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## A CRITICAL SURVEY OF CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

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### Abstract

This paper relates the connection between climate change and sustainable development. The research work is hinged on theory of environmental responsible behaviours. The data was acquired through deployment of survey method (distribution of questionnaires) and 130 questionnaires were distributed to workers selected from of two meteorological centres and a governmental ministry on development. Then chi-square was employed as the statistical tool in analyze the data. From the result, value of tabulated chi-square ( $X^2$ ) is 7.815 and the calculated value of chi-square ( $X^2$ ) is 9.03. Since the calculated value of  $X^2$  exceeds the critical value of tabulated  $X^2$  which is 7.815, then null hypothesis of the distributions is rejected and the alternative hypothesis is accepted. The finding shows that climate change affects (whether negatively or positively) sustainable development. The effects are mostly negative due to emissions of greenhouse gases (GHGs) on the environment. However, climate change could be said to be an agent of sustainable development. In view of the result, recommendations are made: creating wide awareness and campaign of effects of climate change on the environmental system, government creation of policies to reduce GHGs emissions, and government imposing of high tax payment on usage of resources that are GHG sources. These recommendations are good policies and, also strong tools to promoting sustainable development.

**Keywords:** Climate, Climate Change, Greenhouse Gases, Sustainable Development

### 1.0 INTRODUCTION

Climate change (CC) has become a staid threat to global peace, security, and prosperity. Till date, however, much of the focus of international policy makers and

institutions has been confined to the arenas of science and the economy. While climate change is certainly an environmental phenomenon that necessitates scientific research and innovation, it is also a security, economic development, and human rights imperative [1].

Climate change occurs when the average long-term weather patterns of a region is altered for an extended period of time, typically decades or longer. The examples include the shifts in wind patterns, the average temperature or the amount of precipitation. These changes can affect one region, many regions or the whole planet [2]. The scientific consensus on climate change is that climate is changing and that these changes are in large part caused by human activities. Climate change remains the most challenging threat to all living creatures. These changes in climatic and ozone layer depletion by the activities of man have been predicted to be at exponential rate [3].

Sustainable development (SD) has become a popular catchphrase in contemporary development discourse. However, in spite of its pervasiveness and the massive popularity it has garnered over the years, the concept still seems unclear as many people continue to ask questions about its meaning and history, as well as what it entails and implies for development theory and practice [4].

However, notwithstanding its pervasiveness and popularity, people murmur of disenchantment about the concept of SD, what it entails, as well as what it implies for development theory and practice [5]. SD therefore stands the risk of becoming a cliché like appropriate technology—a fashionable and rhetoric phrase—to which everyone pays homage but nobody seems to define with precision and exactitude [6].

Sustainable development has a very broad meaning depending on the dimensions being considered. Sustainable development has received much attention from policy makers and academics for four main reasons. Firstly, sustainable development is considered to be the end-goal of the United

Nation's plan for the planet, and many countries have agreed to achieve the sustainable development goal [7]. Secondly, sustainable development helps to promote a sustainable planet for every generation [8]. Thirdly, sustainable development is considered to be an all-embracing development goal because the aim of all other development goals is to achieve a level of development that is sustainable. Finally, sustainable development is expected to bring lasting socio-economic benefits to all people and the environment [9].

### 1.1 CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

There is a dual relationship between sustainable development and climate change. On one hand, climate change influences key natural and human living conditions and the basis for social and economic development. On the other hand, society's priorities on sustainable development influence both the greenhouse gas (GHG) emissions that are causing climate change and the vulnerability. Climate change impacts on development prospects have also been described in an inter-agency project on poverty and it is regarded to compound existing poverty. The adverse impacts of climate change will be most striking in developing nations because of their dependence on natural resources. However, the developing nations have limited capacity to adapt to a changing climate thereby making them most vulnerable [1].

There is recognition of the dual relationship between SD and climate change points to a need for the exploration of policies that jointly address SD and climate change. A number of international study programmes including the development and climate project [11] and an organization for

economic co-operation and development (OECD) and environment directorate programme [12] explore the potential of SD-based climate change policies. Other activities include projects by the world resources institute and the PEW centre [13]. The impact of positive climate change on the environment steers the society towards development which can be sustained through continual adaptation to the changing climate and adherence to climate change policies.

## 1.2 SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE POLICIES

The sustainable development (SD) and climate change (CC) policies are herein discussion of factors affecting sustainable development encapsulated in climate change evolution. SD and CC are influenced by a number of key policy decisions related to economic, social, and environmental issues, as well as business-sector initiatives, private households and many other stakeholders. These decisions are again framed by government policies, markets, information sharing, culture and a number of other factors. Some of the decisions that are critically important in this context are investments, use of natural resources, energy consumption, land use, technology choice, and consumption and lifestyle. All of these can lead to both increasing and decreasing greenhouse gases (GHG) emission intensities which again will have implications for the scope of the mitigation challenge [14].

The policies for climate change in achieving sustainable development in this context are borrowed from the Third Assessment Report (TAR). It reviews the national policies, international agreements and initiatives of sub-national governments, corporations and non-governmental organizations (NGOs). The

policies are regarded as instrument for abating GHG emissions and manage activities that indirectly lead to GHG emissions, such as energy consumption, agricultural activities, industrial evolution, etc. The policies include taking regulatory measures and standards on emissions level, fixing emission taxes and charges, setting tradable permits for different forms of targets and compliance and enforcement issues, voluntary agreements between government and other private sectors [12]. They are meant to achieve environment objectives or to improve environmental performance beyond compliance to regulated obligations, to control subsidies and incentives of industrial and agricultural performances, to fund research and development programmes and to sponsor information instruments such as awareness and education campaigns. Other policies such as those affecting trade, foreign direct investment, consumption, social development goals can also affect GHG emissions. All these policies directly contribute to sustainable development in developed and developing countries.

## 1.3 GREENHOUSE GASES AS AGENTS OF CLIMATE CHANGE

Greenhouse gases (GHGs) are gases in the atmosphere that absorb and retain radiations within the atmosphere region. The main greenhouse gases in the earth's atmosphere are carbon dioxide, methane, nitrous oxide, fluorinated gases, troposphere ozone, and water vapour [15]. GHGs concentrations in the atmosphere have historically varied as a result of many natural processes (e.g. volcanic activity, changes in temperature, etc). Some greenhouse gases like carbon dioxide occur naturally and are emitted to the atmosphere through natural processes and human activities. These activities are the

fundamental causes of the greenhouse effect. The GHGs enter the atmosphere by the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products and as a result of other chemical reactions (e.g. manufacture of cement). Carbon dioxide can be removed from the atmosphere or sequestered when it is absorbed by plants as part of the biological carbon cycle [15].

Also, greenhouse (a glasshouse, or, if it has sufficient heating, a hothouse) is a structure of walls and roof constructed with transparent material, such as glass, in which plants requiring regulated climatic conditions are grown. A greenhouse is a house made of glass walls and a glass roof. A greenhouse is warm inside, even during winter. Sunlight shines into it and warms the air inside. But the heat is trapped by the glass and cannot escape. So during the daylight hours, it gets warmer and warmer inside a greenhouse and stays warm at night too [16].

#### 1.4 RESEARCH QUESTIONS

- i. Is there any relationship between Climate Change and Sustainable Development?
- ii. Does Climate Change affect Sustainable Development?

#### 1.5 RESEARCH HYPOTHESIS

The hypothesis relating to the goal of this research was formulated and tested. The hypothesis is formulated to assess whether Climate Change is a factor of Sustainable Development.

Hypothesis

H<sub>0</sub>: Climate Change (negative effect) has effect on Sustainable Development.

H<sub>1</sub>: Climate Change (negative effect) has no effect on Sustainable Development.

#### 2.0 THEORETICAL FRAMEWORK

This research is hinged on theory of responsible environmental behaviour. Theory of responsible environmental behaviour refers to actions and activities in which an individual or group engages or behaviours that they exhibit to mitigate their potentially negative environment impact [17]. The Model of Responsible Environmental Behaviour indicates that variables, intention to act, locus of control (an internalized sense of personal control over the events in one's own life), attitudes, sense of personal responsibility and one's knowledge suggest whether a person would adopt a behaviour or not.

The intention and attitudes of population size of this research are responsibly to fight and reduce the negative environmental impact of climate change as result of emissions of GHGs.

#### 3.0 RESEARCH METHODOLOGY

The data were collected through primary and secondary approaches. This work is descriptively achieved through survey design. However, data were collected by means of survey questionnaire. Questionnaire was administered to one hundred and thirty (130) workers selected from two meteorological centres and a governmental ministry on development. The questionnaires were completely returned without a single loss of it. Secondary data were sourced from books, journal articles, and the Internet. Then the data collected were statistically analyzed using Chi-square. In applying the

chi-square ( $X^2$ ) technique, the following decision rules were used:

- Accept  $H_0$  if  $X^2$  calculated is less than or equal to  $X^2$  critical value.
- Accept  $H_1$  if  $X^2$  calculated is greater than or equal to  $X^2$  critical value.

Where,  $H_0$  = Null hypothesis, and  
 $H_1$  = Alternative hypothesis.

The calculation of chi-square ( $X^2$ ) is derived from this formula:

$$X^2 = \frac{\sum_{n=1}^n (O-E)^2}{E}$$

..... 1.1

Where  $O$  = observed frequency in the distribution

$E$  = expected frequency in the distribution

The expected frequency for each of the cells is computed using the formula:

$$E = \frac{RT \times CT}{GT}$$

..... 1.2

Where  $RT$  = Row Total

$CT$  = Column Total

$GT$  = Grand Total

The degree of freedom (df) = (r-1) (c-1)

..... 1.3

Where  $r$  = number rows

$C$  = number of columns

#### 4.0 DATA PRESENTATION

Table 1: Representation of data collected

Number of Staff Selected	Total Questionnaire Distributed	Total Questionnaire Returned		Total Questionnaire not Returned (void)	
		Cell	Total	Cell	Total
130	130	40	45	-5	25
		2	130	none	6

Source: Fieldwork computed by the Authors (2022)

#### 4.1 FINDINGS

Amongst other responses to other questions of the questionnaire, the responses to second research questions were presented in tabular form of chi-square.

##### Testing of Hypothesis

The research question 2 was tested using chi-square ( $X^2$ ) which is a statistical technique designed for testing hypothesis. The results of the questions in questionnaire form the question for testing of the hypothesis.

The levels of significance used for this research is  $\alpha = 0.05$  with 95% confidence interval.

##### Test of Hypothesis

$H_0$ : Climate Change (negative effect) has effect on Sustainable Development.

$H_1$ : Climate Change (negative effect) has no effect on Sustainable Development.

The research question 2 can be restated as "Does Climate Change affects Sustainable Development?"

Table 1: showing Test Statistics for research and chi-square table of independence for research question 2

S/N	Observed frequency (O)	Expected frequency (E)	O - E	(O - E) <sup>2</sup>	$\frac{(O - E)^2}{E}$
	45	45	0	0	0
	40	45	-5	25	0.5
	130	130	0	0	0

<b>Cell 3</b>	10	20	-10	10	5.00
<b>Cell 4</b>	25	20	5	25	1.25
<b>Total</b>	130	130	0	250	9.03

Source: Fieldwork computed by the Authors (2022)

The calculated value of  $X^2 = 9.03$

#### 4.2 DATA (CRITICAL) ANALYSES

In decision rule of analyzing the chi-square of  $\alpha = 0.05$  that has confidence level of 95%, the critical value of tabulated chi-square,  $X^2$  was taken as 7.815. Since the value of calculated  $X^2$  was hypothetically found to be 9.03 (through a thorough survey) exceeds the critical value of tabulated  $X^2$  which is 7.815, then null hypothesis is rejected and the alternative hypothesis is accepted of the distributions. The data collected from the questionnaire distributed which was tested using chi-square consequently confirmed that climate change affects (whether positively and negatively) sustainable development as it is written in research question 2. When the case of climate change is abruptly negative it means that lives and every human activity will be hampered and as such create a slow down or complete stoppage on the part of development. This is because climate change influences key natural and human living conditions and the basis for social and economic development. Hence, there exists a relationship between climate change and sustainable development.

#### 5.0 CONCLUSION

From the Chi-square findings, climate change has effect (negative) on sustainable development. Climate change could cause a slow down or even a complete stop of developmental process. Consequently, if a development is achieved, the sustenance (ideal of sustainability) is long term process which could be hampered by climate change. The theory on which this research is hinged on is the theory of environmental responsible behaviour which unravelled the actions and activities of individual or group engagement to mitigating the potentially negative environment impact. The climate change affects things beyond human efforts to the growth and development. Policies are taking into considerations to control regulatory measures and standards on emissions level, fixing emission taxes and charges, setting tradable permits for different forms of targets and compliance and enforcement issues, voluntary agreements between government and other private sectors. These policies are meant to accomplish environment goals and, or to improve environmental performance beyond compliance to regulated obligations, to control subsidies and incentives of industrial and agricultural performances, to fund research and development programmes and to support instrumental information such as awareness and education campaigns.

#### 5.1 RECOMMENDATIONS

- There should be wide awareness and campaign of effects (especially negative effects) of climate change on the environmental system.
- Government must create policies to reduce GHGs emissions.



- Government has to impose high tax payment on usage of resources that are GHG sources.

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