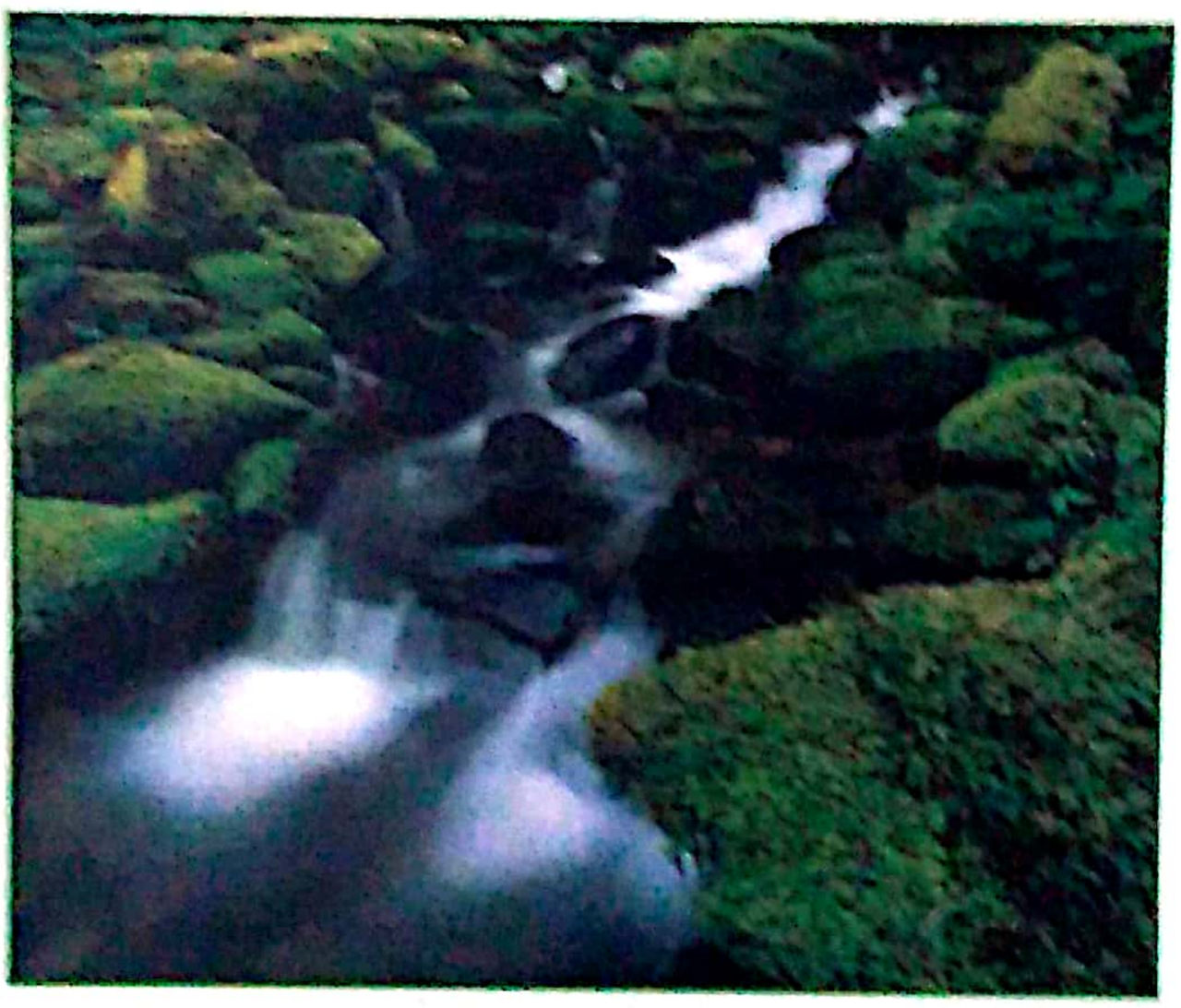
# SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL PROTECTION

(Strategies and Procedures For Developing Nations)




Bells University of Technology, Ota.

Institute for Environment Research and Development

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# &
# ENVIRONMENTAL PROTECTION
## (Strategies and Procedures for Developing Nations)


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# Optimizing Thermal Comfort and Energy Efficiency for Residential Sustainability in Nigeria: A Design Approach

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*Abstract*

*The current situation of global warming and climate change is one of the most critical components of environmental degradation that poses a great challenge to sustainable development in the built environment. In the face of these challenges, the essential role of architecture is still to provide built environment that sustain occupant's safety, health, physiological comfort and productivity. Hence, the building sector has an important role and global potential to help protect the environment as well as increase life comfort and well being.This has therefore brought to the fore the essential consideration of climate in the design of building which has a major effect on the performance of building, its occupants comfort and energy consumption. A study conducted in Bauchi northern Nigeria, shows that in hot dry season, occupants of residential buildings complain of thermal discomfort and this has led to much dependence on the use of artificial energy for indoor comfort. In this study, thermal comfort evaluation of residential buildings within Bauchi metropolis was carried out via both environmental measurements and questionnaires.The study aims to put forward some basic principles that can be used in provision of indoor comfort for sustainable designs in residential buildings especially in hot dry area of Nigeria. Recomendations were given to achieve sustainable architecture in an age of dwindling resources and questionable climatic stability.The paper concludes that architects through design approach should pay maximum attention to designing buildings that can adapt to local climatic conditions in order to provide the needed occupants' comfort while at the same time minimising the use of artificial energy.*

*Keywords: climate change, energy efficiency, residential buildings, sustainable design, thermal comfort.*

## Introduction

Increasing concerns about global warming and climate change present the building industry with a challenge to cut its energy consumption. In many developing countries, the rapid urbanization that is occurring has important implications for energy consumption in the building sector. And as a result, millions of apartments and houses are added to accommodate the growing population in the urban areas, which in turn create new demand for energy to power lights, appliances, heating and cooling systems. Hence, the growing need for energy efficiency in the building sector. According to United Nations Environment Programme (UNEP), energy efficiency is defined as the ability to provide the same (or higher) level of energy services, such as thermal comfort, high quality lighting, etc. at lower energy consumption and cost (UNEP, 2007). Energy efficiency is increased by investing in improvements in the design and the technology used in the building. Energy efficient buildings have higher levels of thermal comfort, greater ability to be operational in the face of energy supply disruptions, and encourage greater productivity of their occupants.

Building design in tropical areas, particularly in warm and humid climate like Nigeria, should aim at minimizing heat gain indoors and maximizing evaporative cooling of the occupants of the spaces so as to achieve maximum thermal comfort (Lawal, 2008). Aside from the fact that the use of building design and proper material specification to directly or indirectly reduce annual active energy consumption is supported by many authors, measures to promote energy efficiency in existing and proposed residential

buildings in the country is also important. However, in Nigeria, there has not been much study conducted to see what can be done in the area of providing thermal comfort and energy conservation in residential buildings (Akande and Adebamowo, 2010). Hence, the lack of climatic adaptation of most residential buildings has resulted to problems of thermal discomfort of occupants and energy consumption within the building. The study aims to put forward some basic design principles that can be used in optimizing indoor thermal comfort and energy efficiency for residential sustainability especially in hot dry area of Nigeria. Meanwhile, the objective is to develop some design guidelines which would enable architects to adopt the appropriate design strategies that are conducive to making better use of the natural environment and resources during the initial conceptual design stage for residential buildings in Nigeria.

## Conclusion

Climate is a principal physical environment factor in the design of buildings and settlement hence, climatic design creates comfortable, energy efficient and environmentally wise buildings. The role of architects in sustainable development is to contribute through designing buildings, which achieve the objectives of sustainability. In order to achieve sustainable development, buildings must be designed inclusive of the concepts of sustainable development. Such buildings will have a positive impact on the environmental, social and economic systems, which will lead to enhancing both the economic well being and environmental health of communities and the quality of life. Therefore, architects should pay maximum attention to design buildings that can be adapted to local climatic conditions in order to provide occupancy comfort while using minimum artificial energy.

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