

A REVIEW OF COMMON CONSTRUCTION PRACTICES TO MITIGATE GLOBAL WARMING IN THE BUILT ENVIRONMENT

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ABSTRACT

The realities of global warming are evident around us with things like extreme weather conditions, dirty atmospheric air, flooding in many places, drought, deforestation, acidic ocean, glacial retreat and rising atmospheric temperature serving as proofs to its existence. The situation calls for a conscious effort to fix the environmental menace of catastrophic trend of continuous rising atmospheric temperature occasioned by the presence of greenhouse gases in the air. In the light of this, the various hazardous construction practices adding to the problem of warming planet were reviewed in the context of green theory so as to reverse the negative trend in order to ensure a sustainable development and environmentally responsible behaviours among the various stakeholders in the built industry. The findings from the study include site clearing, procurement of new materials, freight of goods to site, use of non-degradable materials for packaging and exploitation of forest as hazardous construction practices that should be stopped. In conclusion, the paper suggested that all aspects of physical development are to be reviewed if the trend of global warming is to be mitigated against.

Key Words: Global Warming, Green Theory, Construction Practices, Environment, Greenhouse Gases

1.0 INTRODUCTION

Global warming can be described as a continuous rise in the temperature of earth climatic system and the surrounding atmosphere. Meanwhile building which depicts architecture of a people can be portrayed as an assemblage of composite materials to modify the various weather elements in order to create a condition suitable for living. This condition must offers warmth in an extremely cold period and cool indoor when the weather outdoor is unbearably hot. This way, the building will be seen to offer protection from any adverse weather conditions that threaten comfort in life.

The various authorities on the subject of global warming had submitted that 40% of greenhouse gases emission responsible for global warming is from the buildings we lived in. And while buildings are the major products of our architectural activities with millions of them dotting our cityscapes, powering, cleaning and finishing them is creating a menace to the environment. Our source of energy deployed to power our buildings, site clearing embarked upon to create space for construction activities, how wastes generated in buildings are disposed, our choice of materials for buildings and measures put in place to get rid of surface water are some of the majors contributing factors to global warming in the building industry.

Hence, the various design formats and construction methods adopted by professionals in the built industry to define our architecture are significant part of the problem of how the atmosphere is being warmed and subsequently the global community. And if part of the problem, adopting a better way of doing things correctly in the industry will significantly help to mitigate the menace. The concept of sustainability which emphasized the use of less to achieve more and durability of the various products from every human endeavor give rise to an instinct in everyone in the industry to be environmentally responsible. This can be done largely by architects through the adoption of construction practices and design formats that will cut emission of greenhouse gases.

The various architectural designs embarked upon to develop our cities need a review in the light of global warming phenomenon. Lokoja, a city in North-central Nigeria will be the research area of this study and the common pattern of construction practices will be reviewed with the aim of exposing how these practices had contributed to the menace of global warming and how this trend can be halt.

The aim of the paper is to review the common construction practices in the built industry which are aiding global warming with the view to advocate for alternatives that are environmentally friendly. While the objectives include the following:

- To bring to the fore conventional practices in the built industry which hitherto had been seen to be without adverse impact on global temperature.
- To ascertain the reality of global warming phenomenon with the aim of making the various stakeholders environmentally responsible
- To review the relevant literature on human activities that released greenhouse gases into the atmosphere in order to broaden conversation on the need to fully go green.

2.0 LITERATURE REVIEW

Global warming was described by Henrik (2016) as a climatic phenomenon that was noticed in the past fifty years, in which the average global temperature has increased at the fastest rate recorded in history. He went ahead to reveal that the trend has been accelerating. According to him, all but one of the sixteen hottest years in NASA's (National Aeronautics and Space Administration) 134-year record has occurred since 2010. Again global warming can be defined as the observed century-scale rise in the average temperature of the Earth's climate system and its related effects (Gills, 2015). Furthermore, global warming as defined by United Kingdom Meteorology office (2014) is the current increase in temperature of the Earth surface (both land and water) as well as its atmosphere. The office further claimed that average temperature around the world had risen by 0.75°C over the last 100 years about two third of this increase has occurred since 1975.

This is different from climate change which according to Oxford Language Dictionary (2010), is a change in global or regional climate pattern in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuel. Climate change may also refer to a change in average weather conditions, or in the time variation of weather within the context of longer-term average conditions. Climate naturally is expected to change within a period of thirty-five to forty years brought about by alteration in weather conditions but when this change is defined by increase in temperature of the Earth surface as a result of the presence of more greenhouse gases such as

carbon dioxide, methane and nitrate oxide in the atmosphere it is termed global warming and seen as environmental menace, a threat to lives and an impediment to comfort that architectural edifices are meant to offer.

The history of global warming ecological phenomenon has been one that evolved with claims and counter claims as expounded in the narration of Enzier (2018). There has been denial of this sensitive issue among professionals, politicians and policy makers that define our planning laws. However, from Enzier (2018) account of the history of greenhouse effects and global warming started with the work of a Swedish scientist named Svante Arrhenius in 1896 when he first lay claim to the fact that fossil fuel combustion can result in global warming. Then, in his work he proposed a relationship between atmospheric carbon dioxide concentration and temperature. Thomas Chamberlin partnered with him to help calculate the rate at which human activities could warm the earth by adding carbon dioxide to the atmosphere.

This submission of Arrhenius and Thomas Chamberlin was not taken seriously at the time because there was an assumption among the scientists that human influences were insignificant compared to natural forces such as solar activity and ocean circulation. It was also assumed then that oceans were such a great carbon sink that will automatically cancel out our pollution. This assumption persist in the science world until 1940 when infrared spectroscopy was developed for measuring long-wave radiation and it was discovered that increasing the amount of atmospheric carbon dioxide will give rise to absorption of more infrared radiation and that water vapour absorbed a totally different types of radiation than carbon dioxide. Gilbert Plass in 1955 also explained by concluding that adding more carbon dioxide to the atmosphere would intercept infrared radiation that is otherwise lost to space, warming the earth.

In the year 1950, evidence was found that carbon dioxide has an atmospheric lifespan of approximately ten years. Hence, while still holding unto the notion that oceans would absorb most carbon dioxide, what becomes of carbon dioxide molecules after it would eventually dissolved in the oceans remain unclear. In the same decade, research showed that ocean could never be the complete sink for all atmospheric carbon dioxide; it was thought that only nearly one third of anthropogenic carbon dioxide is absorbed by oceans. Nevertheless, another counter claim was made in 1970 when Charles Keeling produced a concentration curve for atmospheric carbon dioxide and the ocean sediment research came up with a study that showed there are signs that the

globe was experiencing a cycle of cold-warm temperature and a pointer to the fact that a new ice age was imminent.

However, in 1980's the global annual mean temperature curve started to rise. In fact towards the end of that decade, the curve began to increase so steeply that the global warming theory became a topical issue of discussion. Precisely in 1988, it was finally acknowledged that climate was warmer than any period since 1880. The greenhouse effect was named and intergovernmental panel on climate change (IPCC) was founded by United Nations Environmental Programme and world metrological office.

NASA (2018) pointed out the fact that the earth's climate system has changed throughout history attributing the cause for changes to a very small variations in Earth's orbit that change the amount of solar energy our planet received. The body listed the followings as evidences of global warming: Global temperature rise; Warming oceans; shrinking ice sheets; glacial retreat; Sea level rise and Ocean acidification. The body concluded that the increase is as a result of human emits more carbon dioxide into the atmosphere and hence more being absorbed into the oceans. In the same light, Ministry for the Environment (2017) submitted that 'the direct temperature measurements on land, changes in the dates when lakes and rivers freeze and their ice melts, a reduction in glaziers, changes in the heat stored in the oceans, changes in rainfall pattern resulting in more floods droughts and intense rain are proofs that tells us the average temperature of the world's atmosphere and oceans have increased over the past 150 years. The ministry went further to add that shifts in the ranges of some plant and animal species and earlier timing of spring events such as leaf-unfolding, bird migration and egg-laying for some species are proofs of a warming globe. Again, Allison and Amanda (2015) used the changes in autumn senescence in Northern hemisphere deciduous trees to prove the reality of global warming.

Furthermore, Sabrina and Paul (2017) revealed that scientists said the accumulation of heat in the oceans is the strongest evidence of how fast the earth is warming due to heat trapping gases released by the burning of fossil fuel. The oceans are said to have absorbed 90 percent of the extra heat trapped by increasing greenhouse gases. The research in this area shows that during 2015-2016, the amount of heat stored in the upper 2,000 meters of the oceans read its highest point on record.

According to Joe (2019), power plants deployed for electricity production to power homes account for 40% of carbon dioxide emissions while transportation account for 33% of carbon emission. Other causes of emission of heat trapping gases warming the planet include industrial farming which Joe (2019) claimed contributed 20% to the total emission of greenhouse gases. He went further to add fertilizers usage, oil drilling, natural gas drilling and the melting of Permafrost to the list of causes of global warming.

The report from Natural Resources Defense Council (NRDC, 2021) shows that the following are effects of global warming:

- More frequent and severe weather
- Higher death rates
- Dirtier air
- Higher wildlife extinction rate (biodiversity loss)
- More acidic oceans
- Higher sea levels

These consequences of global warming are being felt in many places to confirm the reality of this natural phenomenon induced by human actions.

3.0 METHODOLOGY

The data for this paper will be obtained from secondary source in form of literature review of the works of previous researchers on the subject matter in order to expand the conversation and create awareness on the nexus between inappropriate construction practices and global warming. Meanwhile the review will be carried out in the context of green theory.

The theory that was adopted for this work is the green theory which belongs to the critical theory tradition, in the sense that environmental issues evoke question about relations between and among us and others in the context of community and collective decision-making. This will result in having developments that are sustainable and environmentally friendly. There is a need for a review of the common construction practices and developmental patterns in the spectrum of green

theory. Again, the collective actions and in-actions of everyone must be scrutinized to know how these impacts on the global environment.

Meanwhile the ideology that defined this theory is that which must be accepted and practiced by everyone in the built industry for it to make meaningful impact of lowering the production of greenhouse gases. This move must be sustained for years to come in order to cut greenhouse gas emission to the atmosphere. Moreover, green theory is a theory of international relations that focuses on environmental issues as they relate to global justice, international development, modernization and security (Wikipedia, 2022).

4.0 FINDINGS

Common construction practices that need to be reviewed, in order to mitigate the continuous rise in the atmospheric temperature as a result of the presence of heat trapping gases.

- Site clearing to pave way for construction works.

The common thing in practice is to clear the allotted plot of land earmarked for construction work, in most cases these greenery are not replaced and in the process there is a permanent destruction of the vegetal covers of the land surface.

- Procurement of new construction materials.

Whenever new buildings are to be constructed, the common practice is for the owner of the project to either buy all the materials needed for the building project or the client reimbursed the contractor to supply the materials new from the market for the project. This practice discourages the re-use and recycling aspect of sustainability concept and mounts pressure on nature to produce more whether it has replenished its capacity to do so or not.

- Freight of goods and services to construction sites.

Transportation, which was identified as responsible for 33% of greenhouse emission is synonymous to building construction as materials and workforce are moved from one part of the city, state or country to the site. In the process, more fossil fuel is burnt and carbon dioxide released to the atmosphere.

- Packaging of Materials to site with the use of non-degradable materials like polythene.

Building project is a complex work that required supply of several materials to building site. Most of these materials get to the site in packages of non-degradable materials like polythene (nylon). These wraps ended up in fire and hazardous gases released into the atmosphere or left littered on construction sites.

- Turning to the forest to obtain wood for furniture, doors, windows etc.
Sawmill is an integral part of the supply chain of building materials to construction sites. In order for saw millers to meet the supply needs of the various construction sites, the various forests in the country has to part with their wood resulting in deforestation and desert encroachment in many places
- Continuous use of cement from foundation to the roofing level of the building projects.
Cement is one building material that is heavily used in the construction industry at present. It is used to lay foundation, for cladding, beams, columns, slab, lintel, finishes, roofing tiles and even roads. This same material has been found to possess high carbon footprint in the atmosphere, hence the need for a review.
- Burning of waste on and off site to clear spaces.
During construction works, lot of material wastages are incurred from broken blocks to off-cuts of woods. These often required clearing in order to create space for workmen on site. The usual practice is that these wasted materials are set ablaze and smokes containing carbon mono-oxide and nitrates are released into the atmosphere.
- The use of existing legislation to moderate the practice of building construction.
The various existing laws and bye-laws used for moderation of contractual works do not emphasized green technology and this is not good enough if the trend in greenhouse gases emission is to be halt.
- The use of hydro carbons to power buildings. The conventional building design and construction is one that ensure the production of buildings with several meters of wire carrying tons of electrons laid in theirs walls and connected to an alternative current source (mostly generators). The other source of power to which these cables are connected is the direct current (gas-usage powered stations). Both of them are carbon emitting sources which are bad for the narratives on global warming.

4.1 REVIEWED: SOLUTIONS

- The solution to all of these is going green in the construction industry. The materials we use to build, the technology adopted to frame our buildings and the energy use to power them must all be provided from cleaner source other than the present source with high carbon footprint in the atmosphere.
- The various laws and bye-laws governing the contractual works must be amended to reflect the need for acknowledgement of green theory that is capable of producing developments that are sustainable.
- Researches in the area of production of environmental friendly materials must be encourage to find alternative to the use of building materials like cement, steel and asbestos which are known for high carbon emission.
- Finally, building regulations that make developers to be environmentally responsible must be put in place not just for sustainable development but to halt the continuous rise in atmospheric temperature.

5.0 CONCLUSION

The reality of global warming is evident around us and denying it will only compound the problem. Hence, all aspects of physical development must be reviewed to produce the desired result of halting the continuous rising global temperature. Although we are living in the time of global climate emergency, we are not yet acting as if we are in an imminent crisis (Barry, 2019). The construction practices that are injurious to the environment and sustained the catastrophic trend of global warming will need to be reviewed if solution is to be sought within the narrative of green theory as proposed. Finally, going green will not just halt the continuous emission of greenhouse gases, it will make individuals to be environmentally responsible and ensure developments that can be sustained.

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