

USE OF SOFT LANDSCAPE MATERIALS IN MINIMIZING CLIMATE CHANGE AND ITS EFFECT ON THE ENVIRONMENT, A CASE STUDY OF AKURE, NIGERIA

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Abstract

The most salient reason for the environmental abasement that has led to the global environmental crisis is the deteriorating relationship between man and his environment. Man's activities such as overexploitation of natural resources, technological and industrial development has resulted in climate change. According to the severe climate change in recent days, there is a need to pay more attention to the control and modification of climate. Moreover, soft landscape materials also obviously affect climate. To systematically understand how soft landscape materials, minimize climate change and its effect in our environment. Qualitative method was adopted for this paper, which involves the study and review of existing literature on the subject, and personal observation was equally put to use. The information collected was analyzed, and findings demonstrate significant understanding on how soft landscape could serve as a modifying factor for climate change and its effect on man and the environment. The finding contribute to the existing understanding of how soft landscape materials can be used to reduce climate change and its effect which in turn improve the quality of life of the people and equally providing a sustainable environment for future.

KEYWORD: Climate Change, Environment, global warming, Materials, Minimizing and Soft Landscape.

Introduction

Climate plays an important role in people's life, and also the basis of all planning and design (Chen, 2016). Climate change has important outcome on human and natural systems. This climate change is driven by the effect of man and his activities on the environment (Trenberth 2018). The term, 'environment', has many connotations. For this paper, the word 'environment', connote the natural environment, which encompasses all the biotic and abiotic elements that form our surroundings and all other living and non-living elements of this planet Earth. According to Ramamohana 2017, the environmental crisis arises out of the environmental impairment caused by several forms of pollution. Katar and Anil (2007) further explained that without the environment, none of us can survive. Presently, the environment can no longer satisfy our growing need and demand and creating a sustainable environment is probably the most pressing problem facing us today. Nwankwoala (2015) and IPCC (2017) explained that the changed in the environment can occur as a result of both man and natural activities. These activities over time have resulted into change in the climatic condition of the micro and macro environment (Mehta (2019) and Vaghefi (2019)). The impact of this climate change on the environment is critically debated; the latest report of United Nations Intergovernmental Panel on Climate Change special committee (IPCC, 2019) shows that global warming has already reached 1 degree Celsius above the per industrial level due to the past and current greenhouse gases emission. The emission has resulted into increase in the earth temperature, increase in sea level, melting of ice cap, flooding, and lot more (and Anderson 2016). The challenge of modifying the climate and maintaining a sustainable environment is probably the single most pressing problem facing us today and will remain so in the foreseeable future (George Berg, Linda, Peter and Raven (1998). In other to control the climate change and its effect the landscape materials are modifying factor of the local climate and it is considered an important design element in mitigating the local climate .Thus, it is necessary for the paper to examine how vegetations can be use in minimizing the climate change in our environment. This will be achieved by evaluating the causes of climate change and investigating the impact of vegetation on climate.

Causes of Climate Change

The Public health institute (2018), explained climate change as the systematic change in the long-term state of the atmosphere over multiple decades. The Australian Government's Department of Climate Change and Energy Efficiency, (2012) in its website further explained that Climate Change- *'our climate is changing, largely due to the observed increases in human produced greenhouse gases. Greenhouse gases absorb heat from the sun in the atmosphere and reduce the amount of heat escaping into space. This extra heat has been found to be the primary cause of observed changes in the climate system over the 20th century'*. Climate change is characterized by a general increase in average temperatures of the Earth, which modifies the weather balances and ecosystems for a long time. The problem of climate change we faced today is the complex consequence of forces connected with various interrelating factors (Trenberth, 2018) and this started since the Industrial Revolution of over 200 years ago.

The advance of these new technology has been largely responsible for the generation of synthetic and non-biodegradable substances and other environmentally injurious substances (Ramamohana R. 2017). Sampath 2015, explained that an Increasing industrial expansion is responsible for the release of enormous quantities of pollutants (e.g.) ions of chlorine, sulphate, bicarbonate, nitrate, sodium, magnesium, phosphate, through sewage effluents into the rivers and the lakes and thus for contaminating the water. Also, the application of carbon intensive methods of energy production through Industrial activity has also been blamed for warming the climate and when coal, oil and gas are burnt, they emit harmful greenhouse gases which trap heat in the earth's atmosphere (Omer, 2008b). Chigbo, Chidozie and Chekwubechukwu, (2016), further, explained that industrial emissions have led to an increase in aerosols in the atmosphere.

However, since the industrial revolution human has tremendously increased the rate of deforestation. The present economic man has forgotten the environment and ecological significance of natural vegetations Ramamohana R. 2017 and has destroyed the forests so rapidly and alarmingly which have caused serious environmental problems. Approximately 30% of the Earth's land mass is covered by forests (Percy, Jandl, Hall, and Lavigne. 2003) and the removal of forest cover alters global and regional climate patterns and results in catastrophic rainfall spells followed by prolonged dry periods (Strasser, Vilsmaier, Prettenhaler, Marke, Steiger,

Damm, Hanzer, Wilcke, and Stötter 2014). This can both release the carbon stored in trees and significantly reduce the number of trees available to absorb CO₂.

Agricultural development on the other hand degrades the environment in a variety of ways, like through the application of chemical fertilizers, pesticides and insecticides etc Kanianska, 2016. Balogh and Jámbor 2020. Furthermore, increase in population growth especially unplanned population growth has led to more usage of the land for agriculture in order to maintain the population (Ramamohana R. 2017). The demographic dynamic is the main driving force of global environmental change, (González Energía Cambio 2013).

Global warming has been generally agreed to be caused primarily by the emission of greenhouse gases (such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), chlorofluorocarbons and other chemicals into the atmosphere Hecht, These GHG act like a greenhouse to trap the sun's energy and heat, rather than letting it reflect back into space (Public Health Institute/Center for Climate Change and Health 2016) Darkwah W., Odum B., Addae M., Koomson A., Kwakye B., Ewurabena A., Asenso T. and Buanya B., (2018). This heat trap has led to the gradual heating of Earth's surface, oceans and atmosphere, melting of ice cap, extreme weather events, sea level, water acidification, extinction of some plants and animals (NASA 2015 and IPCC 2001).

Impact of Soft Landscape Materials on Climate

The trees, the mulch, the dirt, the lawn, flowers, trees, shrubs, and ground covers all make up soft scape materials. Plants in the landscape environment are as important and the various plant are used in different ways. Soft landscape materials cool the environment indirectly through evapotranspiration (Setaih, Hamza, and Townshend, 2013, and Zhendong, Yajun and Guo 2019). Evapotranspiration is the loss of water from vegetation to the atmosphere by evaporation and transpiration. This is where plants release water vapour which helps to cool the ambient temperature. According to Bernatzky (1982) vegetations reduce the local temperature by 2–4°C. Trees are very important in reducing air temperature Ballinas and Barradas (2016), this affects the whole microclimate (Saaroni, et al., 2004, Zhang, Bae and Kim 2019). plants can influence urban microclimates directly by shading surfaces and altering wind speeds, and indirectly through evapotranspiration and by modifying the storage and exchange of heat between urban surfaces (Middel, 2014, Magliocco and Perini, 2014; Lee, Mayer, and Chen 2016).

Heisler has stated that trees are effective for cooling because they absorb 70–85% of the heat from solar radiation by transpiration (cited in Akbari, et al., 1992). Cooling effect by vegetation influence had been recorded in the past by researchers such as Wallace, (2007) Ballinas and Barradas (2016), and others.

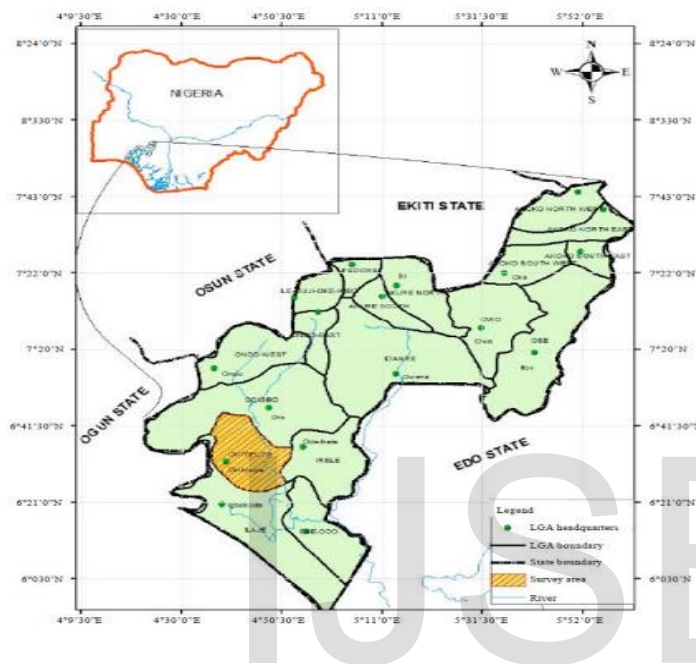
Trees also serves as windbreaks which are barriers used to reduce the wind speed Molla 2016. The reduction of wind speed by trees can modify the microclimate in the sheltered zone, increasing the temperature and humidity levels Helen 2014. According to Scudo, (2002), vegetation influenced the direction of wind movement by means of obstruction and deflection, guidance and filtration depending on tree geometry, height, canopy permeability and crown cover. Thus, it is structural characteristics of the vegetation that is the controlling factor for air movement. The plant itself has certain closeness, can play the role of the wind screen in the landscape space, and dense plants can be achieved to reduce the wind speed of 75% - 85% Shahidan, Jones, Gwilliam, and Salleh, (2012). In the same vein, Stathopoulos et al, (1994), observed that a single row high density windbreak vegetation reduced air infiltration by about 60% when planted approximately four tree heights away from the building. Tree shading has the ability to reduce thermal heat through solar energy interception.

Field measurements by Simpson & McPherson (1996) have suggested that the shade provided by trees and shrubs planted immediately beside buildings can directly reduce cooling loads. Proper landscaping around the house could potentially save energy and protect our environment. Landscape facilities design of urban landscape space should be integrated landscape facilities for the design of spatial and climatic factors.

Methodology

The study adopted a qualitative method to achieve its aim and objective through the review and careful consultation of relevant journal papers, periodicals, books, international policy regimes, websites and papers of different agencies. To analyze the issue theoretically the paper has framed the overall Climate Change discourse through continuous report in this area. Also, personal observation was put to use in the assessment of the climate parameter. While the review of existing literatures allows us to understand the cause of climate change and also understand the wallop of landscape on the environment.

Study Area



The study was carried out in Akure, the Ondo State Capital in Nigeria. **Ondo State** is a state in Nigeria created on February 3, 1976, from the former Western State. It originally included the present Ekiti State, which was split off in 1996. Ondo state is situated on latitude $5^{\circ}45'N$ to $8^{\circ}15'N$ and longitude $4^{\circ}45'E$ to $6^{\circ}00'E$ in the South-western humid forest of Nigeria (Ogunrayi 2016). Ondo state has a tropical humid climate with two distinct seasons, namely, wet and dry season. The wet season usually lasts seven months starting from April and ends in October (Daniel 2015). According to National Population Commission National Population Commission 2016, the national population projection for the year 1996 and 2000 puts Akure South population and Akure North population at 269,207 and 298,712 respectively. However, a sharp increase was recorded in the 2006 census, at 353,211 and 131,587 respectively (National Population Commission 2006). Most of the basement complexes are sedimentary rocks that have been deeply weathered to produce regolith of several meters deep. These rocks are rich in solid minerals which are yet to be mined [Obeta,2009]. Agriculture (including fishing) constitute the

main occupation of the people of the state. Indeed, Ondo state is the leading cocoa producing state in Nigeria. Other agricultural products include yams, cassava and palm produce.

Discussion

The issue of climate change that is currently engulfing Akure has always been progressive. The length of the rainy season has remained shrinking while the temperature has increased over time. Air temperature is one of the important variables of climate and also a major indicator of climate change (NASA 2015 and IPCC 2001). Records from metroblue climate Ondo, Agroclimatology and Ecological Monitoring unit, and various journals shows that there has been an increase in air temperature and a fluctuation in the rainfall pattern since 1980 (Eludoyin 2016, Daniel 2016, Ogunrayi 2016 Adefolalu 1998.) this indicates that the climate is changing and this continuous change has made it impossible to forecast rainfall for the future. The increase in air temperature have a multiplier effect on the environment, this effect ranges from decreasing and fluctuating occurrences in farm produces such as cocoa, plantain, yam etc. (Sunday and Sekumade 2016) gradual desertification, flooding and erosion. The change in climate is occasioned by urbanization, unplanned population, unemployment and low GDP of the people in the state.

Conclusion

The causes and the effect of climate change are interwoven however this change is caused due to natural and man activities of the present century. The activities of man have led to the introduction of many harmful substances consciously or unconsciously, into the environment and these substances have endangered both living and non-living thing. It has also led to climate deterioration through the emission of greenhouse gases. This greenhouse gases includes carbon di oxide Methane (CH₄) Nitrous oxide (N₂O), Fluorinated gases and other. Studies carried out shows that Carbon dioxide CO₂ contribute about 81 percent of the total gases emitted. This Carbon dioxide can be removed from the atmosphere when it is absorbed by plants through the process of photosynthesis. Plants are major users of Carbon dioxide, therefore making adequate provision for plants in the environment will help in minimizing the amount of carbon dioxide in the atmosphere. Again, Trees not only absorb carbon dioxide from the atmosphere, but also help prevent carbon dioxide emission. This process thus, helps in reducing climate change and its effect. plants have a lot of benefit which includes cooling, shading, windbreak, reducing the ambient temperature this process leads to the modification of the microclimate. The rational use

of soft landscape elements is deep in every corner of the environment and this should adapt to the nature and get harmonized with the man.

Recommendation

Therefore, the following are recommended:

1. Focuses should be place on soft landscape materials and the designers should be able to recognize the different purposes of these materials.
2. Land should be properly utilized for planting of trees because they help in the process of evapotranspiration and are also natural sink of carbon dioxide. These plants in turn provide a habitation for the animals because animals need cooler places in order to survive.
3. Policies should be made and implemented for all facets of construction to embrace green infrastructure in order to reduce emissions of carbon dioxide from building and these polices should also encourage green area up to forty percent of the land.
4. Again, regulations and appropriate check should be put in place on how man is going to interaction with the environment based on agricultural activities. This regulation should also make forest management a key issue.
5. Also, more awareness should be made through television, radio, newspapers and all levels of social media to enlighten the people more on the benefit of green in our environment ranging from improving air quality which in turn improve the quality of life of the people and as to how it will help us in achieving a sustainable environment for the next generation.
6. alternative sources of energy that are environmentally friendly, sustainable and pose no threat to ecological balance and the climate at large should be encourage and put to use.
7. Advent of green technology by scientists that will drastically reduce the emission of other greenhouse gases.
8. Lastly government should make effort in increase the standard of living of the people because this has been one of the major contributors of climate change especially in the underdeveloped and developing countries. The low GDP of families has led to the over exploitation of the environment by man in other to survive.

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