

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

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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 consensus 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.

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 [1, 2, 3]. To add more, climate change, synonymous with global warming [4] is the most controversial environmental problem facing the world [5] and gains top priority on international political agendas at present [6, 7, 8]. The special EUROBAROMETER [9] 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 [9]. This finding is substantiated by the works of [9] 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 [10]. The debate on climate change is centered on its causes. According to [11], 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 [12]. At the heart of the debate is the question of "forcing"—what causes what [13]. 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. [14] 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 CO₂ concentrations by about 40%. More than half of the increase has occurred since the 1970s [15]. 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 [16]. [17], 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. [18], 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. [19], 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 [20]. Results from recent climate model suggests that the global average temperature increased from about 1.50C to 4.50C during the last century however, with uncertainty [21]. According to [22], 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 [23] 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 [24]. 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 [25]. According to [26], 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 [27]. [28] point out global warming to be a more serious problem

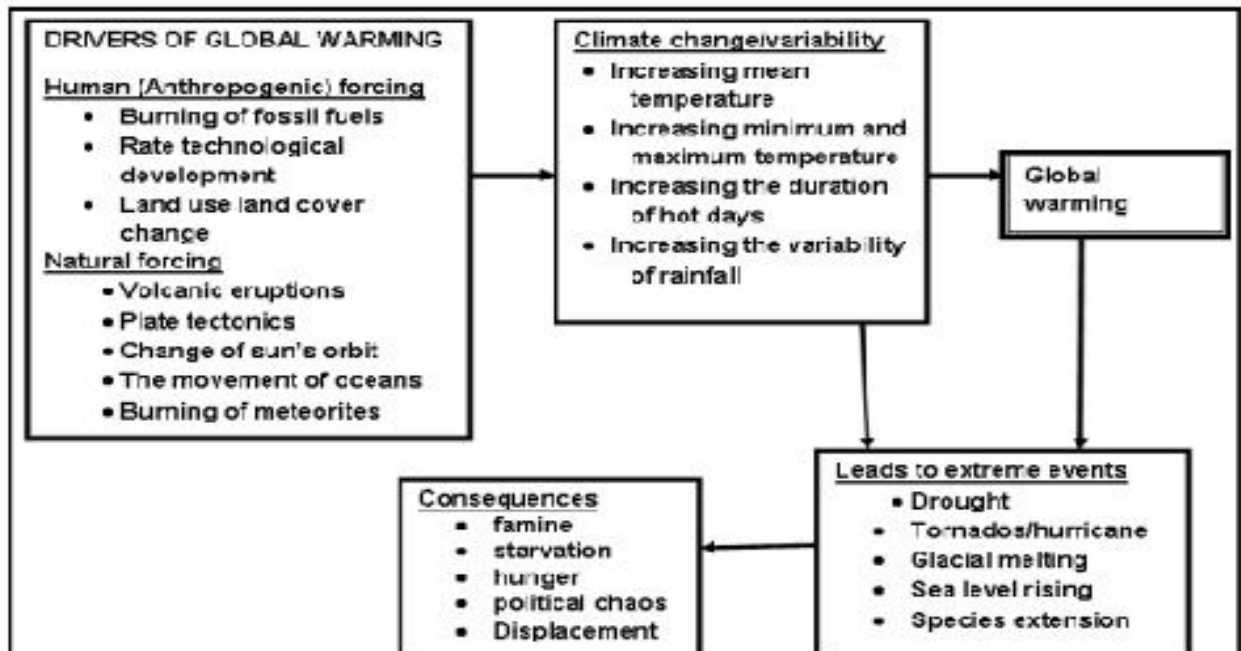
than climate change. According to them, global warming was rated more important and of greater concern than climate change. Climate change is less frightening and sounds like a more controllable challenge than global warming. Because of these issues, this writer selected debates on global warming as 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 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 [30]. [31], supplement that global warming leads to the increasing mean temperature of the earth, associated experiencing (Figure 1). From the discussions, it can be concluded that the links between the causes and consequences of global warming are

weather and climate variations [29]. 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 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

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



highly contested.

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 [32].

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 [33].

RESULTS AND DISCUSSION

Anthropogenic Global Warming: The hottest debate of the decade "Would 'Mother Nature' pay us back for our attacks on her? [34]. 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 [35, 36, 37, 38] 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, [39] 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 CO₂ and

CH₄ 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 [40] 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 [41] 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 [42]. Hence, anthropogenic global warming holds that greenhouse gases, primarily carbon dioxide is predominantly human in origin [43]. It is now more certain than ever, based on many lines of evidence that humans are changing earth's climate [44]. 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 [45]. 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 [46]. [47,48] on their part argue that global warming is already underway and the human activities are accelerating the situations excessively than the natural forces. The CO₂ irradiative forcing for example, increased by 20% from 1995 to 2005 due to extensive use of fossil fuels [48]. In line

with this, majority (52.65%) of the U.S. mainstream press disclosed that humans are major contributors to global warming [49]. [50] 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 [51]. 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, [52] 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 [53]. 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 [54]. According to them, nature, not human activity rules global warming. This is supported by [55] who says, over the last couple of decades, the

indicates that throughout Earth's history, temperatures have often been warmer than now and CO₂ levels have often been higher, more than ten times high presently. The 0.70°C increase in the average global temperature over the last hundred years is entirely consistent with well-established, long-term, natural climate trends. [56], 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. [57], indicates that some 800 scientists from more than 460 institutions in 42 countries over 25 years have written peer-reviewed

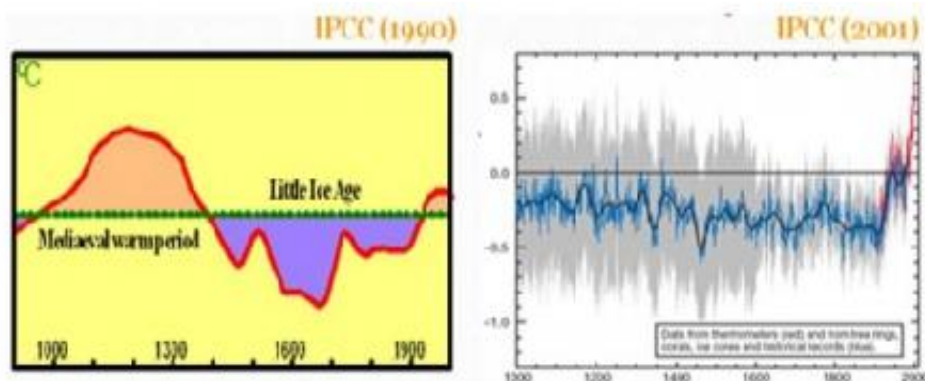


Figure 2. Climate change through time produced by IPCC in 1990 and 2001 (1000- 2000)

Source: Monckton, 2011

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 [55] 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

papers and provided evidences that the Middle Ages were warmer than today. [58] blames how the IPCC attempts to wipe out the Medieval Warm Period in its 2001 report as shown in Figure 2. [59] 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. China and India emerging developing countries, have ratified the Kyoto Protocol

but failed to reduce the emissions [59]. 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 [60]. Japan and Russia withdrew from the Protocol [61]. However, many developing countries agreed to reduce greenhouse emissions by 37% on the coming decades,

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 [63]. This made the prospecting of global warming dark, unsettled and debatable even for the coming decades [64]. 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. [65] predicts that a warmer planet caused by human beings will lead

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 debaters aided with empirical evidences. In this regard, it can be concluded that we are on 'climate wars'. There is a war going on between

because climate change is more of a threat to the world's poor countries [62]. 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.

to more extreme weather, including drought, flooding, storms, snow, and wildfires. However, [56] 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. [48] 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 report also indicates with 90% confidence that most of the warming since the 1950s is manmade. However, according to [11, 12], 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 [19], 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).

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 [26] In relation to this, [34] 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 [45, 48, 54,

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 [12]. Contrarily, land-use change, solar variability and the

57]. have helped me to come to my present conclusion. [59]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.

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? [17]. 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.

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