and implementing policies and climate change mitigation plans.

There are differences regarding how each newspaper reported on the way in which government could take responsibility for addressing climate change. The BusinessDay stated that it is government's responsibility to encourage and support developing countries and local communities by alleviating the impacts of and helping them adapt to climate change (see quote below).

> *"African leaders must use this...opportunity to commit to some concrete actions that will increase the pressure on Western and other countries to accelerate their efforts to provide support to the countries that are most vulnerable to climate change...Heads of state should make every effort to reduce the vulnerability of their communities by giving them knowledge, skills and tools to adopt sustainable technologies and participate in the green economy."* (BusinessDay, 29/6/2011)

Most of the articles in the BusinessDay referred to what the South African government is implementing through structures like *"...the climate change white paper..."*, which are being introduced to solve climate change and illustrate different *"...measures such as renewable energy targets and a carbon tax..."* (BusinessDay, 22/11/2011). The BusinessDay describes what international governments are doing to solve climate change and explained that there has been a shift in the governmental mindset with regard to how climate change action is viewed. Previously solving climate change was viewed as everyone's responsibility while *"...sharing the global burden..."* (BusinessDay, 22/11/2011) whereas governments are now "...*trying to maximise the benefits of climate change legislation."* (BusinessDay, 22/11/2011). The BusinessDay reported that *"...governments have set a goal to keep global temperatures from rising more than 2°C but could not agree on a specific target..."* (BusinessDay, 4/7/2011) to reduce emissions by to reach that goal.

> *"...In Mexico, all parties in parliament recently agreed to come together to back a climate change law; South Korea is in the process of passing legislation for an emissions-trading scheme...The Australian government's carbon-tax bill will become law next year...and Germany has outlined a radical new energy plan including a huge increase in renewable-energy investment..."* (BusinessDay, 22/11/2011)

The Star commented on how government is responsible for, and is able to address climate change by implementing local laws and regulations within the community. There are *"...renewable energy projects but we need government to release..."* (The Star, 27/6/2011) the funds to develop these projects illustrating that the government has control over project development. The Star reported that the South African government *"...committed the country to massive voluntary emissions cuts"* (The Star, 3/11/2011).

The newspapers report that the government has the arena and level of influence to make decisions for society regarding climate change mitigation. The newspapers reported on the need for government to become involved with climate change mitigation. Examples were given in the newspapers as to what each government was doing towards addressing climate change. The newspapers also suggested that government and political leaders should meet and come to an agreement to resolve and take responsibility for addressing climate change. Unlike The Star and BusinessDay, the Mail & Guardian did not illustrate or report on any local examples of schemes or solutions that the South African government has or will be implementing to address climate change. The need to reduce carbon emissions through legal commitment was often reported in all three newspapers.

4.2.5.2. Businesses responsible for addressing climate change

The second group of authoritative figures are the businesses who could take responsibility for mitigating the effects of climate change. The Mail & Guardian and BusinessDay were the only newspapers that reported on business taking responsibility for addressing climate change. The Mail & Guardian reported that both business as well as government should become involved with climate change action. The Mail & Guardian exemplifies Anglo American who admits they *"...have to take*

action" (Mail & Guardian, 21/11/2011) for climate change. If companies and the local authority got involved it would allow for a bottom up process to deal with climate change. The newspapers explain that influencing the local community could gradually create a change throughout the country.

The BusinessDay reported that *"it is the responsibility of business to contribute solutions..."* (BusinessDay, 18/4/2011) toward addressing climate change such as becoming involved with developing alternative technology for climate change solutions. The inclusion of the business sector in climate change mitigation could be useful because this sector is less politically involved and has the ability to invest in developing new climate change technologies. The BusinessDay reported on Richard Branson's Virgin Earth Challenge, which promotes *"...the invention of technologies to remove greenhouse gases...from the atmosphere"* (BusinessDay, 18/4/2011). This would be beneficial to businesses as *"climate change is a business problem and a commercial opportunity"* (BusinessDay, 25/11/2011). The BusinessDay showed *"...that global business is taking climate change seriously...when 175 firms...committed to working to keep the effect of greenhouse gas emissions below 2°C"* (BusinessDay, 18/11/2011)

4.2.5.3. Scientists responsible for addressing climate change

Scientists are the last authoritative group responsible for addressing climate change. The Star is the only newspaper that showed how scientists could be used in conjunction with government and business to address climate change. Scientists are used as providers of information to assist with decision making and policy planning. The problem, as seen in the quote below, is whether the relevant authoritative figures involved use the information in decision making processes. The quote below illustrates how problems arose because the government did not use scientific information when making climate change decisions.

> *"Gore says Obama has failed to stand up for "bold action" on global warming and has made little progress on the problem since the days of Republican President George W Bush. Bush infuriated environmentalists by resisting mandatory controls on the pollution blamed for climate change, despite overwhelming scientific evidence that the burning of fossil fuels is responsible."* (The Star, 23/6/2011b)

The Star implies that scientists could be considered a leading authoritative group in this field and should be included when addressing climate change. It is important to *"...bring together academics from all fields to research adaptation, biodiversity, health, environmental policies, green cities, pollution and water and waste management"* (The Star, 10/11/2011b). By using a unified science field, government could develop and implement stronger climate policies and legislation.

4.2.6. General responsibility for addressing climate change

General responsibility for addressing climate change is the sixth responsibility theme. All the newspapers recognised that the climate situation has to change and that society has to take responsibility for mitigating against climate change. The consensus is that *"climate change is the most pressing challenge faced by humanity today and greater urgency is needed to address it"*

(BusinessDay, 24/6/2011) whereby *"...a climate-justice approach, which would compel us to consider the human impacts of climate change, as well as our shared responsibilities, is what is required"* (Mail & Guardian, 15/3/2011). There must be a universal and simultaneous commitment that *"...includes greater awareness, greater trust and a greater global commitment..."* (Mail & Guardian, 15/3/2011) for addressing climate change. The Star reported that *"we do not blame anybody for this. We call upon every person to accept that climate change is with us..."* (The Star, 5/10/2011). All the newspapers agree that there must be a universal and simultaneous commitment to address climate change. The Star highlighted the importance of actively including and motivating society into action by *"persuading the citizens of the world to save our Earth by reducing the emissions of gases into the atmosphere that contribute to climate change"* (The Star, 3/10/2011). The newspaper articles hint that everyone is directly impacted and affected by climate change making the global population responsible for transforming and solving climate change and its related problems. If solutions were provided by the newspapers for combating climate change, society would be able to take the initiative and make a difference towards climate change.

4.2.7. Individual responsibility for addressing climate change

Individual responsibility for addressing climate change is the seventh responsibility theme. The newspapers highlighted individual responsibility in different ways. The BusinessDay had one article which acknowledged that individuals need to be encouraged to take action against climate change and that challenge is how to create *"...the right level of urgency, which is what ordinary citizens...want?"* (BusinessDay, 24/6/2011).

Everyone has *"common but differentiated responsibilities"* (Mail & Guardian, 15/3/2011) illustrating that there are shared individual responsibilities *"...to conserve the environment and to make meaningful life change to address the effects of climate change"* (Mail & Guardian, 24/6/2011). Amongst people *"there is a willingness here to actually do something about it [climate change]..."* (Mail & Guardian, 9/12/2011). The Mail & Guardian mentioned that*"...if you are aware of what's happening to the natural world, then you have to have some sense of responsibility"* (Mail & Guardian, 4/1/2012) for your impact on climate change. Hawthorne and Alabaster (1999) explain that society should be educated to improve their understanding of climate change and for individual action to become effective within society.

The Star was the only newspaper to report on specific examples of how individuals or groups were involved with climate change action within their communities (see quotes below). The key to this is educating the public *"on what climate change is and how everyone one of us can contribute to mitigation and adaption solutions..."* (The Star, 9/11/2011). Other examples reported in The Star were for people to *"stop cutting down trees and instead plant more of them..."* and that *"people must recycle all the cans, papers and plastic for reuse"* (The Star, 28/11/2011b). Involving the community as a whole, or as individuals, educates and alerts citizens to their surroundings and the consequences if nothing is done to avoid climate change. Thus, the newspapers explain, providing examples, that

once people understand that they are able to address climate change, they are then able to change their lifestyles actively and continue educating the rest of their community about the importance of climate change.

> *"She dedicated her life to saving the environment. It started with planting a few trees in her garden. Later, working with a group of Kenyan women, Maathai mobilised poor Kenyan women to plant more than 40 million trees as part of a drive to combat soil erosion and produce sustainable wood for fuel."* (The Star, 28/9/2011b)

> *"The high school pupils see climate change as the most important challenge facing the country and are intent on generating a similar regard among their peers."* (The Star, 18/10/2011)

These newspaper articles show people that steps can be taken by individuals to make changes to their lifestyles which could gradually impact on society and address climate change. Education for and understanding of climate change is important so that people comprehend the severity of climate change impacts. The individual responsibility theme was reported on positively, suggesting that people feel their efforts are helpful. It is interesting to note that there are no examples of specific individual's responsibility efforts in the Mail & Guardian and the BusinessDay newspapers. By including examples of an individual's successful climate change mitigation efforts in The Star, the rest of society could then be motivated to make their own lifestyle changes.

4.2.8. Corporate/social responsibility for addressing climate change

Corporate-social responsibility for addressing climate change is the eighth responsibility theme which looks at how businesses are involved within the community. Businesses become involved in communities through sustainable development and upliftment projects that are beneficial for the company as well. The Star defined corporate-social responsibility as an integrated process where *"effective action...requires the government, business and society to work in unity and demonstrate effective and brave leadership...to achieve meaningful results"* (The Star, 12/12/2011). The quote below from the Mail & Guardian reported on the partnerships that evolve between business, local government, NGOs and other social sectors of society to make climate change mitigation strategies.

> *"...Anglo American works with national and local governments, with NGOs, suppliers and with the broader mining industry and with local people, to do what it can. We are, for example, working with some of the world's leading research institutions to develop climate change models for the regions where we operate. These will enable us to adapt our business and to help the communities we operate in to do the same."* (Mail & Guardian, 21/11/2011)

Corporate companies work with communities that need help in adapting to climate change by creating private-public partnerships through integrating different authoritative sectors within the community. The quote below from The Star illustrates how private-public partnerships allow companies to work in

an area, introduce climate friendly technologies and educate and empower the community about the climate change issues they face.

> *"...improving the level of engagement with civil society, labour and the faith communities to raise public awareness and motivate individuals, institutions and authorities to conserve...will form a critical partnership for action...Working in partnership with civil society organisations that work directly with community-based organisations and particularly with poor people and women, ensures that climate change information is packaged and communicated effectively to effect local change with regard to...environmental protection."* (The Star, 24/11/2011b)

4.2.9. Adaptation and mitigation measures used for addressing climate change

The ninth responsibility theme is the adaptation and mitigation strategies used for addressing climate change. The Mail & Guardian defines adaptation as a solution for developing communities to adapt to climate change *"...by making aid available to vulnerable nations to cope with climate change, and about how much should go where. It is also about who will administer the money that will flow to poor countries..."* (Mail & Guardian 30/9/2011). Mitigation is described as an urban (or developed) solution and the *"...most difficult of all the negotiating issues as it deals with every country's economy"* (Mail & Guardian, 30/9/2011). Mitigation encourages countries to *"negotiate about how to share the burden of reducing greenhouse gases and simultaneously trying to grow their economies sustainably..."* (Mail & Guardian, 30/9/2011). The frequency with which adaptation and mitigation were mentioned and how each of the terms was reported on will be discussed further.

4.2.9.1. The frequency and reporting of adaptation and mitigation in the newspapers

The frequency with which adaptation and mitigation were reported on varied. Most often adaptation and mitigation were reported in the same article as seen in Table 8 below. With regard to reporting on the terms individually more articles reported on adaptation than mitigation. Adaptation was used in all the newspapers whereas only mitigation appeared in The Star. South Africa is committed to climate change mitigation by reducing emissions, but South Africa is a developing country and therefore should adaptative measures should be implemented as well. This could explain the frequent use of adaptation on its own and together with mitigation in the newspapers.

Table 8: The frequency with which the terms 'adaptation' and 'mitigation' were mentioned in all the newspapers.

	Mail & Guardian	BusinessDay	The Star	Number of times mentioned in total
Adaptation and mitigation	2	0	6	8
Adaptation	2	1	2	5
Mitigation	0	0	1	1

The Star and Mail & Guardian were the only newspapers which reported on **adaptation and mitigation** in the same articles. Adaptation and mitigation were used together in eight articles. Most often these climate change strategies were used when describing various policies or plans to mitigate the effects of climate change. The Star particularly focussed on adaptation and mitigation strategies with regard to the discussions in the CoP17 meeting in Durban, South Africa with particular focus on addressing climate change. When reporting on adaptation and mitigation, The Star also draws a relationship between these climate change strategies and the way towards a greener economy and sustainable lifestyles within society. Examples of this reporting can be seen in the extracts below:

> *"…there are climate-change mitigation and adaptation measures that – if agreed and ratified in Durban – can at least help ameliorate the impacts of climate change."* (The star, 28/9/2011)

> *"However, appropriate adaption and mitigation efforts present viable and sustainable opportunities to transit towards a green economy"* (The Star, 9/11/2011)

> *"Working with private and private-public partners to increase their levels of energy efficiency and to develop and implement climate adaptation interventions to be addressed in sector plans. The process will also identify the adaptation responses that require co-ordination between sectors and departments and it will be reviewed every five years."* (The Star, 1/12/2011c)

The Mail & Guardian reported on an example in Namibia where climate change adaptation and mitigation plans are being introduced. The country is also studying climate change to determine the effects that climate change will have in the future. These climate change strategies will be used to address the effects of climate change as seen in the quote below:

> *"The government of Namibia is committed to developing its evidence based to take tong-term actions for climate change adaptation and mitigation and has commissioned climate projection studies to learn more about climate change effects"* (Mail & Guardian, 16/8/2011)

Interestingly, the second article reporting on adaptation and mitigation in the Mail & Guardian, explains the difference between these two climate change strategies. This was the only newspaper which described these two strategies. The description can be seen in the extract below.

> *"**Adaptation**. This is about making aid available to vulnerable nations to cope with climate change, and about how much should go where. It is also about who will administer the money that will flow to poor countries. Although billions of dollars have been pledged, nothing has been signed yet. Another issue is that of oil-producing countries, which want some form of compensation for the loss of income in a world weaning itself off its fossil-fuel diet. **Mitigation.** Mitigation is the most difficult of all the negotiating issues as it deals with every country's economy. Under this banner,*

> *nations negotiate about how to share the burden of reducing greenhouse gases and simultaneously trying to grow their economies sustainably."* (Mail & Guardian, 30/9/2011)

Adaptation is one climate change strategy and was mentioned in five articles (see Table 8 on page 82). The BusinessDay reported that external support in the form of *"...additional funding and new financing instruments..."* are needed *"...to help African countries adapt to climate change"* (BusinessDay, 27/6/2011). Education is important and needs to be included as part of the adaptation process. The Mail & Guardian says *"...investments at a national level are needed to help people understand the climate to which they will need to adapt in the future"* (Mail & Guardian, 29/11/2011). The newspaper implies that nothing can be done to reverse the effects of climate change and therefore people can only learn how to live with the changing climate and its related effects.

The Star explains that *"how vulnerable a society is to these events is also measured, along with a country's potential to adapt to future climate change-related hazards"* (The Star, 27/10/2011). Therefore the better prepared and equipped the community is before they encounter climatic events, the better they will be able to continue living as they were before. Adaptation responses need to be addressed through policy implementation via an integrated society, as The Star reports below. Although the community needs to be strengthened and equipped toward the changing climate, planning needs to be done before hand so that there is a concrete path to prepare the community, as described in the quote below.

> *"The national climate change policy includes a risk-based process to identify and prioritise short- and medium-term adaptation interventions to be addressed in sector plans. The process will also identify the adaptation responses that require co-ordination between sectors and departments..."* (The Star, 1/12/2011c)

Mitigation is a second climate change strategy and was mentioned in one article. Mitigation was mentioned once on its own in The Star newspaper as seen in Table 8 on page 82. The quote below explains that mitigation strategies for climate change are planned in meetings where policies can be deliberated and discussed as a way forward so that all sectors are able to unite and minimise the effects of climate change.

> *"The centre will… act as a melting pot where young people can gather and share ideas on environmental challenges and opportunities. It will act as a tool that will enhance the mitigation of the effects of climate change in our society..."* (The Star, 23/6/2011a)

Adaptation and mitigation illustrate two strategies to address climate change depending on a country's or community's vulnerability. Adaptation includes introducing tools, techniques and other options to adapt to climate change. Mitigation on the other hand is a developed-world solution to reduce greenhouse gases by making a transition to low-carbon energy and technology.

4.2.10. Raising awareness of climate change

The tenth responsibility theme is raising awareness of climate change. Climate change or environmental education is becoming increasingly important and *"...investments are needed to help people understand the climate to which they will need to adapt in the future"* (Mail & Guardian, 29/11/2011). The BusinessDay had one article which reports on the importance of people to have a basic understanding of climate change so they are able to discern *"...the validity of statements..."* and *"...not accept statements in the media without examination..."* so as to *"...continue a life-long education to inform responsible action"* (BusinessDay, 1/11/2011).The quote below referenced an interview with Sir David Attenborough regarding his documentary series "Frozen Planet" where he has raised awareness of climate change through another media platform. He agrees that when people are educated and understand how climate change will affect them, society would be able to act on their knowledge, take responsibility and make a difference to the planet's future.

> *"...if you are aware of what's happening to the natural world then you have to have some sense of responsibility. People should be aware of the danger that it is in. It's not the sort of programme that I particularly want to make for enjoyment's sake. It's the kind of programme that I have to make, otherwise it would be irresponsible.""* (Mail & Guardian, 4/1/2011)

The Star reported on the importance of educating society but *"education needs to be available at every level..."* (The Star, 22/7/2011) and that educating the public about climate change is *"about a transfer of knowledge"* (The Star, 7/12/2011). It is important to be able to communicate and *"...to influence behavioural choices..."* (The Star, 24/10/2011) through climate change education programmes. The quote below is an example of a group of school children who were educated about climate change by one of these programmes. The newspapers show the potential influence that children can be if they have the platform, like school, to create environmental clubs and encourage their peers to make environmentally friendly decisions that will filter into their homes and change the community. The importance is educating and raising awareness on one level in the community in order to create a change throughout the society.

> *"They organised a glass recycling drive in Soweto where they collected 25 000 bottles and spelt the word "Soweto" with them to highlight the need to dispose of glass responsibly...the teens are responsible for driving the clubs in their own schools...kids help their peers to dream, by getting back to basics and making a tangible difference – it's not all about materialism and technology...the Generation Earth summit next week is a "place where they can exercise their voice, create awareness and inspire the other school by sharing ideas""* (The Star, 18/10/2011)

There are examples of people raising awareness of climate change. The Star was the only newspaper that gave examples of people who were involved with climate change education in communities. The first quote below is of a family that drove around Africa showing a film to communities about climate change. The second quote is an example of a group of people who went

cycling around South Africa speaking to people about climate change and how to mitigate or adapt to it by recycling and using energy efficiently. The third quote shows how the CoP17 conference was able to raise awareness of climate change in some communities and how the conference encouraged the public to get involved within their communities to make a difference towards cleaning their environment and understanding the consequences of climate change.

> *"They hope to show people they meet along the way a movie on climate change...The lucky watchers will even be served popcorn from a solar-powered cooker...The cooking oil thing is purely to show an alternative way of thinking..."* (The Star, 15/11/2011)

> *"Nearly 500km of cycling since they left from...Musina, Limpopo...all in the name of climate justice. Along the way they are visiting small towns, talking to residents about climate change and encouraging them to recycle and reduce their energy consumption."* (The Star, 15/11/2011b)

> *""Since COP17 we know so much more about climate change," said Mpho Ghu, 19, another Orlando East resident. "We want to keep Soweto clean, encourage residents to stop littering, plant more trees and stop pollution.""* (The Star, 22/12/2011)

Environmental education is highly important in society today. Educating awareness of climate change demonstrates the importance of environmental citizenship (Hawthorne and Alabaster, 1999) and the need for people to be environmentally literate which Schneider (1997) describes as people having a basic understanding of environmental issues where they are able to ask and challenge leading authority.

4.2.11. Reporting of climate change information published by the scientific community

The eleventh responsibility theme is the reporting of climate change information published by the scientific community. The IPCC is an authoritative body that addresses climate change. The BusinessDay and the first quote below from The Star reported on the 2009 'climategate' scandal, where emails were leaked and the Intergovernmental Panel on Climate Change (IPCC) was exposed for *"...cheating, hiding data, proposing to delete data, manipulating graphs, plotting to bully journals who dared to publish papers questioning climate alarm, and generally perverting science"* (BusinessDay, 28/11/2011). The Star and Mail & Guardian (seen below) reported on a more recent 'climategate' scandal where *"...thousands more hacked e-mails from climate researchers...were released online on the eve of a vital UN climate conference"* (The Star, 24/11/2011) exposing the scientific community for similar fraudulent data manipulation. The Mail & Guardian mentioned the 2009 scandal. The result is that the information represented climate change with varying degrees of severity.

> *"The 2009 hacking..."Climategate"...was seized on by climate sceptics who said the e-mails showed researchers manipulating data to support the theory that global*

warming was man-made and obstructing requests for information." (The Star, 24/11/2011)

"More than 39 000 pages of emails to and from scientists at the University of East Anglia (UEA) were loaded onto a Russian server and a link to them posted on climate sceptic websites...almost exactly two years after a similar release of hacked or leaked emails in the run-up to the Copenhagen climate talks in 2009...A selection of hand-picked quotes from the emails appeared to support the criticisms...that the scientists were too secretive about their data, sometimes destroying evidence...and were selectively choosing models and statistics to support the proposition that the global climate has warmed over the last century as a result of greenhouse gas emissions caused by humans." (Mail & Guardian, 24/11/2011)

The BusinessDay and Mail & Guardian reported that the 'climategate' scandals have tarnished the reputation of the IPCC. The IPCC *"has become one of the strongest advocates of climate change alarmism in the world today"* (Mail & Guardian, 20/6/2011) and their trust worthiness should be questioned (see quote below).

"To understand how the IPCC has corrupted science and fooled the public, you can do no better than read a new book, Delinquent Teenager, by Donna Laframboise, an investigative journalist. She likens the IPCC to a spoilt teenager — indulged, never criticised, given large amounts of money, fawned upon and so corrupted... The IPCC's claim that it uses only "rigorous, peer-reviewed science" is nonsense..." (BusinessDay, 28/11/2011)

The last example of misrepresented data and information comes from The Star (see quote below). The *Times Atlas of the World* was published and misrepresented climate change when images of coastlines and ice sheets in some areas of the world were altered. The publishers were found out when a group of scientists exposed them for portraying the effects of climate change to be more severe than they really were.

"Times Atlas of the World has changed a huge coastal area of Greenland from white to green, suggesting an alarming acceleration of the melting of the northern ice cap...But the atlas's publishers have admitted that the "ice-free" areas could in fact still be covered by sheets of more than half a kilometre thick. It came after a group of leading polar scientists from Cambridge University wrote to them saying their changes were "incorrect and misleading", and that the true rate of melting had been far slower." (The Star, 21/9/2011)

The public relies on the scientific community, via the media, for information. However society will question climate change if misrepresentation continues. Houghton (2009) mentioned that the public (and media) are reliant on scientists for truthful information which is not always provided (as the newspapers have described). Weingart (1998) says information is manipulated by the media for easy

public consumption. The newspapers reported that information can manipulated before the media receives it. Burgess (1999) says that the public's opinion is shaped according to the information they receive whether it is manipulated by the scientists or media. The newspapers and literature allude to the fact that a corrupt scientific community and manipulative media can drastically affect people's perceptions, attitudes and actions towards climate change.

4.3. The climate change debate

The climate change debate is the second frame of analysis. The reasons for climate change have been contested for many years. The debate focuses on the causes of climate change. The first view describes that people are solely responsible for causing climate change (anthropogenic causes) while the second view is that climate change is a natural process where the Earth's climate has fluctuated naturally for millennia.

4.3.1. Anthropogenic causes of climate change

The first side of the climate change debate is that climate change is seen to be a human-induced phenomenon. Climate change *"...can be attributed to emissions of greenhouse gases related to human activity..."* (BusinessDay, 24/2/2011). All of the newspapers highlighted the impact humans have on the climatic system because they reported that *"climate change...is manmade..."* (Mail & Guardian, 27/11/2011) and is caused by human activities such as *"...the burning of fossil fuels, and land based activities such as deforestation"* (Mail & Guardian, 30/9/2011). The implication is that climate change started because *"industry has been historically a part of the problem"* (BusinessDay, 18/4/2011) and that *"...climate change problems were caused by an accumulation of emissions produced by developed nations from the time of the Industrial Revolution..."* (The Star, 13/12/2011b).

The quote below from The Star provides a definition of anthropogenic climate change stating that the excess release of carbon emissions has changed the climate system. However, the quote implies that climate change is a natural phenomenon but that the human impact has worsened the effect altogether. The BusinessDay supported The Star and stated *"...that human activity might actually affect the environment"* (BusinessDay, 28/1/2011). Interestingly, these two newspapers illustrate that people have not necessarily caused climate change but have rather added to its effect. The BusinessDay described *"...that the relationship between human societies and our broader environment is inherently dysfunctional"* (BusinessDay, 31/3/2011) signifying that there is a delicate relationship between nature and society that is straining as people have gradually dominated nature.

> *"Climate change is defined as changes in climate caused, directly or indirectly, by human activity which alters the composition of the atmosphere. Key to that definition is "by human activity". It's a change beyond the natural and normal, caused by...releasing millions of tons of carbon dioxide into the atmosphere that otherwise never would have been there."* (The Star, 28/11/2011a)

The Mail & Guardian was the only newspaper which linked *"...the increase in average global temperatures and continued emissions of greenhouse gases..."* with the greenhouse effect stating that *"carbon pollution has probably locked in an additional 1.^{0} C"* (Mail & Guardian, 16/10/2011) and would increase the global temperature. The BusinessDay describes that *"...the climate system does not respond to emphatic human assertions which are erroneous..."* (BusinessDay, 1/11/2011) and that the world can only survive for a certain period based on the current emission trends. Thereafter society will not be able to do anything to reverse their impact concluding that action needs to be taken now to avoid the damaging effects of anthropogenic climate change. The Mail & Guardian expresses similar sentiments to the BusinessDay explaining that society is making it more difficult to rescue the Earth from the dangerous effects of anthropogenic-related climate change.

> *"The real world context is the continuing rise in human-generated atmospheric carbon dioxide and the evidence that our ability to avoid damaging levels of climate change is slipping away"* (Mail & Guardian, 24/11/2011 b)

South Africa was used as an example in the Mail & Guardian and The Star because of its coal dependent economy which is *"...contributing to high climate-changing carbon dioxide emissions"* (The Star, 19/10/2011). The Mail & Guardian states that *"South Africa is a relatively big producer of the greenhouse gases linked...to climate change..."* (Mail & Guardian, 8/11/2011) which contributes to the increasing temperature and weather phenomena.

4.3.2. The natural climatic cycle

The natural cycle of climate change is the second side of the climate change debate. Climate change is acknowledged as a natural cycle which has occurred for millennia and is viewed as a phenomenon that cannot be controlled (IPCC, 2001; IPCC, 2007; IPCC 2013). The natural cycle was reported on less frequently compared with the anthropogenic causes, as seen in Table 6 on page 64. In Table 6, 39 articles reported on the anthropogenic causes of climate change where as there were only 11 articles reported on the natural cycle of climate change.

The Mail & Guardian said the Earth has experienced *"...past periods of rising temperatures..."* (Mail & Guardian, 16/10/2011) and that *"Climates change naturally on all planets with atmospheres"* (Mail & Guardian, 20/6/2011). Therefore it is hard to predict the Earth's future *"climate any better than we know the weather two weeks from now"* (Mail & Guardian, 20/6/2011). The Mail & Guardian contradicted itself when it reported that the Earth's previous climate changes or fluctuations are *"...often seen as an analogue for current climate change..."* (Mail & Guardian, 16/10/2011). The Star explains below that climate change *"...has been in existence for centuries"* (The Star, 24/10/2011b) and the proof is that the landscapes have changed with the climate.

> *"For 150 million years...Earth has experienced essential climate changes, from the deepest tropical heat to the icy abyss of frigid glaciers. Deserts have bloomed and then retreated again; great mountains of frozen water have melted only to form once*

more. Ice ages last for 100 000 years; no one remembers the last, and not a soul will ever recall the next." (The Star, 28/11/2011d)

Easterling *et al* (2000) and Houghton (2009) both make statements which support the newspapers reports. They say that society should not believe that climate change is caused only by people as events and climate variations have occurred for millennia. The Mail & Guardian reported that *"...climate change, which, if didn't exist, would have certainly been invented..."* (Mail & Guardian, 2/12/2011). The term 'climate change' could have been invented so that society has a way to process and understand the climate and why it is changing.

Articles in the BusinessDay contradicted the previous statements regarding the release of carbon dioxide as contributing to climate change. One BusinessDay article (quoted below) reported that carbon dioxide is not a strong greenhouse gas and its impact on the climate is minimal. The levels of carbon dioxide are low when compared with previous measurements and more carbon in the atmosphere would be good especially for plant life to flourish. The article stated that the warming we are experiencing is no different to previous warming periods.

"...carbon dioxide is a weak greenhouse gas...Basic physics shows it can never have a serious effect on global temperatures and observation of the past shows that it never has had. Carbon dioxide is...extraordinarily low in the life of the planet, probably dangerously low for the green plants on which we depend...Rising carbon dioxide will have a negligible effect on the climate but will make green plants...grow better. It will benefit our planet. The slight rise of temperature, about 0,7° C, in the 20th century, was no different, either in magnitude or rate, from previous natural warming periods..." (BusinessDay, 28/11/2011)

4.4. Environmental concerns associated with climate change

The third frame is environmental concerns associated with climate change. There are two themes which address the impact climate change has on our environment and weather systems as well as the environmental concerns associated with climate change.

4.4.1. Weather events associated with climate change

The first theme related to environmental concerns is the weather events associated with climate change. These weather events are natural disasters, including floods, droughts, hurricanes and other weather phenomena, which are associated with and are reported as caused by climate change. Natural disasters appear to be more erratic and unpredictable as *"Heavier rainfall, fiercer storms and intensifying droughts are likely to strike the world in the coming decades as climate change takes effect"* (Mail & Guardian, 25/11/2011), which will affect the global population. The theme has two sections. The first is climate change events which have been noticed globally and the second is climate change events that have been felt in South Africa.

4.4.1.1. Climate change events globally

The first topic is climate change events that have been witnessed globally. The Star reported that average temperatures are getting warmer and *"the warmer it gets, the more unpredictable the weather will be"* (The Star, 31/1/2011). The Star illustrated that the changes in global weather patterns are *"...hotter temperatures, rising sea levels, changes to rainfall patterns, and increases in severe storm and weather events."* (The Star, 16/9/2011). The Star illustrates below that the extreme weather events associated with climate change directly affect the global industry and economy.

> *"Decreases in rainfall, combined with the increased frequency of extreme weather patterns, threaten critical industry sectors such as agriculture, forestry and water, all in turn curtailing the progress being made to address poverty...Incidences of flooding, drought and heatwaves are on the rise, also posing a threat to major sectors...which are critical to our future development."* (The Star, 24/11/2011b)

The Mail & Guardian reported that 2011 was *"...a year of extreme weather..."* and *"...the 10th warmest year since 1950..."* (Mail & Guardian, 29/11/2011). The quote below mentions that weather patterns have changed and uniquely affected people regionally and globally. The Mail & Guardian acknowledged that the extreme weather patterns are associated with a La Niña weather oscillation, which *"...was one of the one of the strongest in the last 60 years"* (Mail & Guardian, 29/11/2011). The BusinessDay said that warmer temperatures and extreme weather events are associated with climate change. However it is difficult to determine *"...if climate change would trigger stronger La Niña and El Niño weather patterns that can cause weather chaos across the globe"* (BusinessDay, 12/1/2011).

> *"Drought in East Africa has left tens of thousands dead; lethal floods submerged large areas of Asia; the United States suffered 14 separate weather catastrophes ...including severe drought in Texas and the southwest, heavy floods in the northeast and the Mississippi valley, and the most active tornado season even known"* (Mail & Guardian, 29/11/2011)

The quotes below from the Mail & Guardian and The Star reported that extreme weather events are associated with the natural El Niño and La Niña weather oscillations and climate change. The Mail & Guardian reported that the severity of the La Niña determines the severity of the weather events. The BusinessDay newspaper similarly reported that weather is associated with the oscillations but now the *"...operating is different"* (BusinessDay, 12/1/2011) suggesting that although the La Niña and El Niño are natural cycles, something else is affecting the global weather patterns (see second quote below).

> *"The drought is chiefly attributed to La Niña, the climate phenomenon that unleashes extreme weather across large parts of the Pacific region. But the crisis has also been linked to climate change, with rising sea levels imperilling the islands' freshwater lens – the layer found beneath coral islands..."* (Mail & Guardian, 21/10/2011)

> *"The wind and water movement known as La Nina is probably the immediate cause of the floods...Yet that may not be the only common factor: 2010 was a particularly extreme year, with record-breaking snowstorms in Europe and the US, an unprecedented heatwave in Russia and floods across the globe."* (The Star, 31/1/2011)

4.4.1.2. Climate change events within South Africa

The second topic looks at climate change events occurring within South Africa. The BusinessDay reported that South Africa's climate would be affected by climate change where *"rainfall intensity is likely to increase, increasing flooding"* (BusinessDay, 24/2/20101). *"The threat to low-lying coastal areas is clear. Less obvious is a rise in the severity of weather-related events"* (BusinessDay, 24/2/2011) illustrating that each region will experience unique climatic changes. The Mail & Guardian and the quote below from The Star reported that there will be *"...radical changes in weather, such as extreme dry spells and exceptionally heavy rainfall..."* (Mail & Guardian, 16/8/2011) where the wet and dry regions and periods will become more extreme and more intense with unpredictable weather. The BusinessDay mentioned that *"...winter in the interior would be most affected"* (BusinessDay, 8/8/2011).

> *"The latest scientific reports indicate that South Africa will become drier in the west and wetter in the east, accompanied by an increase in the variability and the frequency of severe weather events, such as drought, tornadoes, floods and other natural disasters."* (The Star, 9/11/2011)

The Mail & Guardian described that if average global temperatures are not lowered *"...the potential impact on South Africa in the medium to long term is potentially catastrophic..."* (Mail & Guardian, 25/3/2011), thereby affecting erratic temperatures and unpredictable weather patterns. Rainfall has been affected by drought and flooding periods. The Mail & Guardian states that climate change will affect processes such as *"evaporation from dams and rivers will increase and run-off on the ground will decrease so that less water reaches rivers and dams."* (Mail & Guardian, 25/3/2011).

4.4.2. Environmental concerns associated with climate change

The second theme is the environmental concerns associated with climate change. The BusinessDay had one article which mentioned that *"climate change has the potential to destroy ecosystems and impact the lives of billions"* (BusinessDay, 18/4/2011). The Mail & Guardian reported that landscapes have adapted with climate change and *"Lake Chad is living proof of the continent's environment is in crisis"* (Mail & Guardian, 15/2/2011). A secondary result is that the flora and fauna have had to adapt physically to the changing climate as they cannot live in warmer temperatures. A second example from the Mail & Guardian (quoted below) which illustrates that as environments change species have to relocate to a new habitat similar to their old one which displaces other species from their habitat.

> *"Fast-track warming in Europe is making butterflies and birds fall behind in moves to cooler habitats and prompting a worrying turnover in alpine plant species...In order to*

live at the same temperature, species would have to shift northward by 249 kilometres... the risk of population decline is clear...Eventually, the impact of warming hits parts of the local food chain on which they depend, such as caterpillars or vegetation, and this cuts into their chances of being able to adapt. Finding a similar habitat is made more difficult by agriculture...cold-loving plants traditionally found in alpine regions were being pushed out of their habitats by warming-loving ones," (Mail & Guardian, 8/1/2012)

In the examples below from The Star, climate change is directly affecting the lifecycle of species with regard to their behaviour, migration patterns and breeding periods. The changes in seasons have affected the food chain which affects the rest of the life cycle.

"In the late 1980s...the European Swallow, headed up north from South Africa a week later than its flock does today...scientists believe climate change is forcing them to begin their migration to the northern hemisphere over a week earlier than they did 20 years ago...the swallows are taking advantage of global warming, and warmer conditions in the European spring. The increase in temperatures is causing insects and other invertebrates to hatch earlier in the spring." (The Star, 10/11/2011)

"Stories of unseasonably warm springs causing daffodils to bloom and birds to arrive prematurely have become perennials in recent years. But only now have scientists observed climate change leading to behavioural changes in mammals. A new study on Northumberland's Chillingham cattle...shows climate change is altering when the animals breed, and fewer calves are surviving as a result...because they give birth throughout the year...Winter-born calves...are more likely to die before they reach the age of one." (The Star, 15/6/2011)

Another outcome of climate change is that *"...rapid species extinction is upon us"* (The Star, 28/12/2011b) due to changing temperatures. Extinctions are occurring and an example is the seal population which is becoming smaller *"due to thinning winter sea ice"* (Mail & Guardian, 6/1/2011). The Star mentioned how the oceans were emptying and fish species are *"...at high risk of entering a phase on extinction unprecedented in human history"* due to *"overfishing, pollution and climate change"* (The Star, 22/6/2011). The higher extinction rates are associated with *"...land clearing, pollution, climate change and other factors"* (The Star, 25/8/2011).

4.5. The effects of climate change on people

The fourth frame is the way in which people have been affected by climate change. The four associated themes are: the impact of climate change on people's livelihoods, food security, water security and population and resource usage.

4.5.1. The impact of climate change on people's livelihoods

The first theme is how people's livelihoods have been affected by climate change. The Star said that natural disasters and climate change affect all people directly because *"...it knows no borders. It affects every country"* (The Star, 4/7/2011) in different ways. More importantly, *"the rural areas will feel the impacts of climate change to a much greater extent than the urban areas"* (The Star, 32/11/2011). Climate change is seen as *"...the greatest threat to human rights..."* where *"...it is evident that climate change is already a reality for millions of people..."* as *"...people are struggling to secure basic necessities as a result of the rapidly changing environment"* (Mail & Guardian, 15/3/2011).

The Star reported that Africa is being hit hard by socio-economic problems such as drought, and other weather phenomena. These socio-economic problems are increasing pressure on resources and affecting people's health. For example droughts have *"...killed tens of thousands of people... forcing hundreds of thousands of survivors from the worst-affected areas to walk for weeks in search of food and water"* (The Star, 26/7/2011b). The reality is that *"Africa had contributed the least to climate change but was paying the highest price for its severe impact."* (The Star, 1/12/2011a). The quote below describes the way South Africa's climate will change and how resources and livelihoods will be affected.

> *"Conservative emission trends predict that by mid-century, the South African coastline will warm by about 1 to 2ºC and the interior by about 2 to 3ºC. Such temperature increases will affect our lives in every way – the country will be much drier; water availability will be decreased, ultimately affecting human health, agriculture and the environment in general; forest fires and floods will increase in frequency and intensity; and biodiversity will be severely reduced."* (The Star, 24/11/2011b)

The quote below describes how a family in Chad is affected by the issues described above, including the need to migrate to new areas or urban areas to find resources and jobs. There are often *"...conflicts over natural resources..."* (Mail & Guardian, 15/3/2011) and urban areas see a *"rapid influx of people...into already overcrowded urban areas with large service delivery backlogs..."* where *"...their vulnerability is exacerbated by the use of inferior building materials and inadequate road access..."* (Mail & Guardian, 25/3/2011).

> *"For Fatime's anxious mother...climate change theory means nothing, but its impact on her family is painfully clear. 'My two youngest children are dead,'...'There is no food. It has got worse and worse. The lake has dried up and the trees have died. Our camels no longer produce milk -- they have no grass to eat. We see animal carcasses everywhere. It is very dry.' ...Fatime's father...left Chad two years ago when drought killed his camel herd. He now works as a builder in Libya. Like thousands of others, he is a climate change refugee."* (Mail & Guardian, 15/2/2011)

"Climate change is the most pressing challenge faced by humanity today and greater urgency is needed to address it" (BusinessDay, 24/6/2011). Vulnerable groups are most affected by climate change *"...partly because of their geography, but also because poverty erodes the ability of households to adapt to climate changes"* (BusinessDay, 1/12/2011). For example, The Star reported that "*low lying Pacific nations threatened by rising seas"* (BusinessDay, 14/9/2011) and would be displaced due to their geographic location. The newspapers reported how extreme weather events associated with climate change are negatively affecting the productivity of households and killing people.

4.5.2. The impact of climate change on food security

The second theme is how climate change has affected food security. There are two topics which illustrate the effect of climate change on farming and the effect of climate change on food accessibility.

4.5.2.1. The effect of climate change on farming

The first topic related to food security is the effect climate change has had on farming. The Star and Mail & Guardian reported that *"...there was a specific time in the year for planting..."* (The Star, 15/11/2011b) and farming seasons have changed so *"farmers no longer know when to plant and when to harvest as a result of shifting seasonal patterns"* (Mail & Guardian, 15/3/2011). Farming is affected by *"floods and droughts...which...can wipe out whole harvests, contributing to soaring food prices and driving poor people into hunger"* (Mail & Guardian, 25/3/2011) which increases the likelihood of food insecurity in vulnerable areas.

The Mail & Guardian reported that alternative farming methods are taught to subsistence farmers in rural areas so that they are able to continue farming in poor weather conditions and increase the overall crop yield (see quote below). Sometimes farmers are restricted to certain farming methods. Alternative farming techniques, drought resistant crops and genetically modified foods, crops or livestock that are well suited for extreme climates were suggested as solutions in the Mail & Guardian.

> *"Africa Harvest...is working with farmers in an arid stretch in eastern Kenya who were finding it harder and harder to grow their usual crops of corn and beans. Africa Harvest got farmers to switch to sorghum. They have seen bumper harvests as a result because they are focusing on the right crop and the right practices for the climate...Modern techniques of growing drought-resistant crops like sorghum and millet, staggering planning programs, irrigation and harvesting rain and river water in dams help minimize the risk to farmers."* (Mail & Guardian, 27/11/2011)

The BusinessDay reported that adopting *"'sustainable' ways of farming could arrest the negative effects of climate change and population growth on food security..."* (BusinessDay, 31/1/2012). Dilley (2000) and Thomas *et* al (2007) say that farmers have to adopt new farming techniques and implement long term strategies to cope with the changing climate conditions.

The BusinessDay stated that *"climate change and erratic weather are now a major threat to SA's farmers"* (BusinessDay, 21/11/2011b). The BusinessDay quote below provided examples of commercial farmers in the Western Cape who are affected by climate change. The farmers have to adapt to the new environment and farming restrictions.

> *"In the Western Cape's Eden district...there has been a 2°C rise in average winter temperatures since 1940...This is causing concern, in particular among hop farmers as it is affecting the crop's growth...higher winter temperatures are causing the quality of deciduous fruit crops to deteriorate..."* (BusinessDay, 24/2/2011)

The Star reported that *"...natural disasters pose a direct threat to agriculture, food security..."* (The Star, 9/11/2011) and other economic sectors. South Africa's fruit exports are affected by climate change because *"it's no longer possible for many of those areas to continue to produce those fruits..."* (The Star, 1/12/2011b).

Climate change affects crop and agricultural production. Agriculture and crop production are severely impacted by climate change and that *"the outlook for crops is one of more failures"* (BusinessDay, 24/2/2011). The BusinessDay reported that *"climate change poses a significant challenge with projected impacts on soil degradation, food security..."* (BusinessDay, 4/7/2011) and the problem is that crops do not get enough water in drought stricken areas which restricts the farming productivity. The Mail & Guardian reported that in severe instances *"flash floods fall, but can't be absorbed for crops as the Earth is baked solid"* (Mail & Guardian, 15/2/2011). The Star reported that agriculture is already feeling the effects of climate change which affects food security and food production both of which will *"...have disastrous socio and economic consequences..."* (The Star, 24/10/2011) if nothing is done to solve the problem now. Therefore alternative farming methods are necessary for adaptative purposes. The Mail & Guardian and The Star illustrates below that the increase in average temperature places pressure on water resources and food production, as climate change and extreme weather affects crop yields.

> *"...the right to health for all will be severely compromised by increasing temperatures and agricultural crop failures, and by severe weather events and destruction of infrastructure. The right to decent work opportunities will be undermined by interruptions in food production, and forced migration due to weather changes."* (Mail & Guardian, 15/3/2011)

> *"If the average global increase goes up...the number of days when there will be temperatures over 40^{o}C will increase. Now, if you're a farmer, that's a big issue. You see your maize crop wilting. There's no rain. It's devastating. It also means the number of days over 30^{o}C will increase."* (The Star, 2/3/2011)

4.5.2.2. The effect of climate change on food accessibility

The effect of climate change on food accessibility is the last topic related to food security. The newspapers report that extreme weather conditions make it difficult to access food as resources are

depleted and food costs increase. The Mail & Guardian reported that access to food is difficult, especially in Africa, as many rural regions are food insecure. The Star stated that *"...one-third of the human population of sub-Saharan Africa already suffered regularly from chronic hunger, and this would become worse due to climate-related problems..."* (The Star, 26/9/2011). An example from the Mail & Guardian which explained that some areas are more food insecure than others and how farming, extreme weather and poverty have contributed to the problem is seen below.

> *"Communities are battling to access food...It points out varying food insecurity levels across the Southern African Development Community region, with higher levels in Lesotho and greater food insecurity anticipated in Namibia...Conditions in these areas remain a concern as harvests have been reduced. The resulting food deficits have had adverse impacts, especially on poor households that...face constraints in accessing adequate food. Climate change is expected to play havoc with the region's food security in the future and...will worsen existing food insecurity...."* (Mail & Guardian, 9/9/2011)

The Star described that problems over resources arise in places like Tanzania where herders moved to resource rich areas which resulted in *"...more frequent conflict between nomadic pastoralists and agricultural communities..."* (The Star, 16/9/2011).

The Star reported that hunger and famine is a global problem which is especially prominent in North Africa. The Mail & Guardian says that *"...rising food prices, stock market speculation in crop futures, conflict, climate change and corrupt, repressive regimes"* (Mail & Guardian, 17/10/2011) are why people are suffering from food insecurity in Africa. There are areas that are improving as *"...aid is getting through, some harvests are being reaped and the long-awaited arrival of rain is making pasture available for surviving livestock"* (Mail & Guardian, 17/10/2011). The quote below is an example of organisations investing in subsistence farmers to help them develop their business and feed their local communities. Making such investments allows the farmers to be taught sustainable farming techniques that can be passed onto to other farmers. The newspapers explain that this not only supports local businesses and local communities but it helps people adapt to climate change by ensuring they have positive crop yields which minimises food insecurity.

> *"Oxfam is making a global call for serious investment in small-scale farmers – who feed one-third of humanity...Kawelama's husband...is a "lead farmer", trained by the Balaka Livelihood Food Security Programme in progressive farming methods, to transfer their skills to other farmers in their villages...'We are doing well because we have adapted to climate change with these new farming methods. But nowadays when it comes to the rains, sometimes you get too much and it destroys the crops.* Sometimes *you don't get any at all and the crops just wilt...'"* (The Star, 1/6/2011)

4.5.3. The impact of climate change on water security

Water security is the third topic describing how people have been affected by climate change. The Mail & Guardian and BusinessDay each had one article on water security saying that *"...rising temperatures will have many consequences, including greater reliance on underground water..."* (BusinessDay, 24/2/2011) and that *"water is arguably the primary medium through which the impact of climate change will be felt by people, ecosystems and economies..."* (Mail & Guardian, 25/3/2011). Water security is important because both nature and society are dependent on water for survival.

The Star focussed more on water security compared with the other newspapers. The main concern is *"...about the water supply and the increasingly erratic rainfall patterns"* (The Star, 1/6/2011). The example below is a secondary problem of natural water sources which are diminishing because people over-exploit it or divert water courses thereby restricting the amount of water that flows into bigger bodies of water.

> *"A present example was the threat to Lake Turkana, which might have its main source of water, the Omo River, dammed and diverted to feed sugarcane fields and crops to make biofuels. The lake, which supported the people and desert ecosystems of much of northern Kenya and south-western Ethiopia, would lose its main water supply."* (The Star, 7/11/2011)

The Star reported that South Africa *"...is already water stressed and vulnerable to the effects of climate change"* (The Star, 24/11/2011b). The two examples, seen below, describe what could make South Africa's water security situation worse. The first quote below illustrates concerns regarding Gauteng's water quality reliability which is affected by Acid Mine Drainage (AMD). The second example is how fracking will pollute natural water sources if *"...waste water from fracking is...discharged into rivers..."* (The Star, 10/8/2011). Vulnerable communities who rely on these water sources would be seriously disadvantaged and would be forced to find alternatives.

> *"Gauteng will face a water crisis in the next decade, unless we pay more attention to the way we manage water, and acid mine drainage is the least of our problems...we will not run out of water because water is not a finite resource that disappears when you use it up, but our water reliability is lessening. "The next big drought will reveal many weaknesses,"* (The Star, 21/2/2011)

> *"...the disposal of fracking wastewater poses a serious threat to the most vulnerable communities in our society, especially in rural areas where fracking will take place. The industry has not indicated how it plans to dispose of the billions of litres of...wastewater that fracking will generate..."* (The Star, 12/8/2011)

Water insecurity directly affects local communities who rely on such water sources. In regions where people are water insecure, conflict may arise over the resource and unfortunately *"...with the increasing shortages of water the (existing) conflicts will intensify..."* (The Star, 16/9/2011).

4.5.4. Population and resource usage

The final theme focuses around one of the principles of Thomas Malthus which has been reported in the newspapers. This principle explains that when an increase in population is experienced, there will be a decrease in resources which will place pressure on the population and resources. In 1798, Thomas Malthus proposed that a population is only able to increase to a certain level before resource dependence becomes an issue, and likewise, that as resources increase so the population will be able to increase only if the resource base increases (Malthus, 1798). Only The Star and Mail & Guardian reported on the Malthusian concept where an increase in population would ultimately reduce the population's finite resource base. The Mail & Guardian had one article which stated that at *"...present population-growth trends and water-use behaviour indicate that South Africa will exceed the limits of its economically usable land-based water resources by 2050"* (Mail & Guardian, 25/3/2011) therefore implying that an increasing population increases the consumption of resources. The Star indicated that too many resources are being consumed by the global population due to *"the combined effects of climate change, over-exploitation, pollution and habitat loss..."* (The Star, 22/6/2011). The Star states that *"The global market...is extracting and depleting finite resources at an unsustainable rate...making it harder to sustain life on the planet."* (The Star, 28/12/2011b). Control over the global population is necessary to curb over-exploiting resources.

4.6. Climate change reported from a moral/religious standpoint

The moral/religious standpoint from which climate change is reported on is the sixth frame. The moral or religious standpoint encourages people to become aware of and take responsibility for the environment. The Mail & Guardian and the BusinessDay both reported on the moral standpoint. The Mail & Guardian states that *"...if you are aware of what's happening to the natural world then you have to have some sense of responsibility..."* (Mail & Guardian, 4/1/2011) or a moral obligation to do something. Baron's (2006) statement is supported by the newspapers because he says people may feel guilty and want to do something to reverse the effects of anthropogenic climate change. Therefore it is important for people to be concerned for their environment. The BusinessDay highlighted an interesting observation in the quote below, that previously, when inexplicable things happened, witchcraft was blamed. Nowadays when communities experience droughts, crop failures and other phenomena, carbon dioxide and the natural environment are blamed. A change in perceptions of climate change is clear as society now understands that such extreme climatic events are caused by changes in carbon dioxide as seen in the quote below.

> *"...climate change has brought in a new age of superstition...when we look back on the witch-burnings of the 16th century where all manner of ill fortune, such as crop failures...was blamed on harmless old women...Today, all manner of ill fortune, such as crop failures, droughts and floods, is blamed on a perfectly benevolent trace gas in the atmosphere, carbon dioxide."* (BusinessDay, 28/11/2011)

The Star reported on the religious or spiritual standpoint of climate change. The Star reported on a conference where religious leaders from different faiths gathered to discuss environmental issues. The leaders acknowledged that the Bible states that people are responsible for looking after their environment. The outcome of this conference was to encourage *"all people of faith to reduce their personal emissions and to urge their political leaders to adopt...targets for the reduction of greenhouse gases..."* (The Star, 26/7/2011). There was a second article in The Star which gave examples of climate change in the Bible such as *"...the seven years of hunger and seven years of plenty, as well as the floods during Noah's time..."* (The Star, 24/7/2011)

> *"Christian, Jewish and Muslim leaders...joined forces to launch a multifaith environmental campaign...to protect the Earth across their three faiths...the obligation upon humans to care for their surroundings comes near the beginning of the Bible...the original charge in the first chapters of Genesis, given to the first man and woman, not purely to develop...the land, but also to protect it… to conserve it..."* (The Star, 26/7/2011)

The Star illustrated the responses from spiritual leaders to climate change. The article below illustrates the teachings of Gandhi. The spiritual lesson explained in the newspapers is that society needs to be considerate and work in harmony with nature and not dominate it as it is a fragile and over-exploited resource that should not be overpowered by science and technology.

> *"In Gandhi's thought an approach to ecological justice derives from three critical themes. First, there is a unity of all living things. While human beings are endowed with reason and morality this does not make them superior to other life forms...Second, human beings are indebted to society and nature. This indebtedness is also the basis of our interdependence. Thus, we need an ethical practice and awareness that guides our choices in the world...Third, Gandhi called into question modern civilisation, particularly...modernisation. While he was not against the scientific spirit...he did believe that science and technology had to be subordinated to moral standards."* (The Star, 28/12/2011b)

4.7. Financial issues relating to climate change

The seventh frame is the financial issues relating to climate change. This frame includes the necessity to start up the Green Climate Fund, the introduction of a carbon tax to reduce carbon emissions, the impact of climate change on a country's finance and lastly the need to move to a green economy.

4.7.1. The Green Climate Fund and climate change

The Green Climate Fund (GCF) is the first theme associated with financial issues. The Green Climate Fund is a financially based initiative which helps developing countries move to low-emission economies and climate resilient goals. The transition to a low-carbon economy is done by lowering

greenhouse gas emissions and financially helping these countries adapt to climate change and its impacts (Green Climate Fund, 2014). The BusinessDay reported that the GCF was first proposed at CoP16 and it *"...was vital that there would be finalisation of the Green Climate Fund..."* (BusinessDay, 28/11/2011) while The Star agreed that *"...COP17 will need to agree on how to start implementing the practical measures adopted at COP16...especially the Green Climate Fund"* (The Star, 25/11/2011). The African Union was interested *"...to establish something similar..."to the GCF as"...African countries are struggling to find financing to match their proposals for (adapting to) climate change. (They) need more than subsidies for climate adaptation projects."* (BusinessDay, 27/6/2011). The Star confirmed below that the GCF was set up. By setting up an exclusive fund for Africa, funds can be focussed into a single region to ensure they receive the necessary support.

> *"The Africa Group had therefore focused on...getting the green climate fund up and running and a range of technical issues, such as the transfer of technology from rich to poor countries to help them adapt to climate change and reduce emissions. The fund was successfully established in Durban, and some countries had pledged to donate."* (The Star, 13/12/2011b)

The quote above from The Star and the quote below from the Mail & Guardian mention that the GCF provides a platform for developing nations to receive funding from developed nations for climate change adaptation.

> *"Technology that combats climate change and helps nations adapt to climate change is growing rapidly but is centred largely in rich countries and in the hands of private businesses. This makes it expensive for the developing world to get access to. The United Nations Framework Convention on Climate Change wants to overcome this by requiring developed parties to facilitate and finance the transfer of clean technology to developing countries..."* (Mail & Guardian, 30/9/2011)

The Star reported that Canada had refused to sign the Kyoto Protocol but was still committed to climate action and "...*would continue to play an active and constructive role in international negotiations and remains committed to international action on climate change"* (The Star, 28/12/2011). The Star newspaper illustrates that there is pressure for developing countries to reduce their carbon emissions which is *"...dependent on technology transfer..."* (The Star, 28/11/2011a). *"But without the technology or the money of the First World, how do they expect them to do it?"* (The Star, 28/11/2011a).

All the newspapers reported that there were concerns regarding who would finance the GCF *"...and whether the bulk of the money will come from public funds and government aid or from private sources and investments"* (Mail & Guardian, 29/11/2011). The Star said that the carbon taxes *"...should go to a green climate fund as a continuous source of reliable revenue"* (The Star, 1/12/2011f). The BusinessDay explained that developed countries cause the most damage to the environment and should therefore support developing countries adapt to climate change. The

BusinessDay explained how new ways needed to be explored to help developing nations while ensuring the strategies were financially viable.

> *"An argument...relates to who should pay for the damage already done. Developing countries...argue that developing countries should not be required to reduce emissions without funding from developed nations as they are responsible for much of the damage. The developing world is least equipped to deal with the effects of climate change...Consequently, they argue, developing countries should not have their emissions capped as it would slow economic growth and the transition to a low-carbon economy would also be pricey."* (BusinessDay, 22/11/2011)

4.7.2. The introduction of a carbon tax to reduce carbon emissions

Carbon tax is the second financial theme. The Mail & Guardian explained that the goal of the carbon tax is to limit *"...carbon emissions for top polluters, who could face penalties if they do not conform to new regulations"* (Mail & Guardian, 8/11/2011). The BusinessDay mentioned that *"A price on carbon...was essential..."* (BusinessDay, 22/9/2011) to reduce emissions and move to a low-carbon economy. However, The Star reported that the tax should be considered carefully *"...to avoid negative effects on consumers and the economy"* because *"...the proposed tax will be used by the Treasury for any purpose it sees fit. So really it's just another tax"* (The Star, 11/7/2011).

Carbon tax laws are being introduced to the shipping and aviation industries as they are *"...responsible for around 5% of greenhouse gas emissions"* (BusinessDay, 24/11/2011) and neither of them have encountered *"...penalties for their significant emissions"* (The Star, 21/11/2011). The Star and Mail and Guardian both reported that the tax is seen as a means for *"shipping to take responsibility for the emissions..."* (Mail & Guardian, 29/11/2011) as their*"...CO_2 emissions...are unregulated..."* (The Star, 28/9/2011) and *"...the best way to do that is to have a universal charge applied to all ships..."* (Mail & Guardian, 29/11/2011) which can then be used towards solving climate change. The Mail & Guardian and BusinessDay only mentioned the aviation tax while The Star described what the tax entailed. The agreement is that international airlines would be taxed flying to or from the European airports. The effect of the tax on aviation is that the costs for airlines will increase if they are unable to reduce their emissions.

> *"The new emission measures will come into effect...for all airlines flying into or out of European airports... Although the EU describes the new Emissions Trading Scheme as a "market-based mechanism" rather than a carbon tax on aviation, the effect would be to progressively raise costs for airlines that are unable to reduce emission levels."* (The Star, 1/12/2011e)

The Star was the only newspaper to report on the introduction of carbon tax to Australia. The newspaper implies that introducing the carbon tax was a political move from the Australian government that would have an impact on the economy. The tax targets *"...coal fired power stations and other major emitters to 'pay to pollute'..."* and will not *"...be able to pump carbon pollution into the*

atmosphere for free" (The Star, 8/11/2011b). Like Canada, Australia has committed to reduce carbon emissions as a means to take responsibility for climate change.

4.7.3. The impact of climate change on a country's finance

How climate change affects a country's finance and economy is the third theme. The Mail & Guardian said *"...dealing with climate change would slow the annual growth of the global GDP by just 0.2%..."* (Mail & Guardian, 7/12/2011) but it is an issue which needs to be addressed. The BusinessDay illustrated below the way in which *"...climate change will hamper economic growth and development"* (BusinessDay, 25/11/2011) and the need to move to a green economy. South Africa is dependent on coal and there is pressure to reduce emissions which will change the economy and if no climate action is taken, trade tariffs would be enforced. *"...SA could lose jobs in battling and adapting to climate change"* (BusinessDay, 17/10/2011).

> *"With climate change expected to have a significant economic impact on many countries…"going green" is increasingly on companies' agendas…substantial implications for South Africa as the country was a greenhouse gas emission "offender", due to its heavy reliance on carbon fuels. The country is also situated in an area where the effects of climate change would be severe, and is vulnerable to trade tariffs being imposed on its products if action is not taken to counter climate change."* (BusinessDay, 25/10/2011)

The Star mentioned that addressing climate change and *"...containing carbon emissions would have a host of benefits"* (The Star, 1/12/2011g) as it provides the opportunity to address other issues and open up stagnant markets. The Star mentioned that *"...ignoring climate change would damage economic growth...and could reduce the global GDP by 20 percent by the end of the century"* (The Star, 22/11/2011). The article continued and said that a certain portion of the GDP must be used towards climate change mitigation. However, The Star reported that natural disasters associated with climate change negatively affect the economy. The example below is of a tsunami in Samoa which affected the country's GDP. The Mail & Guardian and BusinessDay newspapers did not report on any relationships between natural disasters and the economy.

> *"Small developing states are especially exposed to natural disasters...some so severe that entire populations and economies are affected. The tsunami that hit Samoa in 2009 cost that country 22 per cent of its annual GDP."* (27/10/2011b)

4.7.4. Climate change and moving towards a green economy

The last finance-related theme is the need to move towards a green economy. The BusinessDay did not mention the green economy. The Mail & Guardian described that transitioning to a green economy is beneficial because it provides *"...an opportunity to develop new technological capabilities to grow the economy..."* (Mail & Guardian, 21/11/2011). The Star elaborated that achieving a green economy is *"...not just about low-carbon, it is also about the reduction of resource usage, waste and*

the valuing of the ecosystem goods and services." (The Star, 12/12/2011c). The Star added that South Africa needs a green economy to ensure *"...a climate resilient low-carbon economy..."* (The Star, 1/12/2011c). The Star and Mail & Guardian at first portrayed the green economy as a positive as they report the benefits of a green economy.

The two newspapers (The Star and Mail & Guardian) explain that there are negative aspects to the green economy. The Star reported that South Africa's proposed targets for moving to a green economy were unrealistic because of the dependence on external support to reach this goal (see quote below). At the same time The Star also reported that *"...the transition to a lower carbon economy also presents risks to economic growth and jobs"* (The Star, 15/12/2011).

> *"...business was worried that Minister of Economic Affairs...was continuing to project targets for South Africa moving to a green economy that were entirely unrealistic because they were based on billions of dollars of subsidies pouring in from rich economies in the middle of a global economic crisis."* (The Star, 23/8/2011)

The Mail & Guardian gave examples of companies that were developing green technologies but did not succeed and stunted the progress towards a green economy. An article reported that *"...carbon intensity therefore doesn't indicate the level of contribution we need to make to addressing climate change, rather it indicates the complexity of the task to transition to a low-carbon economy..."* (Mail & Guardian, 25/11/2011). The quote below also explains that the move to a green economy will not have any benefits for a country.

> *"Several organisations continue to counter that the green economy will create thousands of jobs but these claims have not been borne out in either Spain (often quoted as an example of the success of low-carbon transitions) or in the United States where high profile bankruptcies of renewable energy companies continue, despite the massive support and subsidy packages..."* (Mail & Guardian, 25/11/2011)

4.8. Climate change terminology used in the newspapers

The eighth frame is the climate change terminology, specifically 'global warming' and 'climate change', used in the newspapers. Global warming is a term that was originally used to describe the general warming of the Earth (Davies and Joubert, 2011). As climate science has advanced, climate change was introduced to describe all changing climate phenomena (Davies and Joubert, 2011). The problem is that the global warming is confused with climate change and both are used interchangeably thereby suggesting they represent the same thing. The interchanging of the terms illustrates a lack of understanding of climate change. This lack of understanding among newspaper authors could be a reason why information is misrepresented and why the public may receive incorrect information. An example of this is seen in The Star quote below.

> *"Like other pancake-flat Pacific nations such as Tuvalu and the Marshall Islands, and Indian Ocean nations such as the Maldives, it faces oblivion as a result of* ***global warming****-induced rising sea levels."* (The Star, 14/9/2011)

Although the newspapers do interchange terms as seen in the above example, the terms 'climate change' and 'global warming' are sometimes used correctly as well as seen in the Mail & Guardian and The Star quotes below.

> *"Fast track* ***warming*** *in Europe is making butterflies and birds fall behind in moves to cooler habitats and prompting a worrying turnover in alpine plant species...the study was not designed to say whether these species are suffering as a result of* ***warming****, which is one of the big questions in the* ***climate-change*** *saga"* (Mail & Guardian, 8/1/2012)

> *"The current carbon emission reduction pledges under the Kyoto protocol and the Cancun agreements...are not enough to stop* ***global warming*** *from rising above the critical 2°C, where the effects of* ***climate change*** *will run away exponentially."* (BusinessDay, 31/3/2011)

4.9. Conclusion

The research highlighted the frames that newspapers use for climate change articles. The responsibility frame was used most often in the newspapers. This frame highlighted that although the assumption is that responsibility should focus on the environmental aspect of climate change, the newspapers took an interest in the politics of climate change conferences and commitments. The focus on the politics surrounding climate change in the newspapers may reflect the political nature of the newspapers. The prominence of politics in the newspapers also highlights the importance of climate change politics especially events such as the CoP meetings. The conflict frame described the two sides of the climate change debate. The newspapers focussed more on anthropogenic related climate change rather than the natural cycle of climate change. The focal point of climate change being a human-induced phenomenon in the newspapers may mislead the public into thinking that climate change is only caused by people. Climate change is in fact a natural cycle which has occurred for millennia which has most recently been affected by anthropogenic activities.

The environmental concerns frame described how catastrophic events appear to be happening more often with greater severity. There are some environmental concerns associated with the catastrophic events because as the climate changes, fauna and flora are affected and a disturbance to lifecycles and ecosystems is noticed. This frame begins to illustrate the way in which our environment is changing and what environmental and climatic changes are expected in the future.

The newspapers framed some articles to show the effects of climate change on people and describe the way in which people have to adapt to climate change. People are affected by climate change

because their livelihoods as well as food and water security are affected by the changing climate. This frame continues to highlight the environmental changes which are expected and the way in which people are affected by climate change. This frame (the effects of climate change on people) was used more often than the environmental concerns associated with climate change frame possibly because the way in which people are affected by climate change is understandable to the public than how flora and fauna will be affected. This frame also showed the pressure that is placed on resources and the dependence of the population on them.

As expected, the moral/religious frame as expected was used the least. Each newspaper had a few articles related to this frame when the newspapers took a stance from the religious/spiritual view. The religious/moral frame may be used the least because climate change does not have direct associations with religious or moral standpoints. The finance frame described how climate change is affecting the global and individual economies with the introduction of carbon taxes and the Green Climate Fund in order to move towards a green low-carbon economy. This frame highlights that globally economies have little option but to move towards becoming greener. This frame highlights that there is a relationship which exists between climate change and the state of an economy. The last frame found that some articles use the terms global warming and climate change correctly but there is still confusion regarding the definition of the terms.

Chapter 5: Newspaper readers' perceptions of climate change and climate change reporting

5.1. Introduction

In the previous chapter, the way newspapers report on climate change was examined. This chapter explores the newspaper readers' perceptions of climate change and climate change reporting. A sample of 120 newspaper readers was asked to complete a questionnaire (40 readers for each of the three newspapers - The Star, BusinessDay and Mail & Guardian selected for the research). Many of the readers read two of the three selected newspapers as well as other newspapers that were not selected for this research. Therefore the data collected reflects all three newspapers **and** other newspapers as the readers may be influenced by more than one newspaper. The chapter will explore the readers' perceptions of climate change; the readers' perceptions regarding how newspapers portray climate change; the sources of information for readers' perceptions of climate change; factors which influence the readers' environmental decisions; and finally the sector of society responsible for addressing climate change.

5.2. The readers' perceptions of climate change

Climate change is a difficult issue to grasp due to its complexity and unpredictability. Therefore climate change will not have the same impact that other issues, such as conservation, will have on the public (Houghton, 2009). People's levels of awareness of climate change can be associated with how much attention climate change is given in the media (Burgess, 1999). Houghton (2009) explains that issues such as conservation will be able to gain more public interest as people are able to become involved in an initiative. However due the complexity of climate change people are not able to see a direct change if they invest in the cause and therefore they lose interest in becoming involved with climate change.

Although asked to describe the concept of climate change, the majority of the readers described the causes of climate change and its impacts. This section will firstly look into people's knowledge of climate change and then whether they think climate change is natural or human-induced.

Table 9: The readers' understanding of climate change.

Readers' understanding of climate change	**Number of people (out of 120 for each)**	**Percentage of readers (%)**
Basic understanding of climate change	72	60%
Contrasting views of the causes of climate change	38	32%
• Perceptions of climate change as a natural cycle	9	8%
• Perceptions of climate change as an anthropogenic phenomenon	16	13%
• Perception of climate change as both a natural cycle and an anthropogenic problem	88	73%
• Readers who are sceptical about climate change	7	6%
Mention climatic events associated with climate change	102	85%
Blame greenhouse gases and carbon emissions	36	30%
Misconceptions of climate change	13	11%

Table 9 above shows the most common responses from the readers regarding their understanding of climate change. Some of the readers responded in more than one way. In their responses, some readers show a basic understanding of climate change, mentioning climatic events that are associated with climate change. Others introduced contrasting views of climate change where they see climate change as a natural process or an anthropogenic phenomenon where people have impacted on the climate through the release of greenhouse gases.

In describing climate change the readers introduce the causes and impacts of climate change and display a few misconceptions regarding climate change and ozone depletion. As seen in Table 9 above, 60% of the readers understand that climate change is a **cycle** which fluctuates and changes the weather and climate regionally and globally. For example Respondent 3 correctly states that climate change is seen as *"...changes [that] occur in cycles..."*. 85% of the readers link a variety of climatic events to climate change. This is highlighted in the following quotes:

> *"Glaciers melting, rising sea temperatures, global warming"* (Respondent 41)

> *"...melting the ice caps, changes in weather patterns, droughts, [and] floods..."* (Respondent 50)

> *"That it is a process characterised by changing weather patterns, more extreme storms and droughts, greater unpredictability, changes in average temperatures, melting glaciers etc. It is a process that will impact significantly on the poor in particular who are less ability to mediate the impact"* (Respondent 99)

> *"The world has seen varying effects of this in weather pattern changes – extra heavy rain storms, larger snowfalls, shorter seasonal times, temperature variances etc"* (Respondent 101)

Respondent 49 gave an accurate description of climate change as a natural process that has occurred for millennia and that climate change has been impacted by anthropogenic activity since the start of the industrial revolution.

> *"Briefly, global climate change is a fundamental, natural phenomenon on the evidence of the historic and especially the geological record. It appears to involve both a steady, selective increase in the mean atmospheric temperature, and is believed to induce progressive changes in rainfall patterns around the world in extreme weather events. It has both an underlying, natural cause related to such factors as the Earth's orbit around the Sun. Since the beginning of the industrial revolution in Europe and our consequent exponential consumption of carbon-based fossil fuels, however, it appears that our generation of atmospheric carbon dioxide and other greenhouse gases (such as methane), has made a measurable and had a generally adverse effect on global warming and also possibly on extreme weather patterns. Other factors with a large (and largely unknown) influence on climate are the deliberate destruction of tropical forests (such as the Amazonia) and the inadvertent spreading of extensive arid areas (such as the Sahel). And so on."* (Respondent 49)

32% of the readers say climate change is a **long term change** that affects the temperature and climate, thereby affecting weather patterns, catastrophic events, ecosystems and people. This statement is in agreement with Davies and Joubert (2011) where they describe climate change as the long term change in both the natural variability and the anthropogenic influences on the climatic system. These readers agree that there have been natural climate fluctuations for millennia and that climate change is not a new concept. Examples of this thinking can be seen from the respondents quoted below:

> *"In theory, climate change is just that: climate changing from what it was at a certain period of time. This period of reference is not clearly defined, although I understand it to be either the industrial revolution in the late 18th century or more recently after WWII. What is now meant by climate change is the real or perceived climate variations that have been happening over the past 10 years or so. This includes more*

rain in some areas and less in others, more violent cyclones/typhoons, more snow falls in winter in some areas and less in others, etc" (Respondent 51)

"It is the gradual warming of the Earth's atmosphere which is leading to global warming. This in turn leads to the melting of the ice caps, changes in weather patterns, droughts, floods etc" (Respondent 50)

"Climate change is a significant change in weather patterns. These changes can be average or extreme. They are also lasting changes" (Respondent 48)

"It is the change in weather patterns over long periods of time (decades to millions of years)" (Respondent 53)

"A long-term change in the Earth's climate cause by changes in atmospheric pressure (either natural or human-induced)" (Respondent 15)

30% of the readers explain that climate change is caused by industrialisation, production and consumption which release greenhouse gases and carbon emissions which alter the climate. The readers mention that although climate change is a long term [natural] process there are human influences that affect the climate and therefore describe it as *"...a gradual increase in temperature resulting from the human production of greenhouse gases"* (Respondent 47).

"Progressive warming of the atmosphere due to rising CO_2 levels. Climate change is the manifestation of this warming in the form of changing weather patterns" (Respondent 6)

Houghton (2009) describes that the enhanced greenhouse effect is due to the excess release of greenhouse gases into the atmosphere. The readers explain that there is an association between climate change and anthropogenic influences. This association is most likely due to greenhouse gas emissions which are seen to be responsible for causing climate change. The readers, quoted below, describe how the climate has been affected by the release of anthropogenic carbon emissions which in turn affect the natural processes and people.

"Greenhouse gases have risen due to carbon emissions. This has led to a heating of planet Earth which is causing problems in terms of natural disasters and changes in weather patterns" (Respondent 20)

"It is the progressive warming of the atmosphere due to rising CO_2 levels. Climate change is the manifestation of this warming in the form of changing weather patterns" (Respondent 6)

"I do understand that climate change is caused by greenhouse gas emissions (CO_2, nitrous oxides, methane) resulting from human industrial activity" (Respondent 2)

> *"...It is a gradual increase in temperature resulting in the human mode of production of greenhouse gases. There is also a 'natural' element to climate change in that there are cycles of ice ages/warmer ages – but in the context of global warming, we are seeing a trend of warming which can be/has been attributed to greenhouse gases"* (Respondent 47)

> *"Unnatural weather patterns, compared to historical norms, due to excessive greenhouse gas emissions by humans"* (Respondent 92)

The newspaper readers hold some misconceptions regarding climate change especially concerning the relationship between climate change and ozone depletion. Often people make a connection between climate change and ozone depletion particularly with regard to the ozone 'hole' causing climate change (Bostrom *et al*, 1994; Read *et al*, 1994). In reality it is the chlorofluorocarbons (CFC's) which react with ozone and breakdown the ozone molecules (Bostrom *et al*, 1994). 11% of the readers think that climate change is causing the depletion of the ozone layer which subsequently warms the atmosphere. For example, Respondent 12 mentions that *"...reduction of ozone and production of greenhouse gases threaten to expose people to harmful rays from the sun and to heat up the planet"* and Respondent 42 says that *"the climate change causes damage to the world's ozone layer"*. The readers often refer to "ozone destruction" without elaborating further.

A few readers suggest that greenhouse gases react with the ozone molecules which deplete ozone. Some of the readers, quoted below, state that the ozone depletion is associated with gas emissions. Bostrom *et al* (1994) and Read *et al* (1994) describe that gases which are released into the atmosphere react negatively with the ozone molecules which break down.

> *"That somehow the atmosphere (ozone) is weakening with the result that the Earth is warming up...that the gases produced by human activity, agriculture and industrial production add to the weakening of the ozone and exacerbate global warming"* (Respondent 52)

> *"A loss in places of the ozone layer, exacerbated by carbon emissions and deforestation caused by logging, resulting in global warming, and melting of the polar ice caps which will result in rising sea levels"* (Respondent 17)

In summary, the readers define their understanding of climate change according to the basic changes involved. The readers say that the result of climate change is seen in temperature changes, changes in weather patterns and more severe weather conditions. The readers suggest that climate change is a process that appears to be affected by an external trigger i.e. where the release of greenhouse gases has affected the climate cycle.

5.2.1. Contrasting views of the causes of climate change

There are contrasting views of the causes of climate change held by the readers. These contrasting views are whether climate change is seen as a natural cycle, a human-induced phenomenon or both. Table 10 below shows that 8% of the readers believe that climate change is a natural cycle, 13% of the readers believe climate change is caused by people, and 73% of the readers understand that climate change is a natural process with human influences. 6% of the readers are sceptical about climate change.

Table 10: The contrasting views of the causes of climate change held by the newspaper readers.

Contrasting views of climate change	**Number of people**	**Percentage**
Perception of climate change caused by a natural cycle	9	8%
Perceptions of climate change caused by an anthropogenic problem	16	13%
Perceptions of climate change as both a natural cycle and a human induced phenomenon	88	73%
The readers who are sceptical about climate change	7	6%
Total	**120**	**100%**

5.2.1.1. Perceptions of climate change as a natural cycle

The first view held by the readers' is that climate change is a **natural cycle**. According to Table 10 above, only 9 people (8%) agree that climate change is a natural cycle. The readers describe that the Earth has gone through previous climate changing cycles and natural fluctuations. The readers support their arguments by referring to previous warming and cooling periods as well as landscape changes. Examples of this can be seen in the quotes below:

> *"There have been previous warming periods in the Earth's history"* (Respondent 36)

> *"I don't regard myself as particularly informed on this topic but the Earth has experienced climate change , including catastrophic ice ages, and in the last 300 years sea levels seem to have been receding – the Cape Town castle built in 1652 was, I believe, on the shoreline and is now about a kilometre from the sea"* (Respondent 17)

> *"It is the gradual warming of the Earth's atmosphere which is leading to global warming. This in turn leads to the melting of the ice caps, changes in weather patterns, droughts, floods, etc"* (Respondent 50)

"According to what I know from history, climate has never been static. There have been several 'little ice ages' in the middle ice ages and a few centuries ago if I remember correctly. Our present warming could be part of these cycles" (Respondent 61)

5.2.1.2. Perceptions of climate change as an anthropogenic phenomenon

The second view held by the readers is that climate change is a **human-induced phenomenon**. As shown on Table 10 (see page 112), 16 readers (13%) believe that climate change is caused by people. This group of readers also suggest that increasing population, human activities and the anthropogenic abuse of the planet have caused climate change. Respondent 42 says that *"the factors causing climate change are largely preventable by human behaviour and acting responsibly in a coordinated manner"* suggesting that something can be done to mitigate against climate change. There are three main observations from the readers: people have caused climate change by releasing greenhouse gases; resources have depleted as the population has increased; and that science has proved climate change to be a human-induced phenomenon.

The readers believe that climate change is a human-induced phenomenon due to the release of greenhouse gases into the atmosphere and the general destruction of natural habitat. Examples of this thinking are quoted below:

"...when we talk about climate change, we mean the anthropogenic changes resulting from human industrial activity" (Respondent 2)

"One only has to look at the deforestation and human induced pollution – CFCs – to see the problem" (Respondent 9)

"This must produce larger and larger quantities of CO_2 and pollution which feeds global warming" (Respondent 13)

The readers associate the release of gases with the abuse of the Earth and its resources. The readers' explanations illustrate that they correctly understand that as the population increases, the Earth's resource base and the Earth's natural processes will be negatively affected. The readers understand that the increasing population has led to increasing demands on industrialisation, production, consumption and resources. The respondents, quoted below, explain that the increasing global population and the increasing demand on resources are changing the balance of nature.

"The acceleration in the human population growth (largely as a result of medical and other technological advances) affects the natural order in every sphere from the reduction of habitat and biodiversity to pollution. As stewards of the Earth, human beings should be preserving the condition for life, but we are currently seeing the opposite" (Respondent 3)

"People have caused damage by being ignorant regarding the environment. Also, the world population is growing exponentially, with very little regard to what this does to the environment and of the impact we have by living fast and easy" (Respondent 46)

"The human race has not used resources responsibly. In some cases the abuse of these resources has occurred innocently but most situations it is the result of big business striving for higher profits by taking more from the Earth in an unsustainable fashion" (Respondent 4)

The response from Respondent 94, below, indicates that as the population increases there will be more waste to dispose of, thereby ultimately placing pressure on the Earth's ability to provide and work for us. This again addresses the issue that as the population increases so does the resource use. This respondent however, continues this train of thought further and says that as the population increases with the increased use of resources, it is only natural to assume that there will be more waste production.

"There are too many people for the planet to deal with all our waste. We are selfish and ignorant, for example, we think we can dump our waste in the ocean with no effect, because it is out of sight and we don't know/care what effect it will have on the environment there" (Respondent 94)

In summary, this group of readers believe that climate change is an anthropogenically induced problem. The readers suggest that the release of excess carbon emissions is due to human activities which have polluted the atmosphere and disrupted the natural cycle of the Earth and the climate.

5.2.1.3. Perceptions of climate change as both a natural cycle and an anthropogenic phenomenon

The third view held by the readers' is the perception that climate change is **both a natural cycle and a human-induced phenomenon**. In Table 10 (see page 112), 73% of the readers show an understanding that the climate has fluctuated naturally for millennia but recently there have been changes in the climate cycle due to human activity. Evidence of this is highlighted in the following extracts:

"There have been climate change phenomenons before humans were the dominant species on the planet. We are able to study the impact of ice ages on the environment through research. The climate change that we are experiencing at the moment is a culmination of natural climate change but this has been enhanced by the negative impacts that humans have had on the planet. This is through the increased release of harmful gases and other substances throughout industrial processes, which has had an effect on greenhouse gases and the ozone layer, which has speeded up the rising of temperatures on the planet" (Respondent 11)

"It is both a natural and human-induced process. The human factor was accelerated in recent centuries with the onset of industrial capitalism, driven by the treadmill of production and consumption (accumulation for the sake of accumulation) which rests on the exploitations of fossil fuels. Climate change is but one aspect of the pollution caused by excessive industrialisation, albeit a critically important one. Pollution is also only one aspect of ecological devastation, other inter-related aspects being declining biodiversity and resource depletion" (Respondent 1)

"I think humans have initiated climate change by their behaviour. But that it manifests itself as a natural process. However the natural processes we see were induced in the first place by humans" (Respondent 50)

"Climate change is what I currently take note of, as portrayed by the media. This includes increase in temperatures around the globe, primarily as a result of deforestation, high levels of carbon monoxide into the atmosphere, unnatural floods, drought and increase in ocean levels due to the melting of ice on the poles. Whilst initially accepting without doubt that the human race is responsible for climate changes due to humans poor management of the planet's resources, I have subsequently read in the media that going back in time, it is evident that the same conditions have previously prevailed on planet Earth as these two move in a constant curve over millions of years" (Respondent 44)

"Briefly, global climate change is a fundamental, natural phenomenon on the evidence of the historic and especially, the geological record. It appears to involve both a steady, selective increase in the mean atmospheric temperature, and is believed to induce progressive change in rainfall patterns around the world in extreme weather events. It has both an underlying, natural cause related to such factors as the Earth's orbit around the Sun. Since the beginning of the Industrial Revolution in Europe and our consequent exponential consumption of carbon-based fossil fuels, however, it appears that our generation of atmospheric carbon dioxide and other greenhouse gases (such as methane), has made a measurable and had a generally adverse effect on global warming and also possibly on extreme weather patterns. Other factors with a large (and largely unknown) influence on climate are the deliberate destruction of tropical forests (such as in Amazonia) and the inadvertent spreading of extensive arid areas (such as the Sahel). And so on" (Respondent 49)

"There are always natural processes at work to change climate but currently the human impact has taken on excessive proportions as a change agent" (Respondent 91)

The readers explain that the reason for the change we see today is associated with the release of carbon emissions which hastens the climatic changes we are experiencing. Respondent 91 explains

that the reason for such a change is because *"...currently the human impact has taken on excessive proportions as a change agent"*. Examples of this thinking can be seen by the respondents quoted below:

> *"Although human activity is a major cause of climate change we can't rule out that the Earth is sensitive to natural alterations in global climate. For instance the Earth has always been susceptible to ice ages and cold and hot periods. What is happening now is those natural fluctuations are being magnified by human activity – cars, planes, and factories and the like which are all having a major impact."* (Respondent 100)

> *"Climate change occurs naturally due to minor shifts in the angle of the planet Earth's axis as well as other complex conditions. Humans have contributed through increased greenhouse gas emissions. Gases such as CO_2 and methane"* (Respondent 19)

The newspaper readers suggest that there have been previous climatic changes and that the change we are currently experiencing appears to be becoming more severe. Respondent 49 and 98 (both quoted below) describe that it is important to note that we can only partially observe and understand climate change because the records do not go back far enough. Predicting future climate changes is based on observing past climatic patterns to get an idea of what future changes could be expected (Davies and Joubert, 2011). This suggests that climate comparisons are made between what is experienced now and what was experienced in the past. Respondent 49 describes below that we can only speculate what could happen to the climate in the future.

> *"It is both of the above [a natural cycle and a human-induced phenomenon]. However, it is difficult to distinguish the relative contributions of the two effects because (1) the climate record is not everywhere as long, accurate and detailed as we would wish; (2) the theoretical, statistical models to describe climate change do not satisfactorily explain the underlying mechanisms involved in climate change to give us as much confidence in the predictive value of the various models as we would like to have...Climate change is clearly a fact from the geological and archaeological record (from isotope, faunal and floral records, and, more recently, from the written record). Modelling is relatively recent and requires massive computing power to cope with such a complex phenomenon. Moreover, the research literature shows that our ability to make all the principal assumptions to explain the basic mechanisms is still in the need to refinement"* (Respondent 49)

> *"The planet's climate changes on a local scale and in ways that we only partially understand. We are able to observe directly on short-term changes (over years, perhaps decades)..."* (Respondent 98)

Some readers understand that there have been natural variations and fluctuations with the Earth's climate and that the anthropogenic effect has been noticeable. However, these respondents (quoted below) point out that there is some uncertainty concerning the ability to predict the effect of the natural climate and anthropogenic climate change accurately. Respondent 16 says *"the work done on climate change is suspect partly because of the lack of sophisticated systems used in the past..."*. Respondent 44 describes below that scientists have changed people's perceptions regarding climate change through research as the scientific field publishes specific climate change information.

> *"...it first appeared as if mankind alone is to blame, but by studying historic climate changes and making the results known, the scientists have coloured this perception with their findings that similar conditions have reigned in the past – long before modern man built motor car, fridges and other equipment which release harmful gases into the atmosphere"* (Respondent 44)

> *"The evidence is conflicting, but historically there have been pre-human warming periods, if not to the current extent"* (Respondent 6)

> *"I don't know if it is possible to accurately know how much of what happens with our climate is natural as opposed to human-induced, but I believe there is a whole lot more we should be doing to respect and take care of our environment anyway."* (Respondent 10)

In summary the readers describe that climate change is a natural process that has occurred for millennia and that it is only recently that the release of carbon emissions has advanced the rate of climate change. The readers appear to acknowledge that the human-induced aspect of climate change appears to be more problematic than the natural aspect. The focus on the human-induced aspect of climate change could be that not only is it a recent addition to climate change but as Baron (2006) says, anthropogenic climate change is the aspect that people are likely to become involved with as people may feel that they are able to reverse the impact that they have made.

5.2.1.4. The readers who are sceptical about climate change

In this fourth view, 6% of the readers are sceptical of climate change (see Table 10 on page 112), and question its severity and seriousness. It is interesting to note that all the readers who are sceptical about climate change express their doubt but still describe the contrasting views of climate change as both a natural cycle and human-induced problem.

> *It is a complex issue and a topic that engenders widely diverse theories, opinions and discussions. I don't know if there is an absolute truth on the issues but from what I gather it is prudent to pay attention to all the different perspectives and to not take chances/risks with our environment because it is possible that we are damaging the Earth and our climate/weather patterns irreparably with our modern, developed world lifestyles, especially industrial and carbon emissions. I hope that the global warming issues and supposed human-induced rapid climate change are not as unnatural as*

some would make out but if they are a real danger, and for this reason I believe we should pay attention, be responsible and do our bit towards conserving the environment on a macro and micro level" (Respondent 10)

"You know I am sceptical about climate change and I don't believe people have caused it. And I've read articles about scientists fiddling data. But if there is no such thing as climate change, then why are the glaciers melting?" (Respondent 74)

"Like a far-fetched idea...it does not come across very tangible." (Respondent 46)

One respondent, quoted below, is not sceptical of climate change but rather sceptical about the causes of climate change.

"I understand that it has increasingly become a topical area of debate. Given the different arguments often presented I am a bit of a fence sitter on what causes it. However, in a world of scarce resources I think we certainly need to consider the effects that industry and human have and consider using renewable /green technology and energy and water more efficiently" (Respondent 97)

The scientific community has had an impact on what is reported regarding climate change and are able to manipulate what information is released for publication (Weingart, 1998). Therefore if climate change information is miscommunicated some scepticism may be apparent among the public. Weingart (1998) says that scientists often generate and manipulate their information so that the media is able to report on the subject easily. Some readers recognise that scientific bodies frame and report on climate change in a certain way. Respondent 16 highlights the role that climate governing bodies (e.g. United Nations, IPCC) take up when reporting on climate change as he says that *"the United Nations reports providing so-called evidence of global warming..."*. Respondent 44 is quoted saying that *"...the scientists have coloured this perception with their findings..."* when reporting on climate change. Scientists (and media) have informed the world of scientific findings, however the media often portrays information in an altered form (Burgess, 1990) and as a result the media has influenced the public's perceptions. Tollefson (2010) describes that the media has brought to light some instances (such as the 'climate-gate' scandal) where scientists have manipulated data and information for publication. The statement previously made by Respondent 44, suggests that scientists have changed and moulded the public's perceptions of climate change. Similarly, the media also plays a role in manipulating the public's perceptions of climate change (Burgess, 1990).

Respondent 16 (quoted below) states that he believes climate change is a natural process. However this reader implies that there is an anthropogenic influence with regard to releasing carbon emissions. The reader also mentions that scientists' claims of anthropogenic climate change are flawed. This reader gives an example of carbon emissions not having the effect scientists claim and that the measurements that are taken for climate research are done by equipment that probably give insufficient data. This reader acknowledges that the climate science as well as the methods of accumulating climate data and reporting on it could be questioned.

"Long term cycles in the history of the Earth indicates that such global warming is a recurring phenomenon. Even in 1420 one could sail around the north side of Greenland. The United Nations reports providing so-called evidence of global warming due to man-made causes are suspect and seemingly politically driven. Of course we do not want more CO_2, methane and other pollutants to be allowed to multiply as they have done, and for this reason I support efforts to bring about a reduction in such man-made pollution. But I do not think that they make a significant impact on the global warming that is taking place. The work done on measuring changes in ocean temperatures is suspect-partly because of the lack of sophisticated systems used in the past and partly because of the various levels in the oceans at which such samples have been taken. The damage to coral reefs is not, I believe, a result of global warming but rather due to the pollutants washed into the sea" (Respondent 16)

The readers mention that there are theories, debates, opinions and discussions that have created doubt concerning the extent and severity of climate change when it is portrayed in the media. These sceptical readers have taken a step back from the climate change debate and question the experts in the field and the media. Although the readers acknowledge that they doubt the seriousness of climate change, they do suggest that society and people's activities appear to damage the environment.

5.3. Readers' perceptions regarding how newspapers portray climate change

The third theme looks at the readers' perceptions regarding how newspapers portray climate change. The readers' state that the newspapers reported climate change either as an urgent issue that needs serious attention or as an issue that is not urgent and that not enough attention is placed on it (see Table 11, page 120). 70 out of 120 readers (58%) say climate change is reported as an urgent issue, 19 readers (16%) say climate change is reported as not urgent, 10 readers (8%) say climate change is sensationalised in the newspapers, 8 readers (7%) said that the newspapers focus on the political aspect of climate change and 13 readers (11%) cannot recall stories of climate change in the newspapers or who have other miscellaneous responses.

Table 11: The number of readers who say newspapers portray climate change as an urgent issue, as not urgent, as sensationalised, as political and other miscellaneous comments concerning climate change.

How readers perceive newspapers portray climate change	Number of people. N = 120	Percentage (%)
Urgent	70	58
Not urgent	19	16
Sensationalised	10	8
Political	8	7
Miscellaneous comments concerning climate change	13	11
Total	**120**	**100**

5.3.1. Climate change reported as an urgent issue in the newspapers

Table 11 above shows that 70 readers perceive climate change to be reported as urgent. This first group of readers suggests that climate change is urgent and needs a response in order to do something to mitigate against the effects of climate change. The respondents quoted below, say that a strong response and a strong awareness of climate change is needed to bring society together to tackle the issue.

> *"An issue which needs to be dealt with as a matter of urgency, however not enough is being done. The impact has been huge so the task to be tackled is enormous. Over the last 3 years far more people and businesses are starting play a role in sustainable development of resources"* (Respondent 4)

> *"As a given. As an incredibly urgent issue to which all of the world's intellectual and financial resources must be loaned in order to arrive at a resolution"* (Respondent 98)

> *"Mostly as a serious, man-made problem requiring urgent attention"* (Respondent 6)

Part of the urgency that the readers describe is that the perceived message of climate change, relayed through the newspapers, is that it is *"...a looming threat which can no longer be avoided, only minimised"* (Respondent 14) and that the *"damage will be irreversible"* (Respondent 15). Respondent 102 says that climate change is reported on *"negatively and something to be avoided"*.

Some respondents agree that climate change is seen as a serious and concerning issue. Respondent 17 says that climate change is reported *"as a matter of concern"* while Respondent 19 says it is reported *"as a serious issue..."*. Respondent 99 (quoted below) says who should be taking responsibility for the problem while Respondent 10 depicts below that the concern of climate change is that the Earth cannot sustain the population's demand for finite natural resources.

> *"As a serious issue that needs a serious response from governments and business"* (Respondent 99)

"Very [serious] as I've described. There are differing opinions and debates that argue different theories, but my impression is that there is a growing unanimous concern on some level that the Earth cannot sustain an ever expanding population along with human beings exploiting the Earth's resources and ignoring the impact of modern industrialisation without there being dire consequences at some point" (Respondent 10)

"I don't read every article on the subject so my answer is not objective. When I read articles it is mostly considered a very real and serious issue" (Respondent 51)

5.3.2. Climate change reported as not urgent in the newspapers

Table 11 (see page 120) shows that 16% of the readers believe that climate change is reported as not urgent in the newspapers. For example Respondent 13 says *"...there is not enough emphasis on the looming problems..."* associated with climate change and Respondent 100 feels that climate change *"rarely makes an appearance"* in the newspapers. Respondent 2 (quoted below) agrees that climate change is reported on infrequently and as not urgent. This respondent suggests that climate change articles should be framed differently.

"I personally think that climate change is not addressed with any sense of urgency or seriousness in the local newspapers, all watered down to 'the ten tips to change your light bulbs' material, rather than 'hell, we are in dangerous territory now'. I think the message in the newspapers should clearly state we need action now, and indicate what that actions should be...I think the newspaper articles on climate change are lacking in depth, and don't create the required sense of urgency. The average South African would not know who the IPCC were or how to access their website, or why they should bother doing this. And the newspapers are not urging their readers to consult other sources of information. Have you ever seen an article in the South African press that gives a list of other sources to consult? The IPCC is the major source of climate change information for decision makers – people can consult this themselves, and not rely on the limp South African press for climate change info." (Respondent 2)

Interestingly, Respondent 2 (quoted above) believes that climate change is not addressed with any sense of urgency. This respondent says that it is partly due to the way climate change is reported on, the subsequent lack of information (or 'depth') and the fact that the public in general are not aware of climate organisations such as the IPCC. Respondent 2 suggests that the newspapers do not encourage their readers to further their understanding of climate change and its related issues.

Respondent 50 (quoted below) also agrees that there are few articles in the newspapers dedicated to climate change. Respondent 50 suggests that newspapers need to focus on a different aspect e.g. how people are affected by climate change or certain climate events. Respondent 50 highlights some

environmental issues that should be addressed and be portrayed as urgent. Respondent 50 emphasises the issue of the 'importance' versus the 'urgency' of climate change.

> *"I don't find many articles in the newspapers that accessible on climate change, or that interesting. I think the angle should be more immediate and that the human interest element of climate change should be stressed. For instance the Japanese disaster last year was very interesting and I followed it very closely on CNN, Sky, Time Magazine and the New York Times. The reporting brought out the human elements, how people survived, etc. The dramatised the story and made it interesting. I think there are many SA stories but they are not written...The paper should look at people living in poverty exposed to hazardous waste, poor water, etc. Why don't we get stories about air pollution? Are factories regulated? Why is the air around Secunda still so filthy? Do people in those areas get lung ailments? What role is being played by government to curb this kind of pollution that come from the big petroleum and coal manufacturers? More investigative journalism on pollution and environmental degradation at the hands of human is needed."* (Respondent 50)

Respondent 42 says that there is *"not enough coverage of climate change except during the recent Durban Summit...One wishes that this subject received the same level of importance at least as compared to the coverage on say Malema"*. Based on the readers' responses, there is a sense that the political nature of the South African newspapers overshadows the importance of climate change. This finding agrees with Baron (2006) who says that an issue (such as climate change) is only reported in the newspapers until a new (political) issue is on the table.

5.3.3. Climate change reported as a sensationalised issue in the newspapers

Climate change information that is reported in newspapers is often sensationalised because it is over-exaggerated or it is portrayed in a different light to what it really is (Gavin *et al*, 2011). 8% of the readers suggest that climate change is sensationalised in the newspapers. The readers feel that newspapers over-exaggerate climate change in newspaper reporting. However the newspaper readers say that newspapers themselves manipulate information for public consumption. Therefore the path that information travels from scientists to the media and finally to the public may result in the information being distorted by the time it reaches public (Burgess, 1990; Weingart, 1998; Carvalho and Burgess, 2005). Examples of this thinking can be seen by Respondents 53, 54 and 101 quoted below.

> *"Slightly sensationalised, portrayed as a contentious issue sometimes - it should be a topic of debate, there is enough scientific evidence to support the fact that it is happening largely due to human influence"* (Respondent 53)

> *"Portrays it either as something simple or dramatic. It makes it out to be a problem that can be solved by changing lightbulbs. It also has loads of corporate 'greenwash'" (Respondent 54)*

"More often than not, there are sensational stories about various events that have taken place that are related to climate change. There are good editorials from time to time that provide a more scientific analysis. Generally though it's based on issues and the need to highlight findings/collaborations/international blame..." (Respondent 101)

5.3.4. Politics of climate change reported in the newspapers

The fourth perception of newspapers reporting on climate change is that the focus of the stories is politically orientated. Respondents 11 and 16 (quoted below) say that because the newspapers are politically orientated, climate change stories would naturally be politically focused. Respondent 16 adds that the newspapers are also influenced by political bodies that address climate change, such as the United Nations.

"The Mail & Guardian will sometimes deal with issues of climate change, but as it is predominantly quite a politically motivated paper (in that their main objective or output is to provide the political news domestically and internationally), as such their stories on climate change tend to focus on the political ramifications of climate change, and less so on the actual specifics of climate change itself" (Respondent 11)

"The media generally is very influenced by the UN pronouncement - which has impacted the thinking and view of many governments. Too little attention is paid to the alternative viewpoints expressed by reputable scientists" (Respondent 16)

Respondent 46, quoted below, says that climate change seems to be a 'far-fetched idea' and that politicians often speak about climate change but nothing is done about mitigating the effects of climate change.

"Like a far-fetched idea...it does not come across very tangible. A lot is said by politicians, but not much is done about it" (Respondent 46)

5.3.5. Miscellaneous comments concerning climate change in the newspapers

As shown on Table 11 (see page 120) a minority of 11 % of the readers have miscellaneous comments concerning how climate change is reported in newspapers. The readers say that they cannot recall climate change stories in the newspapers or feel that climate change has very little focus in the newspapers. Therefore the implication is that because climate change is not prominent in the media, this affects the public's (lack of) awareness on this issue. As scientific information and climate change becomes important in media reporting, the public will become increasingly aware of the topic being highlighted. As the public becomes interested in what the media reports on, the science field will incorporate the media into their field (Weingart, 1998). Respondent 94 says that he *"can't recall"* how climate change is portrayed in the newspapers. Respondent 55 (quoted below) shares the same sentiment.

> *"I don't remember any specific incidents of reports on climate change and it is something I would have noticed. Although the Sunday Times has a weekly article on environmental issues somewhere..."* (Respondent 55)

Other readers note that climate change is not often reported on in newspapers. For example Respondent 100 says that climate change *"rarely makes an appearance"*. If people cannot recall how climate change is portrayed or that there is a narrow focus in the newspapers, then the implication is that stories in the newspapers have not captivated the readers' attention. Some of the readers admit that they specifically avoid the articles reporting on climate change (See Respondent 97 below).

> *"To be honest I often avoid the articles on climate change because I don't feel that it will give me an unbiased opinion. Much like the nuclear energy debate, it is difficult to know who to believe. There seems to be one key dissenting voice in the Daily Maverick, Ivo Vector, but I tend to avoid his articles as well"* (Respondent 97)

In summary, some of the readers *"can't recall"* (Respondent 94) or *"don't remember any specific incidents of reports on climate change"* (Respondent 55) in the newspapers. Therefore, a lack of climate change information reported in the papers implies that there needs to be a more focused and in-depth discussion concerning the seriousness of climate change.

5.4. The sources of information for readers' perceptions on climate change

Newspapers have an impact when relaying information on climate change. The first group of readers say that newspapers have affected their perceptions of climate change while a second group of readers say that the newspapers have not affected their perceptions of climate change.

Table 12: The number of respondents who say that newspapers have or have not affected their perceptions of climate change.

Have newspapers affected people's perceptions?	**Number of readers**	**Percentage (%)**
Yes	72	60
No	48	40
Total	120	100

5.4.1. Newspapers influence the readers' perceptions of climate change

Table 12 (see page 124) shows that 60% of the readers say that the newspapers **have** affected their perceptions of climate change; they are more aware of climate change; they understand that measures that need to be implemented to mitigate against climate change; and they are aware of the politics surrounding climate change. The readers frequently mention that they have become more 'conscious' of climate change and related issues. This implies that people are dependent on newspapers for information pertaining to climate change. This is highlighted in the quotes below:

> *"It has made me more conscious of the fact that I must adjust my impact on climate change"* (Respondent 91)

> *"Yes, I think I was made more aware of the political issues surrounding the climate change issues. These included the political influences of the more powerful states and the pressures placed on the less powerful states."* (Respondent 11)

> *"It has made me more 'conscious."* (Respondent 14)

As a result of the newspapers reporting on climate change, some of the readers' say that not only have their perceptions changed but some readers explain that they have changed their lifestyles as well. An example of this can be seen by the Respondent 60 quoted in the extract below:

> *"Articles in the newspapers do affect my perceptions and do make me want to conserve water, for instance, or become more conscious about recycling. But to be honest, I find radio, such as 702, has influenced me far more. I have heard interesting speakers talk about recycling on radio, this has made me buy a composter and Earth worm factory. I've heard people talk about acid water emanating from the mines on radio"* (Respondent 60)

40% of the readers feel that the newspapers **have not** affected their perceptions of climate change (See Table 12 on page 124). This group of people do not rely on newspapers for their climate change information because they feel that insufficient attention is given to climate change and that in some cases the information is not on a level for the average person to understand. For example, Respondent 62 says that *"the newspapers do not give sufficient focus to this area"*, and with regard to the information that is relayed to the public, it is of a *"...very high level, not applicable to your average layman on the street"* (Respondent 46).

Conversely, the readers also say that the information provided by the newspapers is not detailed enough and does not appeal to the reading audience. These readers rely on a number of other media platforms to gain information on climate change. This relates to Weingart's (1998) thinking where he describes the direct relationship between increased media coverage on climate change and people's awareness of this subject. Therefore, if newspapers do not provide sufficient information, the public will move to other sources for climate change information. Respondent 29 says that there are *"other*

more reputable sources..." which influence the public's decisions. Further examples can be seen in the extracts below:

> *"The newspaper articles do not influence my perceptions as I read a lot of other material. I generally find the article in the newspapers weak and bland – the never say things like 'we must close the motor industry down NOW as we are heading for a climate change disaster" – something like that would get my attention. The rest is just "changing the light bulb' stuff. Boring. I think the SA press largely supports the status quo and the 'business as usual' model"* (Respondent 2)

> *"I do not rely on newspapers to give me this information I need (although I still read what they report). Instead, I prefer more technical literature"* (Respondent 49)

> *"More confusing than illuminating, prefer to rely on more trusted sources..."* (Respondent 99)

5.4.2. Other forms of media which influence the readers' environmental decisions

Table 13 below shows the specific media and non-media sources where the readers receive climate change information. The reliance on a number of sources for acquiring climate change information provides a large base for people to receive and consume information. This allows them the ability to decide on the reliability of the information.

Table 13: Media and non-media sources of information on climate change.

Media sources	**Non media sources**
• Newspapers • Media (in general) • Internet • Books • Journals • DVDs • TV • Movies • Documentaries • Radio • Magazines	• Journal articles (Research papers and research) • Public lectures and presentations • People who are knowledgeable in the field • University • Social discussions • Workshops • Non-governmental organisations (NGOs)

The public receives their climate change information from a number of media sources, including newspapers. Table 14 (below) illustrates the number of readers who rely on media sources (visual, print media etc), non-media (social interactions and university) sources or both sources for their climate change information.

Table 14: The number of readers who rely on media and non-media sources for climate change information.

Sources of climate change information	**Number of people**	**Percentage**
Media sources	87	72.5%
Non media sources	8	6.7%
Both media and non-media sources	25	20.8%
Total	**120**	**100%**

Table 14 above shows that 87 (72.5%) of the readers rely on **media** sources for climate change information. These media sources can be seen in column 1 of Table 13 (see page 126). A reason for the dependence on media for information is that this channel provides simple information so that people are able to understand the complex topic of climate change easily (Burgess, 1999). Information is passed from the source of the information (i.e. the scientists) to the consumers of the information (the public) via the media (Burgess, 1999). The role of the media is to represent information in such a way that the public can easily understand the topic (Weingart, 1998). Respondent 55 says that *"facts can be questionable and exaggerated"* thereby suggesting that although information appears to be factual, the statements made must still be questioned as information may not always be entirely true.

5.4.3. Non-media sources which influence the readers' environmental decisions

The second channel through which climate change information arrives is through **non-media sources** such as social interactions, including social discussions, workshops, and engaging with the academic environment as seen in Table 14 above. 6.7% of the readers receive or rely on non-media sources for their information. Social interactions within society are a means to spread information within social groups. For example Respondent 10 says that she works at a *"...university that is concerned about global, international and national issues affecting the quality of life on Earth"* and Respondent 11 says that because they work *"...in an academic environment..."* they are *"...exposed to information in this arena"*. The information from research and journals is the representation of primary and secondary data which is the factual description of climate change data. People who rely on these sources will receive slightly different climate change information compared with information from the media. Media briefly reports on current climate change issues while journals and research publish

more in-depth reliable scientific information. Although the scientific community may be seen to publish reliable information, Tollefson (2010) and the results of the newspaper analysis show that scientific data may be manipulated and published by the scientific community, thereby portraying an altered perception of climate change.

5.4.4. Both media and non-media sources which influence the readers' environmental decisions

Table 14 (see page 127) shows that 20.8% of the readers rely on **both media and non-media sources** for climate change information. Through everyday interactions people naturally engage with each other and with the media to gain information regarding climate change. Respondent 99 describes that he receives his information from *"a variety of sources..."*. These sources have been depicted in Table 13 (see page 126) and are namely *"conversations, history at university and the media"* (Respondent 20) as well as *"workshops, NGOs, TV programmes, radio, environmental activists, newspapers, magazines (especially reading in waiting rooms), using Google at times"* (Respondent 62) and other related media platforms. Respondents 10 and 101 (quoted below) describe the media and non-media sources they rely on for climate change information.

> *"Various media (print, online, TV, radio), lectures and presentations, and people I connect with who are involved or are impacted on one way or another by climate change and the issues surrounding it. Working at a liberal university that is concerned about global, international and national issues affecting the quality of life on Earth, and that has a strong social responsibility consciousness also contributes significantly towards how I engage with these issues"* (Respondent 10)

> *"Media – print and visual, and talking to people who are involved in active research at the poles and seeing their report back when they return from these trips"* (Respondent 101)

Baron (2006) says that within the media an issue remains topical until a new issue is popularised in the press. The same idea could be applied to social interactions. News issues may be discussed in conversation as stories are highlighted in the news until new stories are popularised. Based on Baron's (2006) idea, it appears that there needs to be an external source to provide the new information for social discussions.

5.5. Factors which influence the readers' environmental decisions

There are factors (excluding newspapers) which influence the readers' environmental decisions. As people become environmentally aware they will be able to make informed climate change and environmental decisions (Schneider, 1997). There were readers who felt that newspapers had little influence over their personal and individual decisions and who described that there are other variables which influence their own environmental decisions, viz: other forms of media (61%), green

technologies (42%), financial motivation (34%) and governance (31%) (See Table 15 below). However, not all the readers are influenced by all of the options in Table 15. The reason for this could be that these options may not be viable options for the readers or their lifestyles.

Table 15: The variables that influence the public's environmental decisions.

What influences the public's environmental decisions	**Number of people (120 for each)**	**Percentage of people (%)**
Other forms of media	74	61%
Green Technologies	51	42%
Financial motivation	41	34%
Governance	38	31%

5.5.1. The influence of green technologies on the readers' environmental decisions

Green technologies affect the readers' lifestyles. 42% of the readers say that they have adopted green technologies as part of their lifestyles. The adoption of green technologies into society and individual households appears to encourage people to change their lifestyles. Respondent 53 agrees that the *"the availability of green technologies motivates..."* people *"...to be green"*. The readers who have adopted green technologies have mainly introduced *"light bulbs, low cfcs, solar heating and insulation"* (Respondent 43) into their households. Green technologies have a positive response from the readers as they have acknowledged the importance of green technologies and suggest that more green technological alternatives should be developed. Based on the readers' responses, it appears as if technology is becoming more popular within society and awareness of green technology is increasing. Examples of this thinking can be seen in the following extracts:

> "*These are very important and should be developed further."* (Respondent 11)
>
> "*Their benefits should be reported and marketed"* (Respondent 44)
>
> "*They seem to be gaining acceptance and many people now see the use as important"* (Respondent 13)
>
> *"I have become more aware of alternative energy savers available"* (Respondent 92)

However, there are some readers who appear to be sceptical about green technologies and feel that these alternative technologies should be questioned or investigated further. Respondent 55 says that *"a lot of 'green' alternatives can be worse for the environment"*. Respondent 70 says that they are *"not sure what these are"*. While Respondent 11 initially supported green technologies, this respondent does say that:

"However, with the political battles that subsist over natural resources and the corporate investment in oil and coal I think that this will require more environmental pressure before the world starts to really explore bio-fuels and other green technologies" (Respondent 11)

Overall the readers commented positively on green technologies as they view this alternative as a way to help mitigate against climate change and protect the environment. However although green technologies are slowly being accepted by society, some readers commented that these technologies are too expensive or that they are sceptical about the efficiency of the technologies.

5.5.2. The influence of financial motivation on the readers' environmental decisions

Financial motivation may influence the readers' environmental decisions. 41 readers (34%) explain that they have adapted their lifestyles to save money thereby intentionally or unintentionally mitigating the effects of climate change. So the question is whether the readers are making environmental decisions out of concern for the environment or for their own financial benefit (i.e. unintentionally making environmentally friendly financial choices). For example, Respondent 2 says that that the financial benefit is that they *"...use less electricity and water in..."* the *"...household to save costs"*. To support their efforts, some readers have implemented alternative energy. These readers say that they have installed solar heating and geysers as well as water collectors as a means to reduce costs. This thinking is seen in the readers' quotes below:

"Any motivation toward action has little to do with financial motivation, although I could list financial alleviances that 'greener' living could have. Buying locally grown, unpackaged food for instance. Public transport, not buying expensive processed products, not buying a new electronic device to replace an outdated but fully functioning one unless absolutely necessary. Buying unbleached, recycled paper, toilet paper is also cheaper as it comes in bulk (greenhome.co.za), not buying cold drinks in cans or plastic bottles can save a bit of money and resources. A vegetable based diet can save a lot of money" (Respondent 55)

Recycling is more of a moral motivation than financial, where as saving of electricity and water there is a definitive long term saving potential" (Respondent 93)

"Saving on electricity is obviously a good incentive and getting the solar heating subsidy helped" (Respondent 77)

Although these reductions in energy use are financially beneficial in the long term, the cost of installing solar technologies in particular, is a concern for some of the readers as this is an expensive option to use. Respondent 2 says that alternative energy and technology is *"...too expensive..."* however they *"strive in every other way to use less electricity..."* and reduce financial costs and live an environmentally friendly lifestyle.

To summarise, the readers say that finance does affect their environmental decisions. The readers say that they will only implement green alternatives if they are able to afford them and if they are financially viable. Therefore based on the responses from the readers, it seems that people will only introduce environmentally friendly measures or reduce usage of energy (for example) if it is beneficial to them.

5.5.3. The influence of governance on the readers' environmental decisions

31% of the readers say that government has affected their lifestyles to varying degrees. There are two opposing views concerning the government's responsibility for climate change and changing people's lifestyles. The first view is that government has affected the readers' lifestyles by implementing environmental laws and regulations while the second view is that government has not affected the readers' lifestyles.

In the first view, the readers say that the government has affected their lifestyles through laws and regulations. The readers confirm that they are becoming more aware of environmental legislation through the introduction of policies. Respondent 1 says that he is aware of the *"carbon taxes on cars"* which is being implemented as a measure to reduce carbon emissions. The readers who agree that governance has changed their lifestyles (such as Respondent 50 below) say that it is through policies such as the increase in charges on *"plastic bags"* and other laws relating to *"environmental pollution..."* and *"...acid mine drainage"* (Respondent 43). Through the implementation of laws and policies, the public often has no choice but to follow such laws.

> *"Yes. When the local government introduced a recycling option in respect of garbage collection, I followed it. When government introduced unleaded petrol, I changed to it. When government makes environmentally friendly law, I follow it"* (Respondent 50)

Conversely, some newspaper readers say that the government has had no effect on their lifestyles. The majority of these readers explain that they feel the government does not play an active role in implementing environmental policies. Specifically, Respondent 21 says that the *"lack of governance has affected my attitude"* and Respondent 44 suggest that *"governments should play a much greater role in educating the population"*. Therefore it appears as if the readers believe that the government should become more involved in this area.

Other readers' say that the implementation of laws and regulations by government could definitely aid in mitigating the effects of climate change and affect the public's environmental decisions. However Respondent 49 says that regulations and laws are *"...not well developed in South Africa"* and as a result the public is unaware of the environmental laws enforced by the South African government. Therefore the public needs to become more aware of the laws implemented by the government. Further examples of this thinking can be seen by Respondents 55 and 64 below.

> *"Laws and regulations could definitely help to curb climate change, but I'm not actually aware of any regulation or laws in RSA that are affecting my decisions"* (Respondent 55)

"I am unaware of environmental laws in South Africa" (Respondent 64)

Overall it appears as if the newspapers have only increased people's awareness of climate change and have not necessarily created a change in lifestyles. Other forms of media (TV, radio, internet, magazines etc), new green technologies, finance and governance may have more influence over the public than newspapers.

5.5.4. Environmentally friendly lifestyle changes

In addition to changing their perceptions, the readers say that there are a number of ways in which they have changed their lifestyles to become more environmentally friendly. Table 16 (on page 133) illustrates the changes that people have made towards creating an environmentally friendly lifestyle.

Table 16: The changes that people have made to their lifestyles.

Changes that people have made	**Number of people (out of 120 for each)**	**Percentage (%)**
Use less electricity	64	53
Recycle	58	48
Use less water	26	22
Use alternative energy (solar etc)	23	19
Use fuel efficient cars	21	18
Compost	18	15
Travel less	17	14
Reduce consumption	15	13
Use alternative technology (light bulbs etc)	13	11
Use environmentally friendly products	13	11
Collect rain water (rain water tanks)	10	8
Vegetable garden	10	8
Organic food	8	7
Plant trees	8	7
Reduce carbon footprint	8	7
Reduce waste	8	7
Support policies and movements for conservation	8	7
Reduce emissions	6	5
Use alternative transport	5	4
Use less paper	5	4
Educate other people	5	4
Use less plastic	4	3
Reduce use of aerosols (Pesticides, chemicals, deodorants)	3	3
Careful disposal of harmful substances	3	3
Use alternative fuels	2	2

As seen in Table 16 (see page 133), the changes that the readers have adopted at home range from using alternative energy and technology, to recycling, using less water and electricity, finding ways to save on travelling, reducing carbon emissions and carbon footprints and using environmentally friendly products. Examples can be seen in the extracts below:

> *"Recycling of all products e.g. glass, paper, etc; using natural waste from kitchen in garden compost; reducing electricity consumption-turned off 1 geyser, installed geyser time controlled thermostats so not on constantly all day; use rain water tank to collect rain water to fill up pool; turning off lights when not in room, shower not bath; being aware of reducing one's carbon footprint by being cognisant of energy consumed and produced e.g. dry dirty clothes naturally instead of in a spin drier"* (Respondent 7)

> *"Reduction of electricity use (home insulation, removal of coal burning fire), composting, recycling via a local school, reduction in plastic packaging"* (Respondent 33)

> *"Solar heating for geysers, water free succulent gardens, recycling of waste, use of less heating in winter and mainly gas as it is quick and immediate. Buying local and seasonal fruit and veg that have not travelled far. Never leaving any waste of litter after visiting parks, reserves, sanctuaries, etc"* (Respondent 50)

> *"Have had my carbon footprint measured and done calculation of number of trees I must plant annually (500) to neutralise my carbon footprint. Financed the planting of 500 trees in 2011 under the auspices of Food and Trees for Africa; Endeavoured to build a 'green' holiday home in Plettenberg Bay by reducing environmental impact by means of the following: Capturing rainwater (22x5000l tanks installed), solar heating used to reduce power consumption, installed heat pumps versus conventional geysers; Reduced power consumption at my main residence by switching off geysers"* (Respondent 92)

> *"Recycling of paper, glass, tins and plastic, using less electricity and being more conscious of water usage, starting an organic vegetable garden"* (Respondent 94)

> *"More conscious of waste disposal at home, use of a hybrid car, energy efficiency around the house, use of sun block more frequently"* (Respondent 101)

The readers appear to have become increasingly aware regarding the use of resources and the need to become more responsible when using these resources. According to Respondent 53, 10 and 4, they are *"... more conscious..."* (Respondent 53) of being environmentally friendly and buying *"...products that...are environmentally friendly..."* (Respondent 10) and are *"...more careful with the disposal of environmentally unfriendly substances"* (Respondent 4) as they have become aware of environmental issues because of climate change and helping to mitigate against its effects.

Respondent 42 says that she has become *"...more responsible on use of electricity, heating, water, switching off geysers..."*. Other readers are and trying to find ways to conserve fuel. Respondent 1 says he drives *"...a car that uses less petrol..."* (Respondent 1) and respondent 18 says that he tries to *"...drive as little as possible..."*. Respondent 10 says that there needs to be *"...more practical/supportive initiatives from the municipality/community"* to allow the public to become involved with climate change within society.

The popular changes that people have made within the household are reducing electricity and water consumption, recycling and trying to use alternative energy sources. Even though recycling, reducing waste and consumption and other household changes are commonly implemented, there are some changes that are expensive and possibly unaffordable options (green technologies and energy saving options).

5.6. The sector of society responsible for addressing climate change

The readers say that there are two groups of people who should be responsible for addressing climate change: people and society, and government and the corporate sector.

5.6.1. Individual and societal responsibility for addressing climate change

The first response from the newspaper readers is that they feel that individuals and society should be responsible for addressing climate change. There are often one word answers from the readers where they stated that *"everyone"* (Respondent 19, Respondent 45, Respondent 56) or *"people"* (Respondent 2, Respondent 3, Respondent 24, Respondent 31) should be responsible for climate change. Although these answers suggest that individuals should take responsibility for climate change, the statements could imply that *"people"* or *"everyone"* incorporates everyone from the individual and society to government and corporate figures.

Firstly, the readers suggest that individuals should be responsible for addressing climate change, indicating that individual responsibility is essential for mitigating against the effects of climate change. For example Respondent 94 says that *"each and every individual"* should be responsible for mitigating against climate change. Respondents 55 and 46 (quoted below) mention the ways in which individuals can become involved to save resources and minimise the impacts on climate change.

> *"Every single individual on this planet! More awareness at a young age with actual methods of implementing the change would be great"* (Respondent 46)

> *"Every single person who lives should be responsible. Every resource used should be considered, water, metals, papers, fossil fuels, electricity – every single person should be doing everything they can to limit excessive consumption"* (Respondent 55)

Respondent 46 mentions the importance of raising awareness of climate change and encouraging individuals, as well as educating and motivating people about what is environmentally appropriate

while implementing methods for climate mitigation. When describing 'each and every individual', the readers are addressing the efforts that individual people are making towards climate change.

Secondly, the readers suggest that society as a whole should be responsible for addressing climate change. Some of the readers say that "each and every individual" (Respondent 94) should be responsible for climate change. This may refer to society as a whole, thereby suggesting that society should come together as an integrated unit to mitigate against climate change. An example of this thinking can be seen from the respondents quoted in the extracts below:

> *"All of humanity should be involved – and every person can do his/her bit to conserve energy and resources, prevent pollution, raise awareness and exert social pressure in the interests of a broader socio-political change such as the chief polluters – industry are reined in under a more rational and socio-economic system that addresses in inter-related problems of social inequality and ecological devastation. While the countries of the North and their transnational corporations – mining, manufacturing buttressed by an uncaring financial system – are the chief culprits, this does not absolve countries of the developing world from seeking alternative sustainable development paths that are just, equitable and holistic"* (Respondent 1)

> *"All of humankind plays some role, using natural resources, emissions, consumptions, but some much more than others, however we can all help a little bit. A complex matter as we recently saw in the CoP17 interaction and other debates"* (Respondent 93)

> *"Every individual. This requires each and every individual to do their share, however small it might be, to contribute to a small directional change"* (Respondent 42)

However Respondent 21 highlights that *"citizens will, for the most part, only act when compelled or action is made easier"*. Respondent 42 says that individual action will *"contribute to a positive directional change. Whilst governments can act as catalysts, this requires individual action"*. The newspapers illustrated that individual action can have a positive influence within society but there needs to be a support structure implemented by an authoritative figure for individuals to follow so that they can become involved with climate action. The findings in newspapers analysis also gave specific examples of people or organisations that were taking action or helping their community adapt to (or help resolve) climate change, whereas the readers gave no examples of specific individuals they know of who are actively taking responsibility for climate change. Therefore, individual responsibility is only useful if there is an example for the public to follow. So it appears as if the public is unaware of others taking individual responsibility unless they read about it in media sources.

Respondent 49 says that people *"...need to be advised about sensible things to do to address the problem in an affordable, practical way"*. Advising or educating the public can be done through various media and non-media platforms. Respondent 44 suggests that *"Television as a medium is a*

wonderful tool to get the message spread to as large an audience as possible. I also believe the country's education system must take responsibility in getting the message out".

5.6.2. Governmental and corporate responsibility for addressing climate change

Some readers suggest that government and corporations should take responsibility for addressing climate change. The readers agree that climate change action should be mainly government's responsibility and environmental laws should be introduced for the public to follow. However the readers indicate that the business sector and scientists should also be responsible for climate change mitigation. Respondent 99 expresses this thinking below:

> *"Western, developed countries must play a leading role. So too should the leading contributors to carbon emissions – especially the BRICS. Corporations have a responsibility to change their production methods and behaviour, and if necessary this should be incentivised by governments. This has to be balanced with the need for employment and poverty eradication in developing countries" (*Respondent 99)

Weingart *et* al (2000) described the effect that media have with regard to helping government develop climate policies which mould people's behaviour and actions towards mitigating against the effects of climate change. The readers feel that a change in societal behaviour can only be achieved through the correct channels by agreeing to and setting environmental laws and legislation. The readers describe that in order to achieve this behavioural change, governments need to be coordinated by a common understanding or agreement but finding that common agreement is the challenge. Once the common grounding has been found, governments will be able to implement international and national regulations and policies (such as the Kyoto Protocol) where each country is restricted, guided or forced to follow environmental laws. The implementation of international regulations and policies could help countries develop environmentally acceptable practices and attitudes. The newspaper readers agree that the government is the leading authoritative figure and should be held most responsible for addressing climate change. Respondent 54 says that *"Broadly, everyone..."* but *"...Specifically, governments have the largest responsibility"* for addressing climate change. The respondents quoted below all share the same sentiments regarding government taking responsibility for addressing climate change and implementing policy.

> *"Primarily it is the responsibility of governments but they need to legislate. There must be consequences for improper action. This will force citizens to become more conscious of their actions whether they like it or not. In time it will become second nature and that really would be the best situation long term"* (Respondent 4)

> *"The only meaningful change can come from national and international legislative reform"* (Respondent 6)

> *"All nations/governments coordinated by mutual agreement but the worse of those responsible for population growth and the word must change attitudes. The biggest problem is finding agreement"* (Respondent 13)

> *"Governments (international bodies and national governments) need to create conditions (both restrictive and enabling) to make it possible and mandatory to cut down on greenhouse gases/global warming. Of course it would help if rich countries played their role and didn't try to shift the burden to the developing world (US – Kyoto e.g.)"* (Respondent 47)

At the same time, the readers, quoted below, suggest that, laws need to be implemented in such a way to include and integrate all levels of society through bottom-up and top-down processes. Through implementing laws and integrating society, changes can be seen throughout the rest of society. The laws need to be implemented both internationally (such as the Kyoto Protocol and carbon tax) and nationally as well (such as the carbon budget being divided between the sectors of a country's economy). This shows a deep level of thinking from the readers around climate change and addressing its problems.

> *"Governments, world bodies/organisations, industry, communities, and individuals all need to take some responsibility for conserving the environment. It needs to be addressed at a macro and micro level, and requires a general shift in consciousness of all concerned."* (Respondent 10)

> *"Governments, local and national, contributing to the international level as well, to support changes at the level of the individual and corporate"* (Respondent 41)

> *"World leaders, and business and action groups and right down to the individuals. It can start with small changes from the bottom, with bigger policies being developed and funded from the top"* (Respondent 101)

The readers most often say that **both** government and corporations should be responsible for addressing climate change. Government and businesses have an interest in, and the readers' explain that government and businesses should be responsible for addressing climate change as it appears as if these institutions have the platform and resources to coordinate a mitigative strategy to address climate change. The readers explain that taking responsibility for addressing climate change is done by implementing laws and regulations for society to follow. The readers suggest that relying on an authoritative figure would ensure that larger corporations and big carbon emitters are controlled and restricted according to what they are able to do. With regard to individuals, the readers suggest that there should be guidance from government and corporate figures to implement climate change strategies. Examples of this thinking are seen below:

> *"As indicated I don't believe that mankind is fundamentally responsible for climate change. As far as restraining pollution I believe that this should be the focus of combined action in the part of business and government. The National Business Initiative is a useful coordinator of such action in this country"* (Respondent 16)

"I think is it the responsibility of governments and international organisations to negotiate with the largest 'polluters'. I have read that some economists suggest adding certain externalities like pollution, CO_2 emissions and the like to the market to prevent inefficiencies, but I haven't read enough to have a decent opinion. If individual households do contribute to climate change then we should be encouraged to take actions" (Respondent 97)

"Western, developed countries must play a leading role. So too should the leading contributor to carbon emissions – especially the BRICS. Corporations have a responsibility to change their production methods and behaviour, and if necessary this should be incentive by governments. This has to be balanced with the need for employment and poverty eradication in developing countries" (Respondent 99)

"Both individual and governments. Individuals need to be more responsible but governments (international bodies and national governments) need to create conditions (both restrictive and enabling) to make it possible and mandatory to cut down on greenhouse gases/global warming. Of course it would help if rich countries played their role and didn't try to shift the burden to the developing world (US – Kyoto e.g.)" (Respondent 47)

There were other responses, where the readers say that not only government and corporate figures are responsible for addressing climate change but academics, scientists, and individuals should also address climate change. Respondent 49 seems to be hesitant regarding who should be responsible for climate change:

"Many parties involved, although who should actually be 'responsible' is a moot point: for example (1) scientists (climatologists, geologists etc) to provide the evidence; (2) the business/industrial/agricultural/energy sectors, to provide the means (technology) to ameliorate the detrimental effects of climate change; (3) politicians (as the law-makers) to encourage good social behaviour and punish the bad) and (4) the general public who need to be advised about sensible things to do to address the problem in an affordable, practical way" (Respondent 49)

In summary, the readers say that society or the government and business sectors should be responsible for addressing climate change. There is a need for government to implement laws and policies for citizens to follow. The readers also agree that both the corporate sector and government should be responsible for addressing climate change. The readers agree that each person can become involved to address climate change, as Respondent 92 says below:

"Society at large will collectively have to solve the problem with the leadership being provided by governments, the corporate sector, academic institutions and environmental pressure groups" (Respondent 92)

5.7. Conclusion

The readers' responses to climate change are varied as well as their perceptions of climate change and climate change reporting in the newspapers. Overall the readers show a basic understanding of what climate change is, however some readers do hold some misconceptions of climate change. Although the climate change process itself is not widely understood by the readers, they do understand the causes of climate change to be a natural process and/or it being influenced by anthropogenic activities. There is a smaller group of readers who are sceptical of climate change and question if it is occurring. There are different views regarding how climate change is reported in the newspapers. The majority of the readers believe that climate change is reported as an urgent issue or matter of concern or they see it as not urgent. The readers also recognise that climate change is reported from a political stance and that it is sensationalised. With regard to the influence of newspapers on the readers' perceptions of climate change, the readers say that the newspapers either do or do not influence their perceptions. If the readers say that the newspapers do not affect their climate change perceptions, they agree that other forms of media as well as non-media influence their perceptions. There are a few other factors which influence the readers' perceptions of climate change. These are using green technologies, governance and financial motivations. Some of the readers explain that they have changed their lifestyles to a certain extent. The common changes that the readers make include using less electricity and water, recycling and using alternative energy and technology. When asked who should be responsible for addressing climate change the readers suggest that individuals and society as a whole should be responsible or authoritative figures including government and business should be responsible because they have the relevant platform to implement policies and laws to regulate and guide society towards responsible climate change behaviour.

Chapter 6: Conclusion

Climate change has become an increasingly important issue affecting society (Burgess, 1999; UNEP, 2002). This research explored the ways in which the media represented and raised awareness of climate change and how these media messages affect public perceptions of climate change. The research questions explored the representation of the climate change contestation in the media, the effects of media messages on public action and lastly the other external factors which influence behaviour change in society. At the same time it is important to find out why certain environmentally 'friendly' decisions are $being made by individuals and to what extent the media and other external factors are influencing these decisions.

Studies have been completed regarding the way in which the media raises awareness of climate change but most have looked at visual media, a few of which look at developing world contexts (Hajer, 1995; Hulme, 2009). Therefore, the purpose of this research was to determine the relationship between the media (newspapers) and climate change and what influences individual action to address climate change. The aim was to determine how climate change is reported in the local newspapers in Johannesburg, Gauteng, South Africa and what influences public perception of climate change (whether it be this form of media or other influences). This research addressed three research questions:

1. How is the climate change contestation represented in the media?
2. What effects do climate change media messages have on the public?
3. What external factors influence people's behaviour and attitude towards addressing climate change?

The first research question involved collecting newspaper articles, relating to climate change, from three newspapers. The second and third research questions invited the newspaper readers' to complete a questionnaire to determine where the public acquires its information regarding environmental and climate issues, and why people make certain environmental decisions. The questionnaire also investigated what other factors influence people to change their behaviour, attitude and lifestyles in order to have a positive effect on climate change. Content analysis was then carried out on the newspaper articles and responses from the questionnaires in order to determine what climate change information is portrayed to the public through the newspapers and investigate the readers' responses in the questionnaire. Content analysis was a way of determining what climate change information from the media is shared with the public and what impact or shock value this had on society.

Through this study, the researcher was able to study the way in which print media (specifically The Star, Mail & Guardian and the BusinessDay newspapers) represent, report on and portray climate change. The study looked at the information which the newspapers are relaying to the public

regarding climate change. Following on from this, the researcher was able to determine what climate change information the public receives from the selected newspapers as a questionnaire was completed which determined the public's knowledge regarding climate change. By looking at newspaper articles relating to climate change it was possible to determine if these articles, other forms of media or external non-media factors influence a change in action throughout society. The public's understanding of climate change, where the public obtains their environmental information from was investigated. The research also explored what affects the public attitudes, perceptions and behaviours towards the environment.

Science has shown that the climate has changed due to anthropogenic activities releasing excess carbon emissions in the last 200 years and particularly since the industrial revolution. A number of changes have been experienced especially changes in surface temperatures, changes in precipitation, changes in weather events, changes in glaciers, oceanic and land ice as well as increases in sea level (IPCC, 2013). In this study, the climate change debate is viewed from two different perspectives. The first perspective of climate change is that it is a natural cycle. Some people say that this perspective suggests that nothing can be done to mitigate the problem and it is an issue that society has to adapt to. The second perspective of climate change introduces the anthropogenic influence on climate change, which implies that people have influenced and have had an impact on climate change in a negative manner. This anthropogenic part of the debate suggests that a sense of action should be taken to try and fix what has been disturbed in the natural environment by people (Leach, Mearns and Scoones, 1997; Baron, 2006; Houghton, 2009). The media influences what people learn and believe. Stories and situations are taken out of context and over-exaggerated. This has both a positive effect in making people aware of the situation at hand but at the same time, the information they receive is often not fully correct. Information is manipulated and reworked to portray a specific story (Burgess, 1990; Weingart, 1998; Houghton, 2009). The resulting delicate relationship that develops is between the media and the public. There are a number of other external non-media factors such as education, technology and innovation, financial motivations, communication and governance which affect people's environmental decisions.

Newspaper articles reporting on climate change were studied from three newspapers, The Star, Mail & Guardian and BusinessDay. The results of this research show that there are a number of ways in which these newspapers framed the articles. These frames include the responsibility for addressing climate change, the climate change debate, the reporting of weather events and environmental concerns associated with climate change, climate change and its effect on people, whether climate change was reported from a spiritual or religious perspective, the financial issues relating to climate change and the use of specific terminology within the articles.

The findings from the newspaper analysis show that many of the articles relate to the responsibility theme and highlight the importance of addressing climate change. The governance and political focus on climate change was particularly prominent with the 2011 CoP17 meeting hosted in South Africa. As expected with the frequent reporting of this meeting in the newspapers, much attention was drawn to the politics and governance surrounding climate change. Specific focus in the newspapers was

drawn to the continuation of the Kyoto Protocol. Particular interest concerning the Kyoto Protocol was on which countries would and would not sign the agreement and the need for heavy carbon-emitting countries to sign. Based on the newspaper articles, pressure is placed on political leaders to make decisions to reduce and mitigate the effects of climate change. The CoP meetings provide an arena for leaders to voice their concerns as well as discuss the logistics of implementing certain agreements such as the Kyoto Protocol. The newspapers reported that the previous CoP meetings were portrayed as unsuccessful and as a result the newspapers reported that same expectation was placed on the CoP17 meeting. It is unclear if each CoP meeting is given the same amount of attention in the newspapers or if it is just because South Africa hosted CoP17 which gave this particular meeting more attention in the media.

The newspapers reported on the importance of reducing carbon emissions globally and within South Africa. The newspapers portrayed South Africa as having a carbon intensive economy (the highest in Africa) due to the heavy dependence on coal. The findings show that the newspapers highlighted a few carbon reduction strategies such as Clean Development Mechanisms (CDMs), the carbon credit system (which is associated with the Kyoto Protocol) and the Carbon Budget. A solution to reducing carbon emissions is introducing and using alternative energies and technologies. The newspapers often reported on the alternative technologies or energies which include the new compact fluorescent lamps (CFLs), solar, wind and nuclear energy as well as using natural gas. The newspapers reported that certain businesses are becoming involved in developing cleaner technologies all in aid of achieving a green economy. However it is interesting to note that only when alternative technologies were reported on, were they suggested as a means to lower carbon emissions.

The newspapers report on the need for a universal and simultaneous commitment to address climate change. Findings from the newspapers explain that responsibility for addressing climate change involves a number of societal areas including individuals, the corporate sector and Government. Authoritative figures including government leaders, businesses and scientists, are involved with policy development and implementation. Government has the means to regulate and implement various climate change mitigation measures. The newspapers illustrated what various governments were doing to become involved in addressing climate change. However, the newspapers also portrayed lack of commitment from government not addressing climate change where it appears that governmental leaders have not shown interest and have not taken responsibility for addressing climate change. The apparent lack of interest in climate change from government is serious for South Africa because climate change poses a serious threat and the leaders should take more interest in climate change.

Apart from government, two of the newspapers reported how businesses are becoming more involved in addressing climate change. The newspapers illustrate that businesses are working in conjunction with government, and they have the support to develop alternative technologies and invest in climate change mitigative strategies. The Star was the only newspaper to report that scientists also work together with government as they are the providers of climate change information and are able to assist with policy planning. Although it is useful to include scientists in climate change decisions, the

newspapers reported that the government does not always involve them or use the information that the scientists provide.

The newspapers report that individuals should also be responsible for addressing climate change and that individual people's efforts can help mitigate the effects of climate change. However people need to be made aware of climate change as well as what they can do to contribute to address climate change. Although all the newspapers highlighted the role of individual responsibility within society, it is interesting to note that The Star was the only newspaper which gave examples of what individuals have done within their community to change the community's perception or attitude to climate change. The corporate-social sector involves businesses helping communities to empower the community and help them adapt to climate change by providing them with the necessary tools to survive. The newspapers did report on adaptation and mitigation strategies which are used to address climate change depending on the community's vulnerability. The papers explained that mitigation is an urban response for adapting to climate change while adaptation is a rural response.

The climate change debate is used to frame the newspaper articles. As expected, the newspapers reported on the two perspectives of the climate change debate. The first perspective of the debate was the anthropogenic cause of climate change where climate change is seen to be a human-induced phenomenon. The findings show that the newspapers frequently describe that human activity and the release of carbon emissions have influenced climate change by altering certain aspects of the climate, such as the increase in temperature. The newspapers also report that industry and the industrial revolution is seen to be the catalyst which started the climatic change we currently experience. Interestingly, some of the arguments in the newspapers suggest that people are the cause of climate change while other arguments suggest that people have only added to the effect of climate change. The second perspective of the climate change debate explains that climate change is a natural cycle. This perspective was infrequently reported on. The newspapers reported that climate change has occurred previously because the climate naturally fluctuates and has done so for millennia. As expected, the newspapers reported more frequently on the anthropogenic cause of climate change rather than reporting on climate change as a natural cycle.

Environmental concerns are important as climate change affects the environment in many ways. The newspapers naturally report on weather events and natural disasters as they occur. However, when the newspapers do report on changes associated with climate change, the readers' attention is drawn to the main changes associated with or expected to occur with climate change globally. Unsurprisingly, the newspapers frequently report on global changes which are currently of concern. Examples of these reported changes are changing precipitation patterns, increasing temperatures, and increasing sea level as well as the occurrence of more intense and frequent storms. The newspapers highlighted that within South Africa, regional changes are acknowledged where each area will experience a different climatic change, whether it is flooding, drought, increasing rainfall and intensity. The newspapers did recognise that dry spells and periods will become more intense and that the local weather will become unpredictable. There are a number of environmental concerns associated with climate change which the newspapers have brought to light. These environmental

concerns are namely flora and fauna which have to adapt to changing conditions and often have to relocate in order to survive in similar conditions. Interestingly, the newspapers frequently make an association between the natural disasters and changing weather conditions as there is an assumption that climate change is worsening weather events.

The newspapers reported on the various ways in which climate change has affected people. The findings show that people (particularly vulnerable people) are directly affected by climate change and associated weather events. The newspapers report that people are affected by climate change because their livelihoods and access to food and water is negatively affected. Results show that often health is compromised and people are forced to move or find new areas for resources and work opportunities. The newspapers report that if a resource is difficult to access, conflict occurs between the different populations involved. Unsurprisingly, the newspapers report that food security becomes an issue as access to food and crop production is directly affected by climate change. The main concern for farmers is surviving drought and flood periods. Therefore farmers are forced to adapt to the new climatic conditions and alternative farming methods are implemented. At the same time the newspapers highlight that water security becomes an issue where underground water supplies are affected by climate change and rain becomes erratic thereby making certain areas to become water stressed.

The newspapers did not focus on climate change reporting from a moral/religious standpoint. Two newspapers reported on climate change from a moral/religious standpoint. These newspapers reported that there is a need to raise awareness of climate change and people should become aware and morally obliged to take action to address climate change. One newspaper illustrated the need for society to work in harmony with nature as this is a fragile resource.

The newspapers reported how financial decisions are affected by climate change. This financial concern was frequently reported in the newspapers especially with CoP17 meeting being a popular topic in the newspapers. The newspapers often reflected the priorities at the meeting and described how financial strategies are being introduced as a means to reduce carbon emissions. These two financial strategies and the need to reduce carbon emissions were of high priority at the CoP meeting and so the Green Climate Fund and the carbon tax were repeatedly reported in the newspapers. Both these measures are seen as a means to mitigate against the effects of climate change by limiting carbon emissions. An underlying issue in the newspapers is that all countries ideally need to move to a green economy to achieve a low-carbon future.

Finally, the newspapers use particular terms when reporting on climate change. These terms are “global warming” and “climate change”. Understandably, the newspapers use these terms when reporting on climate change. Some technical issues have become apparent as these terms are sometimes used correctly and sometimes used incorrectly. When the terms are used incorrectly, they are often used in the same article and are assumed to represent or mean the same thing when they are two different phenomena. Understandably though, as climate change is a complex issue to comprehend this may be one reason as to why these terms are interchanged. Another reason why

these terms are interchanged is because climate change information needs to be simplified and exchanging the terms and suggesting they refer to the same thing may be a way for the newspapers to make it easier for people to understand climate change.

The research also investigated the newspaper readers' perceptions of climate change and climate change reporting. The research explored the effect media messages have on the public and studied who/what is responsible for changes in behaviour to address climate change. The readers were first asked to describe climate change. Some of the readers show a basic understanding of climate change. The readers frequently describe it as a long-term process which has occurred for millennia. The readers mention associated climatic events where climate change affects weather globally and regionally. Unsurprisingly, some of the readers hold particular misconceptions of climate change which is expected due to the complexity of climate change and conflicting reports and stories that people read or hear of in the media. The most common misconception of climate change is that of ozone depletion and climate change especially that the 'hole' in the ozone layer appears to be warming up the atmosphere and causing climate change. A few of the readers correctly explained that the ozone molecules negatively react with greenhouse gases which then compromise the ozone layer.

Unlike the newspapers which report on two contrasting views of climate change, the readers hold three views concerning climate change. The readers explain that climate change is seen as an anthropogenic phenomenon, a natural cycle or both. As expected majority of the readers understand climate change to be a natural cycle which has been negatively affected by people's daily activities which release carbon emissions. Some of readers believe that climate change is purely an anthropogenic phenomenon. This group of readers suggest that the activities which release carbon emissions caused climate change. Adding to this effect is an increasing population which has lead to abuse of the Earth and its resources. A minority of the readers believe climate change to be a natural cycle. These readers explain their point of view by saying it is because there have been previous climatic cycles and changes which are why they believe climate change to be natural. There were a few readers who said that they are sceptical about climate change and particularly question its seriousness and severity. Nevertheless, it is interesting to see that they describe climate change as being a natural cycle which is affected by human activities.

The readers have differing views regarding how newspapers report on climate change. The majority of the readers perceive climate change to be reported as an urgent issue and which needs a response to mitigate its effects. These readers also explain that climate change is reported as a looming threat and that the Earth cannot sustain the population demand. Other readers see climate change reported as not urgent. These readers explain that they do not often see climate change reported in the newspapers, and they suggest that there is a lack of climate change information and awareness in the newspapers. This is an unexpected finding because CoP17 was hosted in South Africa and there would have been a higher volume of articles on climate change particularly towards the end of the year. Some readers acknowledge that climate change is sensationalised in the newspapers. This may be an expected finding as information in the newspapers is often over

exaggerated, manipulated and distorted thereby sensationalising a topic. The minority of the readers perceive that climate change is reported from a political stance. This is also an interesting finding because this political perception of climate change should reflect the political stance of the papers. This political perception should also have been more prominent with CoP17 and its related issues being frequently reported in the newspapers.

The newspaper readers explain that they receive their climate change information from a number of sources which could be categorised into media (radio, television, internet, magazines etc) and non-media sources (research, lectures, NGOs, social discussions). These sources influence the readers' perceptions of climate change. A majority of the readers say that newspapers do affected their perceptions of climate change as they are aware of issues relating to climate change. The rest of the newspaper readers say that there is a lack of climate change information in the newspapers. These readers may rely on other media sources for climate change information. The rest of the readers say that newspapers do not affect their perceptions and rely on other forms of media for information as it is an easy platform to access. Some of the readers explain that in addition to media sources, they also rely on non-media sources. These readers may receive slightly different climate change information which is likely to be current and accurate.

There are a number of influences which affect the newspaper readers' environmental decisions and actions. These include media (already discussed), green technologies, finance and governance. Green technologies are slowly being adopted into society and are a means to reduce consumption of resources (electricity) and reduce costs. However, the readers do perceive green technologies to be an expensive option to use. Finance also influences the readers' environmental decisions. It seems as if the readers either make a conscious decision to become environmentally friendly and as a result they enjoy the financial benefit, or they aim to reduce the cost of something like electricity which therefore allows them to make an environmentally friendly decision. Government has affected people's environmental decisions to varying degrees by implementing laws and regulations. However, for laws to be effective awareness of them is important in order for people to see that government is taking mitigative action against the effects of climate change.

The readers have changed their lifestyles in a number of ways to become environmentally friendly. Most commonly people state that they try to reduce electricity and water consumption, recycle their waste, and use alternative technologies where possible. However it appears that people will only change their lifestyles in ways that are convenient for them to live with.

Like the newspapers, the newspaper readers feel that individuals, society and government should be responsible for addressing climate change. The readers agree that individuals can make a difference when they address climate change. For individuals to be effective there needs to be awareness and some motivation to take action and address climate change. For society to be effective in addressing climate change, society should come together as an integrated unit. The readers also see government as responsible for addressing climate change, especially through implementing laws and regulation. There needs to be a common understanding among all governments for international and

national agreements. Corporations are also involved as they have the relevant platform to work with government for policy and regulation implementation as well as technological development.

There are a number of recommendations for future research opportunities similar to this study. While collecting the primary data, the researcher did not have direct contact with the respondents. Although the respondents each completed the questionnaire, it may have been beneficial to interview them directly as some meaning in their answers may have been lost. Therefore one recommendation for further research would be to interview a smaller group of respondents in order to gain more in-depth information. The newspaper analysis covered a period of one year. This may not be long enough to determine a pattern with regard to how newspapers report on climate change, therefore another recommendation would be to study the newspapers over a longer time-frame to see if there are any recurring patterns in newspaper reporting of climate change. A third recommendation would be to focus purely on the CoP meetings (instead of all climate change articles) and how the conferences are reported on in South Africa. Focussing on the CoP meetings only would also allow the researcher to determine if there is always heightened number of articles on climate change, in the South African newspapers, over each of the CoP17 meetings. This focus on the CoP meetings only would also determine if there was a particular increase in climate change coverage in the South African newspapers when South Africa hosted CoP17 compared with other years.

The research determined that newspapers portray climate change in a way that people can understand. The newspapers do not highlight what climate change is but report on what its effects are and how climate change affects politics, nature and the associated weather events. Focus is also given to reporting on how climate change affects people and their basic needs, and how climate change affects various financial affairs. Newspapers do influence the public but only to a certain extent. This is because people rely on a combination of various media platforms to receive climate change information which allows them to create a base to compare and determine the legitimacy of climate change information received. This reliance on multiple forms of media appears to have a great impact on people's perceptions, understanding and the actions that they may take toward addressing climate change.

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APPENDIX 1: Ethics clearance

School of Geography, Archaeology and Environmental Studies
Private Bag 3, Wits 2050, South Africa Enquiries: GEOGRAPHY: TEL: +27 11 717-6503 • Fax: +27 11 403-7281
ARCHAEOLOGY: TEL: +27 11 717-6045 • Fax: +27 11 339-1620
http://www.wits.ac.za/geography/

ETHICS PROCEDURE	PROTOCOL NUMBER:	GAESPN	37

The following form must be completed after the Departmental Ethics Committee Meeting:

COMMITTEE MEETING CONVENED BY:	DATE OF MEETING:	STUDENT'S NAME:	STUDENT'S PERSON NUMBER:
		LAURA BETH GOODMAN	0710536R

TITLE OF RESEARCH REPORT:
✓ Print Media: Influencing Behavioural Responses towards climate change

CURRENT DEGREE:

COMMITTEE MEMBERS	C. CHAMBERLAIN	G. HOOGENDOORN	READER: DR D HORNBY

DECISION: Tick Route chosen	Route 1: Committee finds there are no serious ethical issues	Route 2: Committee finds there are ethical issues	ACTION COLUMN FOR Lindy Mataboge
✓	Completed Departmental form sent to Lindy Mataboge	Completed Departmental form sent to Lindy Mataboge	
✓	Copy of final proposal sent to Lindy Mataboge	Student completes ethical protocol forms as required by the University Ethics Committee	
✓	Lindy Mataboge assigns protocol number and advises supervisor	Student submits these to the University Ethics Committee	
✓	Lindy Mataboge files documents	Student provides Lindy Mataboge with a copy for filing and for monitoring of progress with clearance process	
✓	Lindy Mataboge advises University Ethics committee quarterly	Student/Supervisor provides Lindy Mataboge with any documentation received from the University Ethics Committee	

SIGNED BY:		Full name and title: Z. PATEL
DATE:	29/09/2011	
RECEIVED BY Lindy Mataboge		

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APPENDIX 2: Letter to the editor

12 March 2012

Dear Editor,

My name is Laura Goodman and I am a Masters student in the School of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand, Johannesburg. My research topic looks at how the media represents climate change with a specific focus on the way in which a select group of newspapers reports on and represents climate change. These newspapers are The Star, Mail & Guardian and The Business Day. The overall purpose of this research is to determine the relationship between media and climate change and what influences individual action. This research will address three research questions: How is climate change contestation represented in the media?; What effects do media messages have on the public?; And What external factors influence people's behaviour and attitude towards addressing climate change?

This first research question involved collecting secondary data sources in the form of newspaper articles, relating to climate change. The second and third research questions involve collecting primary data by means of interviews to determine where the public acquire their information regarding environmental and climate issues, and why people make certain environmental decisions. The last question will explore what other factors influence people to change their behaviour, attitude and lifestyles that have a positive effect on climate change. These last two questions will be answered by interviewing the public with a set of closed-ended questions.

In order to complete this second section of my research I need to request access to a list of names on your subscription list in order to finish my data collection. I have attached a copy of the questions I will ask the respondents. I will be willing to send you the results and a copy of my final thesis on the completion of my degree.

The study will be confidential in the sense that the information that is given in the interviews will be written down and the participant names will be replaced by codes. My written notes for the interviews will be destroyed after the completion of the study. All information received and used is for the sole purpose of this study.

If you require more clarity on this research or have any questions, please contact me directly on the details below or my supervisor Cheryl Chamberlain on 011 717 6514 or Cheryl.chamberlain@wits.ac.za

Hoping to hear from you soon

Yours sincerely

Laura Goodman

Student Number: 0710536R

Cell: 082 513 0533

Email: bugginglau@hotmail.com

APPENDIX 3: Participant information sheet and consent form

Dear Participant,

My name is Laura Goodman and I am a Masters student in the School of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand, Johannesburg. My research topic looks at how the media represents climate change with a specific focus on the way in which a select group of newspapers reports on and represents climate change. These newspapers are The Star, Mail & Guardian and The Business Day. The overall purpose of this research is to determine the relationship between media and climate change and what influences individual action. This research will address three research questions: How is climate change contestation represented in the media?; What effects do media messages have on the public?; And What external factors influence people's behaviour and attitude towards addressing climate change?

In order to assist with the research I would like to invite you to participate in this study. You will not be penalised for not participating, and you have the right to withdraw from this study at anytime. It is also important to let you know that there are no payments for participation. The study will be confidential in the sense that the information that you give on the questionnaire will be written down, however your names and contexts will be anonymous. My written notes and your responses about your comments will be destroyed after the completion of the study.

If you require more clarity on this research or have any questions, feel free to ask and I will try and answer your queries where possible.

I thank you for taking the time to consider participating in the study.

Laura Goodman

School of Geography, Archaeology and Environmental Studies

Cell: 082 513 0533

Email: bugginglau@hotmail.com

Participant Consent form.

I _____ hereby consent to take part in the research project. I understand the purpose, conditions and procedures of the study as they have been explained to me. I understand that I am not going to get paid for my participation and that I have the right to withdraw from the study at any time without a penalty. I understand that all the information that I share with the researcher will be confidential.

Name of Participant _____

Date_____

Signature_____

I _____ have explained the procedures, purpose and conditions of the study to my participants. I have explained to the participants what their rights are as regards taking part in the study as well as the limitation of confidentiality. I agree with the above mentioned conditions and that I will adhere to them.

Date _____

Signature of Researcher_____

APPENDIX 4: Questionnaire

Questionnaire.

1. What is your understanding of climate change?

2. Do you think climate change is a:

a) Natural process

b) Human induced phenomenon? Or

c) Both of the above

3. Why do you think this?

4. If you believe people are responsible for climate change, then exactly who should be responsible for addressing climate change issues?

5. Where do you get your information on climate change?

6. Which of these newspapers do you read most often? (Select one)
   a) The Star ☐
   b) BusinessDay ☐
   c) Mail and Guardian ☐

   Do you read any other newspapers? Yes or No.

   d) Please specify_____

7. How is climate change portrayed in newspaper(s) you read?

8. Have the articles in these newspaper(s) affected your perceptions towards climate change in any way? Yes or No.
   a) If yes, then in what ways has this affected you or your lifestyle?
   b) If no, why not?

9. If the articles have not affected your perceptions of climate change, have any of the following affected your perceptions/actions or motivated you to make certain environmental choices? (Please specify)

   a) Other forms of media.
   _____
   _____
   _____

   b) Financial Motivation
   _____
   _____
   _____

   c) Governance (e.g. laws, regulation, policies)
   _____
   _____
   _____

   d) Green technologies
   _____
   _____
   _____

   e) Other (Please specify)
   _____
   _____
   _____

10. Have you made any changes in your lifestyle as a result of your climate change knowledge?
    a) Yes
    b) No

    c) If yes, please specify.