Global Warming: A Review of the Debates on the Causes, Consequences and Politics of Global Response

Arega Bazezew Berlie

Abstract

A review of the causes, consequences and political responses to global warming is the focus of this paper. The term global warming is now popularly used to refer to the concentration of greenhouse gases (carbon dioxide, methane and nitrous oxide) in the atmosphere attributed mainly to human activities. Evidence show that, there has been an intense and often emotional debate on the causes and consequences of global warming for many years. Though, the causes are still widely disputed and lack consensuses among proponents, much of the evidence prove to be increasing global warming. It is no longer a prediction— it is actually happening. Major indicators include extinction of many species, population displacement/migration, desertification, famine, drought and chronic food insecurity. Governments, the scientific community and politicians are not unanimous to reduce global warming which emanate from their political positions and conflict of interests. The center of the debate is what causes global warming. In the scientific literature, there is a strong argument that global warming has intensified in recent decades and the changes are more of human-induced greenhouse gases emissions. However, opponents of anthropogenic global warming at the other extreme strongly argue that the cause of global warming is natural and the contribution of humans is minimal. These project the issue of global warming at the forefront of the international political agenda and make it a major political, institutional and environmental challenge of our time. The general objective of the study is to discuss the debates among the politicians and scientific communities on the causes and consequences of global warming. In this regard, the relevant literature in relation to the debates on global warming are reviewed. Finally, global warming is inevitable and no longer a prediction. Alternative actions such as climate change adaptation and/or mitigation measures have to be given top priority besides the reduction of dangerous greenhouse gas emissions.

Keywords: Debates, Global warming, Climate change, Climate variability, Greenhouse gas, Anthropogenic, Extreme events

Department of Geography and Environmental Studies, Bahir dar University, Ethopia

Email: aregaberlie@gmail.com

Ghana Journal of Geography Vol. 10(1), 2018 pages 144–164 https://dx.doi.org/10.4314/gjg.v10i1.8

Introduction

Ever since it emerged in the early nineteenth century, global warming remains a topic of discussion and a debatable issue among politicians and the scientific community (Pasquini & Shearing, 2014; Muhammad,2013). To add more, climate change, synonymous with global warming (Bashir, 2009; Hulme, 2005) is the most controversial environmental problem facing the world (Huang et al. 2012) and gains top priority on international political agendas at present (EUROBAROMETER 2008). Without exaggeration, King (2004) cited in Hulme (2005) illustrates that climate change is the most severe problem the public is facing today: more serious than the threat of terrorism. The special EUROBAROMETER (2008) report adds that the most serious problems facing the world at present include global warming, poverty and international terrorism. However, the majority of Europeans reply that global warming is by far the most serious challenge compared to any other threat. Evidence shows that global warming is undeniable and nearly all experts in the field have reached a consensus that the Earth's climate has changed, is changing, and will continue to change regardless of any adaptation and/or mitigation measures (Dantas-Torres, 2015; Solomon et al. 2015). This finding is substantiated by the works of Herath (2011) which says about 83% of the world's scientists believe that the Earth is undergoing global warming and the works of thousands of scientists, in the reports of IPCC, make it clear that the risks and severity of climate change are even greater than previously realized (Keohane & Raustiala, 2008).

The debate on climate change is centered on its causes. According to Gerhard (2004) and Herath (2011), the debates are human versus natural, small amount of warming versus unprecedented warming, and fossil fuel drivers versus natural drivers (largely solar and orbital). Put in a nutshell, the debate is whether human emissions of greenhouse gases cause extreme events of unprecedented intensity or nature is responsible for climate disturbances (Lupo, 2008). At the heart of the debate is the question of "forcing"—what causes what (Berry et al., 2016). These show that the causes, effects and scale of global warming are controversial at present and will continue in the future. One side argues that currently global warming is caused by human factors while the opposite side insists on natural induced factors. Riebeek (2007) points out that global warming is happening at present and scientists have evidence that humans are to be blamed. Human activities, especially the burning of fossil fuels since the start of the Industrial Revolution have increased atmospheric CO_2 concentrations by about 40%. More than half of the increase has occurred since the 1970s (The National Academy of Sciences, 2009;

The Royal Society, 2014). Humans have changed the chemistry of the earth's atmosphere; most notably by changing the concentration of carbon dioxide from a pre-industrial revolution level of about 280 parts per million to its current level of 385 parts per million (Oreskes & Conway, 2008; Vitousek, 1994). Wang & Chameides (2005) supplement that since 1880, when people in many locations first began to keep temperature records, the 25 warmest years have all occurred within the last 28 years because of anthropogenic global warming. The Royal Society (2014) indicates that temperatures in thousands of locations are monitored over land and ocean surfaces and the results show that the period from 1983 to 2012 was probably the warmest 30-year period.

Gerhard (2004) on the other hand blames the anthropogenic global warming derived from computer model simulations and supported by Kyoto Protocol since it is without scientific evidence. Besides, the simulation models dominantly used by the scientific community backup by IPCC have not the power to give valid reasons for its inconsistency. The IPCC's summary for policy makers is not an honest assessment; it is simply personal opinions and distorts the information to suit its agenda (Bell, 2011). Results from recent climate model suggests that the global average temperature increased from about 1.5^0C to 4.5^0C during the last century however, with uncertainty (Schneider, 1990). According to Bell (2011), climate does change but not much because of humans. Humans had not started using fossil fuels on any scale until after the Little Ice Age. The issues raised so far confirm that, the causes of global warming are very controversial at present and will continue for the future emanating from differences on economic and political interests. The general objective of this study is to review global warming debates on the causes, consequences and politics of global response.

Climate Change vis-à-vis Global Warming

Popular studies such as Mann (2009) and Villar & Krosnick (2011) found out that global warming and climate change are not synonymous although they are often used interchangeably in popular media. As a result, the subjects of global warming and climate change have become parts of both the popular lexicon and the public discourse (Mann, 2009). Climate change appeared in the scientific literature before the term global warming and it was used for more than forty years whereas global warming was not used until the 1970s (Mann, 2009; Villar & Krosnick, 2011). According to Maibach (2014), climate change can be viewed as consisting of two components, one of which is anthropogenic and the other which is natural and plays a role in past and present climate variability. Global warming on the other hand refers to the

anthropogenic component of climate change alone, and only the surface warming associated with it. Global warming refers to the increase in the Earth's average surface temperature since the Industrial Revolution, primarily due to the emission of greenhouse gases from the burning of fossil fuels and land use change. Climate change on the other hand, refers to the long-term change of the Earth's climate including changes in temperature, precipitation, and wind patterns over a period of several decades or longer (Maibach,2014). Villar & Krosnick (2011) point out global warming to be a more serious problem than climate change. According to them, global warming was rated more important and of greater concern than climate change. Climate change is less frightening and sounds like a more controllable challenge than global warming. Because of these issues, this writer selected debates on global warming as a topic for argument.

Theoretical Framework on Global Warming

There are a number of causes of climate change, including manmade causes. Understanding all causes and its impact on societies and ecosystems are imperative in developing policies related to reducing our vulnerabilities to extreme weather and climate variations. As shown in Figure 1, human and natural forces are drivers of global warming which result in temperature and rainfall variability. All these ultimately lead to climate change. Anthropogenic theory and climate simulations models suggest that global warming might lead to an increase in either the frequency or intensity of extreme weather events such as hurricanes, heat waves, storms and droughts (Oreskes & Conway, 2008). Khandekar et al. (2005) supplement that global warming leads to the increasing mean temperature of the earth, associated with extreme weather events such as melting of the polar ice caps, and the related phenomenon of rising global sea levels. All these result in famine, starvation, hunger, population displacement/migration and political chaos which many developing countries are experiencing (Figure 1). From the discussions, it can be concluded that the links between the causes and consequences of global warming are highly contested. Hence, it could be the right time for the writer to examine such controversial issues and draw some conclusions and suggestions for the betterment of our planet. This means that, the urgency in addressing climate change should be prioritized because it can hinder wider human development efforts and bring global political chaos (Sylvén et al., 2008).

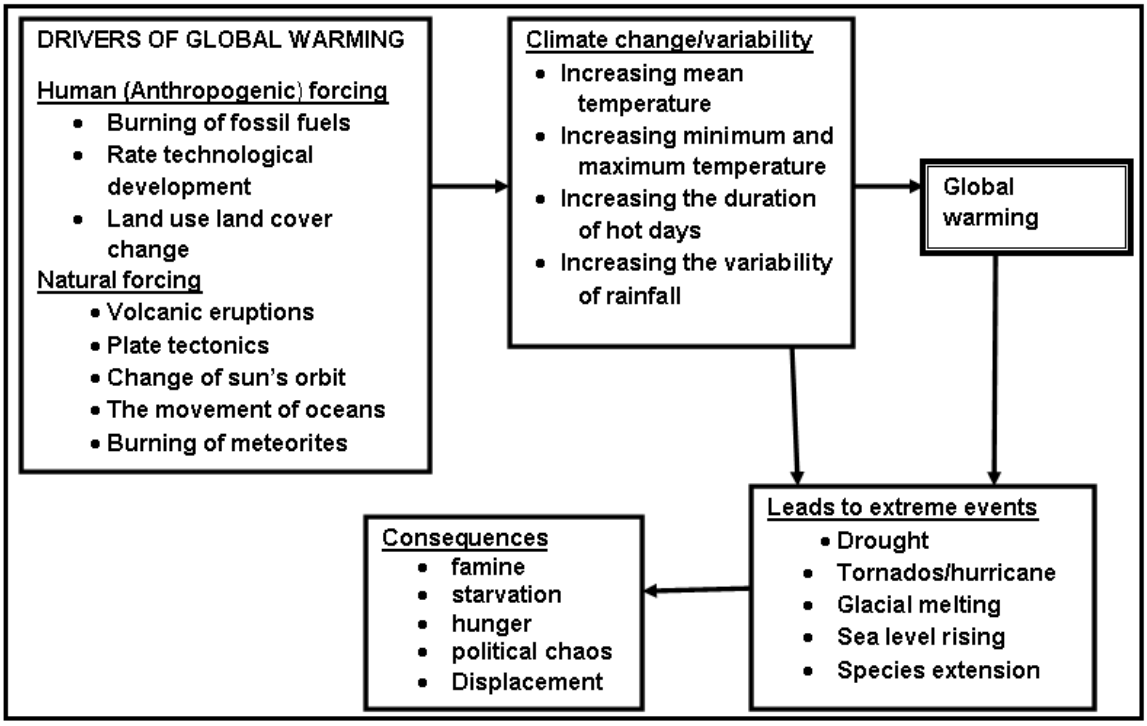

Figure 1. A framework showing the causes and consequences of global warming

Methodology

The writer selected this topic for the reason that, scientific progress is driven by the creative tension prompted by debates such as disagreement, uncertainty and ignorance. Of course, debates on disagreement and uncertainty appear because of insufficient and inadequate evidence, lack of appropriate and logical framework, and overconfidence/ambiguity and belief polarization because of politicization of the science. Hence, this study is to inform the scientific community and politicians on how the debates are supported with empirical evidences. For that reason, this study is based on secondary sources such as books, journals, reports, proceedings and dissertations that have direct relations with the debates on global warming. The debates on global warming, and its causes and consequences have spatial and temporal dimensions which are dynamic. Hence, up-to-date information and scientific consensus on the continuous and unresolved debates on global warming have paramount importance for policy makers and politicians. In this regard, 25 articles, 26 reports, 1 dissertation and 12 books that have relevance to the debate on global warming have been reviewed and documented. The writer believes that this piece could be used by academicians, climate scientists, politicians, policy makers and governments across the world to fill in information gaps. It also adds knowledge to the existing literature about the causes, consequences and political debates on global warming. For that

reason, this manuscript is composed of the following sections: Anthropogenic global warming, natural causes of global warming, the politics of global warming, discussions on the debates of global warming, writer's position on the debates of global warming and conclusions and the way forward.

Results and Discussions

Anthropogenic Global Warming: The hottest debate of the decade

"Would 'Mother Nature' pay us back for our attacks on her?"

(Evans & Steven, 2007:5)

In the 1980s, greenhouse gas was the dominant topic and in the mid-1990s, it was replaced by a more specific term climate change, which soon becomes global warming at present. Ample scientific works (Vitousek, 1994; Oreskes & Conway, 2008; Brönnimann, 2002; Royal Society, 2005; IPCC, 2007; Berry et al., 2016) argue that the theory of anthropogenic warming began with the Industrial Revolution in the late 18th century, with gradual increases in greenhouse gas emissions. Likewise, IPCC (2007) claims that it is very likely, probably greater than 90% confidence that the issue of global warming vis-à-vis climate change emerged from the 1950s onwards and is associated with the Industrial Revolution.

The same report evidently concludes that, the atmospheric concentrations of CO_2 and CH_4 in 2005 exceed by far the natural range over the last 650,000 years and there is high confidence that the global average net effect of human activities increased because of the Industrial Revolution. The Royal Society (2014) and Vitousek (1994) indicate that Earth's average air temperature has increased since 1880; with much of this increase taking place since the mid-1970s when global energy consumption accelerated due to the Industrial Revolution.

In a well-established scientific consensus on global warming, Miller (2012) notes that the earth's global average temperature has been rising over the past century and much of this increase has been attributed to human activities, primarily the burning of fossil fuels during the era of industrializations. Since then, the theory of global warming is now popularly used to refer to the increase in the mean surface temperature of the earth being attributed to human activities and in particular, the concentration of greenhouse gases (carbon dioxide, methane and nitrous oxide) in the atmosphere (Khandekar et al., 2005). Hence, anthropogenic global warming holds that greenhouse gases, primarily carbon dioxide is predominantly human in origin (Brönnimann, 2002; Elke & Paul, 2011; Muhammad, 2013). It is now more certain than

ever, based on many lines of evidence that humans are changing earth's climate (Lupo, 2008; The National Academy of Sciences, 2009). Doran and Zimmerman (2009) cited in Whitmarsh (2011) substantiate that 97% of climate scientists unanimously agree that human activities contribute much to climate change. Based on the results of basic physics, comparing observations with models, and fingerprinting the detailed patterns of climate change, it is evident that climate change is largely caused by human activities (The Royal Society, 2014). A strong decline in the Arctic sea's ice, warming of oceans accompanied by sea-level rise and other climate-related changes are evidence of global warming (Figure 1). This means that human activities have significantly disturbed the natural carbon cycle by extracting long buried fossil fuels and burning them for industrial purposes (Berry et al., 2016). Rosenberg et al. (2010) and Trenberth et al. (2000) on their part argue that global warming is already underway and the human activities are accelerating the situations excessively than the natural forces. The CO_2 irradiative forcing for example, increased by 20% from 1995 to 2005 due to extensive use of fossil fuels (IPCC, 2007). In line with this, majority (52.65%) of the U.S. mainstream press disclosed that humans are major contributors to global warming (Maxwell & Boykoffb, 2004).

Landsberg (1970) in his work, '*manmade climate changes'* also shows that an anthropogenic climate change is real and stronger than the natural forces. The works of the scientific community unanimously confirm that human made global warming is real and poses a threat to human life and development (Miller et al., 2000; Rahman, 2013). More importantly, as the world consumes more fossil fuel energy, greenhouse gas concentrations will continue to increase and the earth's average surface temperature in the long run will rise especially in the polar areas. In relation to this, Oreskes & Conway (2008) point out that physical theory and computer models predict that the effects of global warming will be very strong in the polar areas, because of ice-albedo feedback caused by greenhouse emissions. In summary, because of human development and rates of technological changes, global warming is accelerating and greenhouse gasses extracted from burning of fossil fuels create extreme climate variability such as droughts, floods and typhoons. These results in famine, starvation, hunger and political chaos in which many developing countries are suffered from the consequences.

Natural Causes of Global Warming: global warming denials/skeptic

More than 1,000 dissenting scientists from around the globe have now challenged the supporters of anthropogenic global warming (Climate Depot, 2010). Since they do not accept anthropogenic global warming, they are called climate change denials. Climate change denials

are those who believe that climate change existed during the remote past as a result of natural forces and such scenarios will continue in the future even without human interferences. Skeptics argue that natural forces are the major drivers of global warming (Bast, 2010). According to them, *nature, not human activity rules global warming*. This is supported by Gerhard (2004) who says, over the last couple of decades, the scientific literature on climate change attempts to build theoretical models without significant inputs from humans. This means that human contributions to climate change is minimal as compared to the magnitude of natural forces. In relation to this, Meredith (2012) points that manmade carbon dioxide emissions throughout human history constitute less than 0.00022% of the total, naturally emitted from the mantle of the earth during geological history. Further indicates that throughout Earth's history, temperatures have often been warmer than now and CO_2 levels have often been higher, more than ten times high presently. The 0.7^0C increase in the average global temperature over the last hundred years is entirely consistent with well-established, long-term, natural climate trends. Monckton (2011) strengthens that the world faces many real environmental problems. In any view, however, global warming is not one of them and science shows that the world will not become dangerously warm in the future. Monckton (2011) indicates that some 800 scientists from more than 460 institutions in 42 countries over 25 years have written peer-reviewed papers and provided evidences that the Middle Ages were warmer than today. Monckton (2011) blames how the IPCC attempts to wipe out the Medieval Warm Period in its 2001 report as shown in Figure 2. Davison (2015) adds that the IPCC is the primary proponent of dramatic global warming yet its argument is fundamentally flawed because of the way it selectively uses science and manipulates data to support its views.

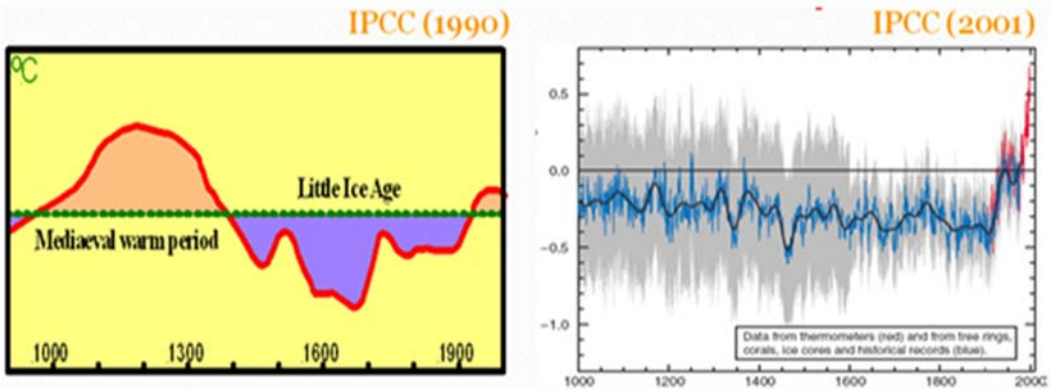

Figure 2. Climate change through time produced by IPCC in 1990 and 2001 (1000- 2000)

Source: Monckton, 2011

Calculations using climate models have been used to simulate what would happen to global temperatures if only human factors were influencing the climate system. These simulations yield little warming, or even a slight cooling, over the 20th century (Royal Society 2014). According to Khandekar et al. (2005), the projection of future climate change over the next fifty to one hundred years is based on insufficiently verified climate models which is not considered reliable now. Lupo (2008) and Monckton (2011) conclude that skeptics are partly right since climate models suffer from the problems of being 100% effective. In this regard, Strauc & Guest (2016) assert that climate models usually diverge from the observed temperature record and fail the engineering test of usability through a lack of validation and verification. A prominent source cited by climate skeptics illustrates the following.

> Computer models are sophisticated, put together by experts, and getting better all the time. However, even if they could predict the climate correctly (they cannot), even if they were based on solid proven theories (they are not), they still would not count as evidence. Models of complex systems are based on scores of assumptions and estimates piled on dozens of theories (Miller, 2012:221)

Energy Information Administration (1998) cited in Gerhard (2004) points out that the total projected human addition to the carbon budget is very same. It is about 5% of which industrialized world contributes about 60%. For the last 1000 years, the earth was warmer than today, long before any industrial development (Gerhard, 2004) (Figure 3). Wang and Chameides (2007) differently state that the Medieval Warming Period was obviously a natural event; the current warming is also likely caused by natural processes. Climate scientists cannot prove the current warming without natural processes and they cannot claim with full certainty that global warming is due to human interferences.

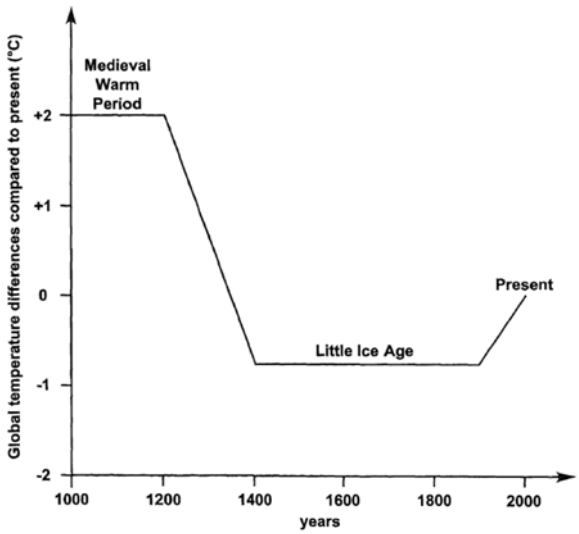

Figure 3. Present temperature compared to medieval warm period and little ice age

Source: Gerhard, 2004

Moore (2014) strongly claims that higher temperatures and an ice age at a time when CO_2 emissions were 10 times higher than they are today, contradicts the convictions that human beings are the major agents to global warming. According to Richler (2006), long-term global warming is mainly driven by i*nsolation* changes, from solar irradiance and intrinsic solar magnetic luminosity variations. That is, historic temperature deviations, geomagnetic activity and the frequency of sunspots (the sun has a significant role to play in the long and short-term climate change on the globe) (Herath, 2011). Bond et al. (2001) cited in Gerhard (2004) adds that correlation of sun intensity cycles, orbital variations, and geologic factors are evidence that the Earth's climate change is fundamentally beyond the influence of humans.

Gerhard (2004) strongly believes that the activities of human beings cannot modify the enormous amount of solar energy driving earth's dynamic climate system, regardless of how much science, technology, and engineering are currently available. Empirical evidence made by Herath (2011) shows that the transformation of Sahara from fertile grassland into a dessert landscape was due to change of the earth's orbit; but not anthropogenic global warming.

Those who oppose anthropogenic global warming frequently associate it with the document of IPCC as shown hereunder:

> Despite the overwhelming consensus on global warming, it is still common to see reference to one or more dissenting arguments as sufficient to overturn that consensus. No matter how qualified, how green, or how dedicated, their names and opinions prove

nothing about carbon because *"argument by authority"* never cans…The IPCC is an international committee; however, it is not evidence. Argument by authority is not a proof of anything except that a committee paid to find a particular result can produce a long document … It only takes one scientist to prove a theory is wrong (Miller, 2012:227).

Likewise, a report on the deniers of anthropogenic global warming expresses their unenthusiastic view as follows:

Please remain calm: The Earth will heal itself -- Climate is beyond our power to control...Earth does not care about governments or their legislation. You cannot find much actual global warming in present-day weather observations. Climate change is a matter of geologic time, something that the earth routinely does on its own without asking anyone's permission or explaining itself (Climate Depot, 2010: 3).

To sum up, climate change denials identify that solar, orbital variability and volcanic eruptions as the major driver of global warming, perhaps modified by human intervention through increasing greenhouse gas emissions. Although theory still considers greenhouse gases as significant contributors to climate change, the only positive correlation between the process and global warming is between solar and orbital variability. Human releases of CO_2 cannot cause climate change as any increases in CO_2 are eventually balanced by nature. Finally, those who believe that global warming is caused by increasing use of fossil fuels are deliberately to attack the global economy (particularly the USA back to the agrarian age).

The Politics of Global Warming: Controversy, inaction and opportunity

The issue of global warming has been a heated public debate since the mid-1980s.This made global warming to be the forefront of the international political agenda (McCright & Dunlap, 2014; Hulme, 2005; Schneider, 1990) and the major political, institutional, and environmental challenge of our time (Keohane, 2015). The debates take place in the language of science; however, it is more of politics against regulations of greenhouse gases **(**Roger et al., 2005). Meanwhile, governments/politicians have developed various incentives to reduce greenhouse gasses emissions. Yet, sufficient progress in reducing greenhouse gas emissions remain elusive (Keohane & Raustiala, 2008) and sluggish responses from the politicians are distressing (Keohane, 2015). There were about 15 conferences held between 1995 and 2012 (The Berlin

conference 1995, Geneva 1996, Kyoto 1997, Buenos Aires 1998, Bonn 1999, The Hague 2000, Marrakech 2001, New Delhi 2002, Milan 2003, Buenos Aires 2004, Montreal 2005, Nairobi 2006, Bali 2007, Poznan 2008, Copenhagen 2009, Cancun 2010, Durban 2011 and Doha 2012) (Korhola, 2014). However, many of the conferences have failed to achieve their purpose since greenhouse gas emissions could not be reduced either absolutely or relatively (Keohane, 2015).

As discussed in the preceding subtopic, anthropogenic global warming poses a threat to all people around the globe, but responses to the threat varies amongst countries (Steves & Teytelboym,2013). In this regard, the Kyoto Protocol and Copenhagen conferences could be taken as the best examples. To begin with, the Kyoto Protocol established in 1997, claims to maintain the Earth's temperature by reducing the use of fossil fuels from industrialized countries, particularly the United States of America, while permitting unrestrained uses of fossil fuel energy to developing countries (Gerhard, 2004). However, with different interests and priorities, the Kyoto Protocol was a battleground between businesses and environmentalists (Evans and Steven, 2007). Though, the Kyoto Protocol with its controversial issue is regarded as the most significant commitment in addressing global warming (Rahman, 2013), USA failed to accept the rules and regulations to reduce greenhouse emissions (McCright & Dunlap, 2014). According to Korhola (2014), the USA and the major emitters have abandoned setting emission ceilings. However, USA alone accounts for about 10% of the total fossil fuel used at the global level (Victor, 2004). For example, in between 1990 and 2012, fluorinated gas emissions increased by about 83% in USA (CryoGas International, 2014). According to Evans and Steven (2007), the USA failed to ratify the Kyoto Protocol because her economic prospects would be damaged, consumers would suffer from 'skyrocketing' energy prices and large developing countries would benefit at the expense of USA economy. This could be the reason why many climate scientists in USA are under enormous pressure to disregard human activities as the major cause of global warming (Antilla, 2005). Last but not least, McCright & Dunlap (2011) point out that Liberals and Democrats in USA are more likely to report beliefs consistent with the scientific consensus and express personal concern about anthropogenic global warming (65.4%) than Conservatives and Republicans (41.8%). Pew Research Center (2015) posit that overall, Democrats and Liberals are more likely than Republicans and Conservatives to believe that human activities cause global warming.

The European Union (EU) is one of the front-runners against global warming (EUROBAROMETER, 2008). The Union sets a 30% reduction of greenhouse gas emissions

by 2020, though the Kyoto conference sets a 20% reduction. More importantly, the UK government has set the longer-term domestic target of 80% reduction in all greenhouse gases by 2050 in the legally binding Climate Change Act (Poortinga et al., 2011; Steves & Teytelboym,2013; Whitmarsh, 2011). Similarly, Germany has adopted aggressive carbon reduction policies that are likely to lead to a significant reduction in emissions in the next decade (Steves & Teytelboym, 2013).

China and India emerging developing countries, have ratified the Kyoto Protocol but failed to reduce the emissions (Antilla, 2005). Historically, these countries account for a small fraction of the greenhouse gases, but their share is rising rapidly at present due to their fast-technological advancement and industrialization (Victor, 2004). Japan and Russia withdrew from the Protocol (Korhola, 2014). However, many developing countries agreed to reduce greenhouse emissions by 37% on the coming decades, because climate change is more of a threat to the world's poor countries (Storm, 2009). At this point, it can be concluded that, the fate of the Kyoto Protocol and other successive conferences are uncertain, highly debatable and elusive; emanating from their political positions and conflict of interests.

The Climate summit held in Copenhagen (Denmark) in 2009 which was eagerly awaited and described as the most imperative political conference in world history and the best alternative to save the planet, ended up a total debacle (Korhola, 2014). Legally binding or politically unanimous agreements were not achieved. This is due to the fact that the two biggest emitters of greenhouse gases (USA and China) refused emission quotas, thereby avoiding any binding target (McCright & Dunlap, 2011). However, the success of the Copenhagen Conference was a decisive factor for the European Union in terms of the Energy and Climate Package (Korhola, 2014).

To sum up, climate change has turned out to be an impious problem, which is hard to define, hard to solve, and its solution does not have a clear end-point but instead generates additional problems. Human beings have only a narrow window of time left, perhaps a couple of decades or so, to begin the long process of stabilizing greenhouse gas concentrations at a level that can avert a devastating impact on global warming.

Discussions on the Debates of Global Warming

Highly complex, widely diverging interests, less effective debates and uncertainty of the simulation models on climate change are issues that make hard to reach consensus on the side

of politicians, the scientific community, and governments (Victor, 2004). This made the prospecting of global warming dark, unsettled and debatable even for the coming decades (Strauc & Guest, 2016). Although politicians offer simplistic remedies, such as the Kyoto Protocol, global warming is a topic of discussion and a debatable issue exclusively within the scientific community, and among the politicians and fossil fuel gas producing countries such as OPEC (Organization of Petroleum Exporting Countries). However, all sides of the debate agree that there is global warming with empirical evidence. For example, flooding, sea level rise, melting of ice and species extensions and other extreme events are caused by global warming. What the different sides of the debate do not seem to agree on the causes of global warming. The succeeding discussions therefore, show the debates among scientists on the causes of global warming.

The IPCC (2007) predicts that a warmer planet caused by human beings will lead to more extreme weather, including drought, flooding, storms, snow, and wildfires. However, Meredith (2012) strongly attacks that. She asserts that over the last century, during which the IPCC claims the world will experience more rapid warming than any time in the past two millennia, the Earth has not experienced significantly greater trends in any of these extreme weather events. Khandekar et al. (2005) supplement the projections of future climate change reproduced by the IPCC over the next fifty to one hundred years. This is based on insufficiently verified climate models and are therefore not considered reliable at this point in time. The IPCC (2007) report also indicates with 90% confidence that most of the warming since the 1950s is manmade. However, according to Monckton (2011) and Riebeek (2007), a natural decline in cloud cover from 1983-2001 probably associated with naturally occurring changes in the system of ocean currents (the Pacific Decadal Oscillation) could be responsible for warming the globe. The IPCC (2007) evidence shows that the atmospheric concentration of carbon dioxide has increased from 280 parts per million in 1750 to 367 parts per million in 1999 (31% increase). In this regard, Khandekar et al. (2005) notes that, today's CO_2 concentration has not been exceeded during the past 420,000 years and likely not to exceed during the past 20 million years. More importantly, Strauc & Guest (2016) indicate that the IPCC report in different years fails to include the natural forcing, as a cause of global warming; however, global warming is dominantly natural in origin.

Lupo (2008) points out that the prevailing wisdom within the popular media (and indeed among the public) is the earth's warming caused by human activities. For example, direct satellite

measurements since the late 1970s show no increase in the sun's output, while at the same time global surface temperatures have increased dramatically (Lupo, 2008; Royal Society, 2014). Nevertheless, Khandekar et al. (2005) point out that a close examination of the Earth's temperature change suggests that the recent warming might be primarily because of land-use change, solar variability and the sun's brightness. Even on a shorter time scale, solar irradiance and its variability has contributed to more than 60% of the total warming of the 20th century. Khandekar et al. (2005) further note that there has been no accelerated sea-level rise anywhere during the 20th century. Lupo (2008) rightly states that it is a misconception for those who consider themselves skeptical and they do not believe that the globe is warming at present, however, there is solid evidence that human induced global warming is occurring at the present. Lupo further grouped deniers of human induced global warming as naïve, dangerous or worse. Wang and Chameides (2005) confirm that while it has not yet been precisely determined how much of the recent warming was caused by human activities, the consensus among climate scientists show that most of the global warming over the past 50 years was caused by human-induced greenhouse gases. Huang et al. (2012) also supplement that the Medieval Warm Period and Little Ice Age are closely associated with the solar activity over the past one thousand years; yet, at the present situations, global warming is mainly caused by anthropogenic activities. On the other hand, Wang and Chameides (2007) claim that thousands of scientists can prove the current warming as natural processes and therefore, cannot speak with certainty that global warming is due to human interferences.

To sum up, the issue of climate change is a source of concern to everyone, including scientists and policymakers who, in recent years, have been organizing endless high-level meetings in their efforts to provide responses to the problems encountered. Those who are skeptical of global warming point out that natural cycle might be the major cause~~s~~ of global warming. Of course, the impact of solar forcing and solar cycles cannot be ignored, however it could not be the major reason for global warming other than human beings. Wang and Chameides (2005) wind up by proposing two alternatives: No effort to combat global warming, or act to reduce it in response to future damages. At this point, we can agree that the earth is continuously warming; this is an observable fact not a matter of political persuasion.

Writers position on the debates of global warming

This document does not have the ability to resolve every scientific dispute. Rather, it examines what scientific conclusions about global warming are based on and how those conclusions

explain the reality and risks of global warming on the ground. The writer identified that there are strong debates among debators aided with empirical evidences. In this regard, it can be concluded that we are on '*climate wars'*. There is a war going on between those who believe that human activities are responsible for global warming and those who deny it. Those who view that global warming will be so severe and so sudden are certain that major species will be died out, millions of people will starve and ecological system might be devastated. At the other extreme, climate change deniers believe that there is nothing but uncertainty, no environmental extremists and no management system for the improbable conditions (Schneider, 1990). In relation to this, Curry et al. (2017) assure that the '*war on science'* is being fought on two fronts: politicians ignoring science and using bad science to justify a political agenda. Curry et al. (2017) further point out that with the advent of the Trump's administration, concerns about '*war on science'* have become elevated and scientists' big concern is silencing of facts.

From the experiences gained so far and through reading scientific works in relation to global warming, the author's stand is on anthropogenic global warming. Anthropogenic global warming is a fact confirmed by an enormous body of observations from many different sources and explains most of the recent increases in global temperatures manifested through the concentrations of greenhouse gases in the atmosphere (fossil fuel burning and other industrial, agricultural, or land-use practices). Besides, the works of lots of scholars in relation to anthropogenic global warming (Lupo,2008; Korhola,2004; Sylvén et al.,2008; Email,2013; Steves & Teytelboymm, 2013; Keohane,2015; The Royal Society,2014; Whitmarsh, 2011; Wang & Chameides,2005; Oreskes & Conway,2008; Evans & Steven, 2007) have helped me to come to my present conclusion. Whitmarsh (2011) points out that about 97% of climate scientists across the world agree for the human contributions of global warming which is synonymous to the principal investigator of this document. The increase in frequency and intensity of extreme events such as heat wave, flood-producing storms and droughts, and their simultaneous occurrences around the world have helped to think that anthropogenic global warming is a major cause and consequence of extreme climate change and/or variability. Finally, it could be questioned that, can global warming be reduced while capitalism and Petroleum Exporting Countries (OPEC) remain hegemony in world politics? In this regard, Storm (2009) argues that nearly all climate change studies show humans are the major causes of climate change; and studies that contradict this claim are often funded by Petroleum Exporting Countries to reverse the situations emanating from their economic interests.

Conclusion and Recommendation

The writer examined at length the causes, consequences and the political debates on global warming. The causes of global warming are highly contested and it is more of politics and economics agenda than any other factor. Put differently, the debates to the responses of global warming among policy makers and climate scientists result in more dilemmas and challenges from their economic and political interests. These problems are serious because of unreasonable expectations from policymakers/politicians as well as climate scientists who are using their profession and experiences for political outcomes and tempting to distort the reality on the ground. At this end, the causes of global warming can be seen from two viewpoints. On one hand, the warming of the globe in recent years has suggested that anthropogenic influence is the cause for global warming because of increasing human activity. Contrarily, land-use change, solar variability and the sun's brightness appear to be the causes and more significant forces warming the globe. Nevertheless, there is no debate about whether global warming is a fact. The debate is about whether human emissions of greenhouse gases cause weather events of unprecedented intensity. It is now more certain than ever, based on many lines of evidence that humans are changing the Earth's climate. This is manifested by sea-level rise, a strong decline in Arctic sea ice, and other climate-related changes. In general, further global warming is inevitable if emissions of greenhouse gases continue unabated or future changes substantially exceed those that have occurred so far. Finally, it can be concluded that the debates over global warming focuses narrowly on the reduction of greenhouse gas emissions, but is it really about the political positions for and against regulations of greenhouse gases proposed under the Kyoto Protocol?

The study recommends that the scientific community, politicians and governments have to prioritize political debates on how to reduce global warming. In this complex and never-ending debates, climate scientists and politicians have to advice policymakers and/or governments to reduce greenhouse gas emissions instead of battling the already existing realities. Hence, effective policies are indispensable if reduction of global warming is to be brought under control. Unless defensive measures are taken, global warming will undermine the efforts to combat poverty and reduce chronic food insecurity. For that reason, developed countries have to finance some developing countries that are working on the green economy packages in reducing the concentration of greenhouse emissions in the atmosphere.

References

Antilla, L. (2005). Climate of skepticism: US newspaper coverage of the science of climate change. *Global Environmental Change*, 15, 338–352.

Bashir, A. (2009). Ethiopia's commitment to climate change adaptation: A summarized paper prepared for the Earth Day Ethiopia 22 April 2009.

Bast, J. L. (2010). Seven theories of climate change. The heartland institute. Printed in the United States of America.

Bell, B. (2011). Global warming - science or politics? Action needed or Canadians will pay billions, November 23, 2011.

Berry, J. L., Bihari, J., & Elliott, E. (2016). The limits of knowledge and the climate change debate. *Cato Journal*, 36(3), 589–61

Brönnimann, S. (2002). Picturing climate change. *Climate Research*, 22, 87–95.

Climate Depot. (2010). More than 1000 international scientists dissent over manmade global warming claims. U. S. senate minority report presented to the United Nations climate change conference in Cancun, Mexico, 9December 2010.

CryoGas International. (2014). Global warming debate highlights F-Gases. A special report from linde gases

Curry, J. (2015). The climate debate in the USA: The global warming policy foundation, USA.

Curry, J., Christy, J., Mann, M., & Pielke, R. (2017). Climate science: Assumptions, policy implications, and the scientific method, ©Copyright 2017, the global warming policy foundation.

Dantas-Torres, F. (2015). Climate change, biodiversity, ticks and tick-borne diseases: The butterfly effect. *International Journal for Parasitology*: *Parasites and Wildlife,* 4, 452-461.

Davison, M. (2015). Man-made global warming is a scam.

Elke, U., & Paul, C. S. (2011). Public understanding of climate change in the United States. *American Psychological Association*, 66 (4), 315–328.

Emil, A. (2012). Consensus and controversy: the debate on manmade global warming. SINTEF technology and society, Norway.

Evans, A., & Steven, D. (2007). Climate change: the state of the debate. Center for international cooperation, the London accord, October, 2007.

Gerhard, L.C. (2004). Climate change: Conflict of observational science, theory and politics. *AAPG Bulletin,* 88(9), 1211-1220.

Giddens, A. (2008). The politics of climate change: National responses to the challenge of global warming. Policy network paper, September 2008.

Herath, A.K. (2011). The climate change debate: Man vs. nature. Available from http:/www.livescience.com /16388-climate change-debate-man-nature.html. Accessed at February 2017.

Huang, J., Wang, S.W., & Luo, Y. (2012). Debates on the causes of global warming. *Advances in Climate Change Research*, 3(1), 38-44.

Hulme, P E. (2005). Adapting to climate change: is there scope for ecological management in the face of a global threat? *Journal of Applied Ecology, 42*, 784–794.

IPCC. (2007). Climate Change 2007: Impacts, adaptation and vulnerability. Contribution of working group, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (Eds.) Cambridge university press, Cambridge, UK.

Kabat, P., Schulze, R.E., Hellmuth, M.E., & Veraart, J.A. (Editors) (2002). Coping with impacts of climate variability and climate change in water management: A scoping paper Wageningen University.

Keohane, R., & Raustiala, K. (2008). Toward post-Kyoto climate change architecture: a political analysis." Discussion Paper 2008-01, Cambridge, Mass: Harvard project on international climate agreements, July 2008.

Keohane, R.O. (2015). The global politics of climate change: Challenge for Political Science. *American Political Science Association*,19-25. Doi: 10.1017/S1049096514001541.

Khandekar, M.L., Murty, T.S., & Chittibabu, P. (2005). The global warming debate: A review of the state of science. *Pure Appl. Geophys,* 162, 1557–1586. DOI 10.1007/s00024-005-2683-x.

Korhola, E.R. (2014). Climate Change as a political process: The rise and fall of the Kyoto Protocol. PhD dissertation, Faculty of Biological and Environmental Sciences University, Helsinki.

Landsberg, H. E. (1970). Man-made climate changes. *Journal of Science*, 170, 1265-1274.

Lupo, A.R. (2008). Anthropogenic global warming: A skeptical point of view. *Missouri Medicine,*105(2), 22-25.

Maibach, E. (2014). What is in a name? Global warming vs. climate change. George Mason University, center for climate change communication.

Majku, J. (2017). Climate science: A guide to the public debate. The Niskanen Center, briefing paper, March 8, 2017.

Mann, M. E. (2009). Do global warming and climate change represent a serious threat to our welfare and environment? Social philosophy and policy foundation, printed in the USA.

Maxwell, T. B., & Boykoffb, J. M. (2004). Balance as bias: global warming and the US prestige press. *Global Environmental Change*, 14, 125–136.

Mccright, A.M. & Dunlap, R.E. (2011). The politicization of climate change and polarization in the American public's views of global warming,2001–2010.*Journalof Sociological Quarterly,* 52, 155–194.

Meredith,C. (2012). Hundred reasons why climate change is natural not manmade.

Miller, K., Trenberth, K.E., Mearns, L., & Rhodes S. (2000). Effects of changing climate on weather and human activities. National Center for atmospheric research boulder, Colorado.

Miller, K. B. (2012). The nature of science and the public debate over anthropogenic global warming. *Perspectives on Science and Christian Faith*, 64 (4), 220-229.

Mohammed, S. (2013). Community perception and indigenous adaptive response to climate variability at Tehuledere Woreda, south wollo zone. *Journal of Engineering International*, 1 (2), 18-27.

Monckton, C. (2011). The Science and global politics of climate change. A special report published by the committee for a constructive tomorrow Washington, DC 20006.

Moore P. (2014). Natural resource adaptation: Protecting ecosystems and economies. environment and public works committee testimony, the green spirit strategies Ltd.

Oreskes, N., & Conway, E. M. (2008). Challenging knowledge: How climate science became a victim of the cold war. Centre for philosophy of natural, social science contingency, and dissent in science technical report 01/08.

Pasquini, L., & Shearing, C. (2014). Municipalities, politics, and climate change: an example of the process of institutionalizing an environmental agenda within local government. *Journal of Environment and Development*, 23(2), 271-296.

Pew Research Center. (July 2015). Americans, politics and science issues. Numbers, facts and trends shaping the world.

Poortinga, W., Spence, A., Whitmars, L., Capstick, S., & Pidgeon, N. (2011). Uncertain climate: An investigation into public skepticism about anthropogenic climate change. *Global Environmental Change,* 21, 1015–1024.

Rahman, M. (2013). Climate change: A theoretical review. *Interdisciplinary Description of Complex Systems,*11(1), 1-13.

Reichler, T. (2006). Climate change: theories, facts and uncertainties. Department of meteorology, University of Utah.

Riebeek H. (2007). Global warming. Earth observatory fact sheet, NASA, USA.

Roger, A., Pielke, J., & Daniel, S. (2005). Bringing society back into the climate debate. *Population and Environment*, 26(3), 255-268.

Rosenberg, S., Vedlitz, A., Cowmanm D., & Zahran, S. (2010). Climate change: A profile of U.S. climate scientists' perspectives. *Journal of Climate Change,* 101, 311-329.

Schneider, S. H. (1990). The global warming debates heats up: Analysis and perspectives. *American Metrological Society*, 71(9), 1292-1304.

Solomon, A., Yihenew, G., Getachew, F., & Birhanu, G. (2015). Time series trend analysis of temperature and rainfall in Lake Tana Sub-basin, Ethiopia. *Environ Syst Res,*4 (25), 1-12.

Special EUROBAROMETER 300. (2008). Europeans' attitudes towards climate change. A special report.

Steves, F., & Teytelboym, A. (2013). Political economy of climate change policy. Working paper October 2013, low carbon transition report.

Storm, S. (2009). Capitalism and climate change: Can the invisible hand adjust the natural thermostat? *Development and Change*,40(6), 1011–1038.

Strauc, M., & Guest, W. (2016). Global warming too weak to be a theory: A commentary paper.

Sylvén, M., Art, M., Reinvang, R., & Žanete,A. (2008). Climate change in southern Caucasus: Impacts on nature, people and society. WWF overview report.

The National Academy of Sciences. (2009). Restructuring Federal Climate Research to meet the challenges of climate change. available at http://www.nap.edu. Accessed at February 2017.

The Royal Society. (2014). Climate change evidence and causes. An overview from the Royal Society and the USA National Academy of Sciences.

Trenberth, K. E., Miller, K., Mearn, L., & Rhodes, S. (2000). Effects of changing climate on weather and human activities. National Center for atmospheric research boulder, Colorado, printed in USA.

Victor, D. G. (2004). Climate change debating America's policy options: A council policy initiative. Printed in the United States of America.

Villar, A., & Krosnick, J.A. (2011). Global warming vs. climate change, taxes vs. prices: Does word choice matter? *Journal of Climatic Change,* 105, 1–12.

Vitousek, P.M. (1994). Beyond global warming: Ecology and global change. *Ecology,* 75(7), 1861-1876.

Wang, J., & Chameides, B. (2005). Global warming's increasingly visible impacts: Environmental defense, USA.

Wang, J., & Chameides, B. (2007). Are humans responsible for global warming? A review of the facts: Environmental defense, finding the ways that work.

Whitmarsh, L. (2011). Skepticism and uncertainty about climate change: Dimensions, determinants and change over time. *Global Environmental Change,* 21, 690–700. doi: 10.1016/j.gloenvcha.2011.01.016.