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# **ENERGY RESOURCE MANAGEMENT IN A FEDERAL SYSTEM**

**CHALLENGES, CONSTRAINTS & STRATEGIES**



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## Climate Change and Green Housing Deployment in Emerging Economies: Insights, Prospects and Challenges for Nigeria

Kazeem Bello Ajide & Oluwatosin Adeniyi

### 38.1 Introduction

Climate change is one of the most challenging global threats. Its damaging effects on human beings, flora, fauna, water bodies and the broader ecosystem can hardly be accurately measured both in terms of its degree and enormity of the cost of its impact. It is widely acknowledged that climate change is largely the result of anthropogenic greenhouse gas (GHG) emissions and, if no action is taken, it is likely to intensify in the years to come. According to the Economic Commission for Latin America and the Caribbean report (2010), 'Human Development Report identifies 2°C as the threshold above which irreversible and dangerous impacts of climate change will become unavoidable . . . we have less than a decade to change strategy and start living within a sustainable global carbon budget identified at 14.5 gigatonnes of CO<sub>2</sub> (Gt CO<sub>2</sub>) per annum for the remainder of the twenty-first century'. Currently, emissions are at twice this level. If these trends continue, the carbon budget will be set for expiry during the 2030s, putting in motion processes that can lead to temperature increases of 5°C or above by the end of this century.

Notwithstanding the acknowledgment that the developed countries contributed largely to the world's current climatic challenge, the impacts of the

dangerous phenomenon are likely to be more profound in developing nations whose mitigating abilities and adaptation strategies are somewhat limited. If not addressed adequately, this could considerably hinder the region's sustainable development and poverty eradication efforts. Consequently, in recent years, addressing climate change has ranked high on the international policy agenda. As indicated in IPCC (2007), there is now a consensus that to prevent global warming from reaching dangerous levels, action is needed to control and mitigate green house gases (GHG) emissions and stabilize their atmospheric concentration within a range of 450–550 parts per million (ppm). The lower bound is widely considered a desirable target and the upper bound a minimum necessary level of mitigation (Stern, 2007). International pressure to control carbon emissions is growing, with countries being encouraged to find 'greener growth paths' – ways to grow while controlling increases in carbon emissions. In the developed economies, green building is one of the key solutions to mitigation of climate change. For instance, the US, OECD/Europe and Russia consume most of their energy in the building sector (about 40 per cent). Energy efficient construction for new buildings, and renovation of existing buildings, can reduce about 40–50 per cent of energy used for space and water heating in buildings. However, if current inefficient building practices continue, buildings could account for 70 per cent of CO<sub>2</sub> emissions by 2050.

Urban areas in less developed countries are projected to house almost all of the world's population increase in the next two decades (United Nations, 2006). Low- and middle-income nations now have three-quarters of the world's urban population. They also have most of the urban population at greatest risk from the adverse impacts of climate change (Satterthwaite, 2008). The extent of risk for cities from extreme weather events depends on the quality of city housing and infrastructure, the extent to which urban planning and land-use management have successfully ensured risk reduction within urban construction and expansion, and the level of preparedness among the city's population as well as key emergency services. Arising from the foregoing is the need to critically evaluate how the deployment of green housing in an emerging economy like Nigeria could assist in mitigating as well as adapting to the potential threat of climate change particularly given her expansive population estimated at more than 150 million.

## **38.2 Climate Change and Housing in Nigeria : An Overview**

### **38.2.1 Stylized facts**

This section presents some stylized background information on the key variables that are likely to drive up the emission of CO<sub>2</sub> and other components that are capable of damaging the atmosphere. Hence, an assessment of constituent components like population, per capita GDP and residential housing characteristics

will be undertaken in what follows.

Figure 38.1 below presents how population has increased consistently over time, beginning from 1970 through 2012. It is discernable from the diagram that Nigeria's population has been increasing steadily and such increase can be attributed, in part, to high birth rates and increased immigrants from the neighbouring countries. People from these countries usually see Nigeria as a country full of opportunities. Apart from this, as shown in Figure 38.2, per capita GDP also maintained an upward trend before sliding downward in 1980 but later picked up in 1988 through 2012. This portends an accumulation of energy consuming devices since more financial resources are available to be spent for their acquisition. This is clearly evident from upward movements of CO<sub>2</sub> emissions from electricity and heating production. The emissions maintain consistent jumps as can be observed in Figures 38.3 and 38.4. This is noticeable both in terms of the proportions of the emissions in the total fuel combustion as well as in million metric tons.

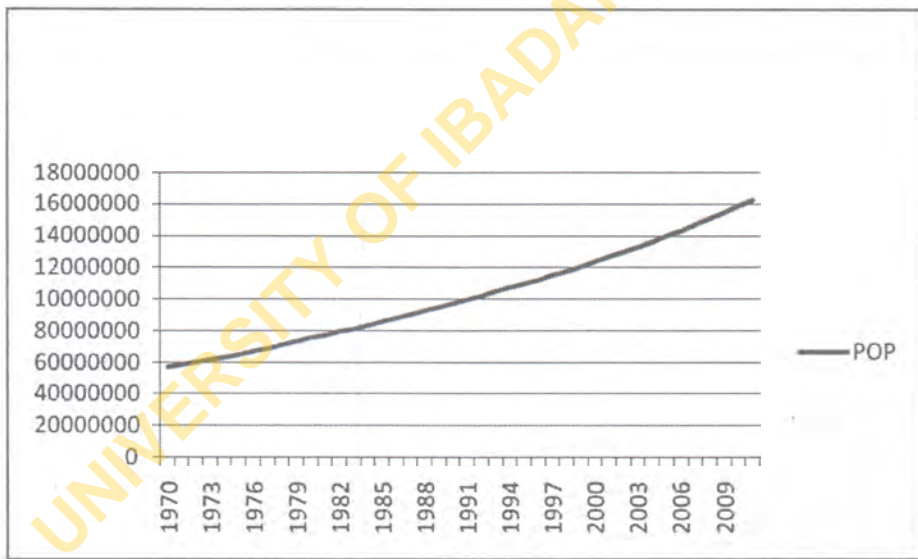


Figure 38.1. Trend of Population in Nigeria (1970-2011)

Source: World Development Indicators (2012)

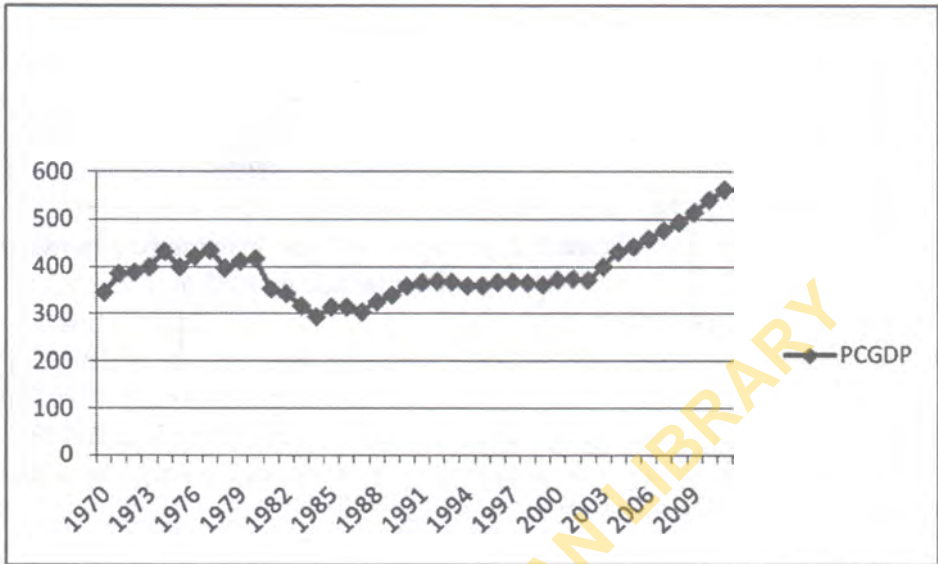


Figure 38.2. Trend of Per Capita GDP in Nigeria (1970-2011)

Source: Same as Figure 38.1

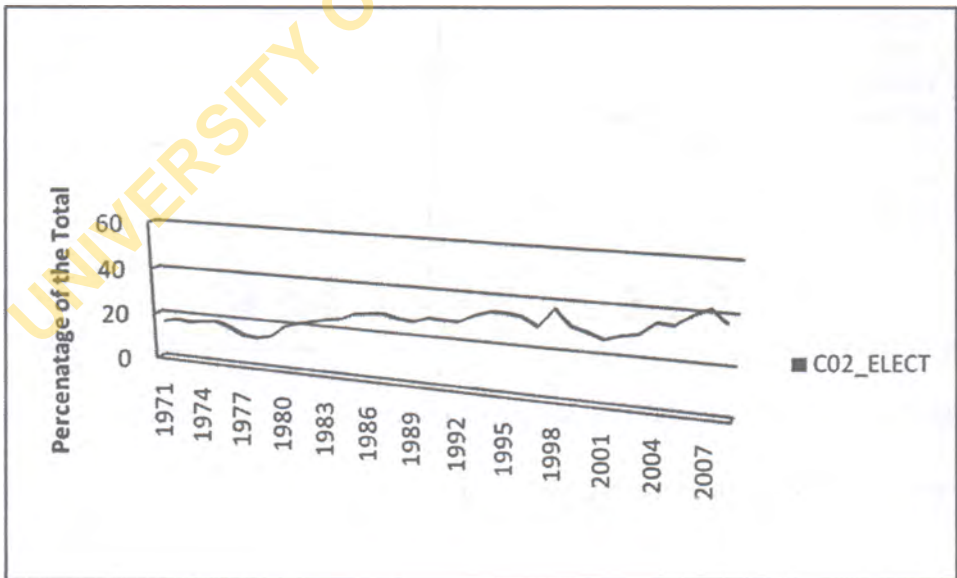


Figure 38.3. CO<sub>2</sub> Emissions from Electricity and Heat Production

Source: Same as Figure 38.1

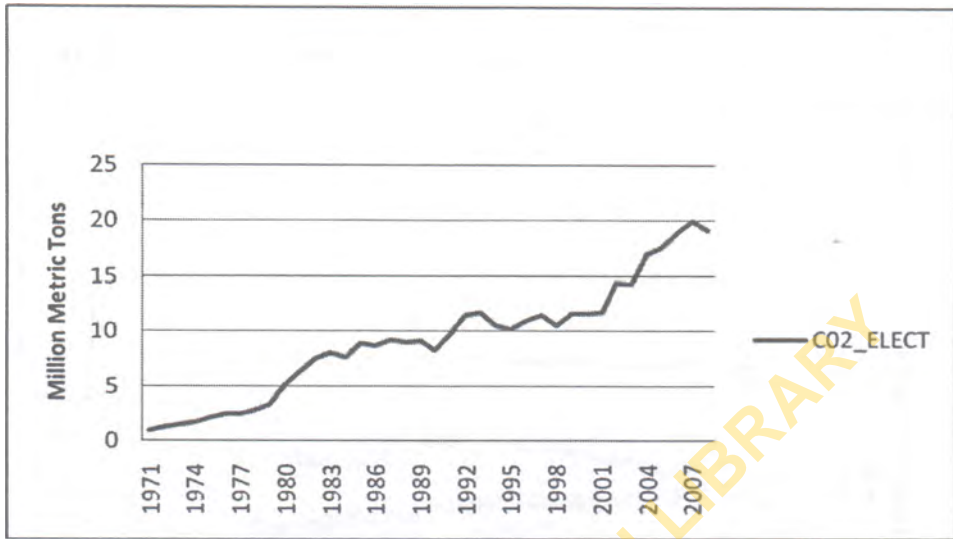


Figure 38.4. CO<sub>2</sub> Emissions from Electricity and Heating Production

Source: Same as Figure 38.1

Apart from the above, Figure 38.5 also presents contributions of various major economic activities to CO<sub>2</sub> emission. Transportation appears prominently as the major contributory economic activity to CO<sub>2</sub> emissions in Nigeria. This is directly followed by electricity and heating production, while the contributions from both manufacturing and residential buildings are small in relation to other sectors. This is not unexpected as the situation simply reflects the poor state of Nigeria's manufacturing subsector and grossly deficient housing supply as against its demand. It is however not out of context to argue at this juncture that most of the electricity and heating production which ranked second in terms of CO<sub>2</sub> emissions, contribution can be likened to have stemmed majorly from both manufacturing and residential buildings.

### 38.2.2 Nigerian residential market and climate change

The Nigerian residential market is dominated by a house on a separate stand or yard, which is about 14,274,444 units of the entire housing stock of 28,197,085 units constituting about 50.6 per cent. This is directly followed by traditional/hut structure which claims about 14 per cent of the housing stock. The distribution of room/let-in house is also substantial, given the number of units (3,861,592) but the least in the distribution comes from informal/improvised dwellings and those categorized as 'others' constituting 0.6 per cent and 2.0 per cent, respectively

(details can be obtained from priority table, 2006). The distribution of the housing units into various categories has implication for energy usages as well as their eventual emissions of CO<sub>2</sub>.

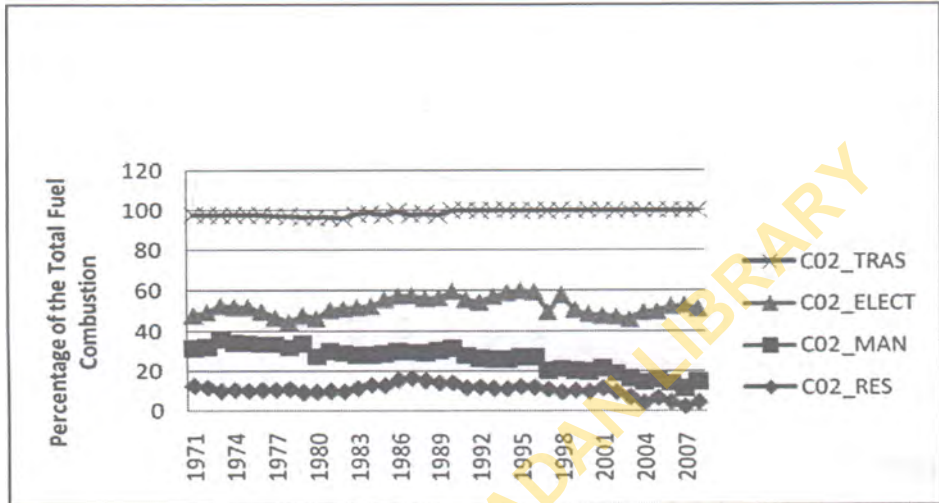


Figure 38.5. Trends of CO<sub>2</sub> Emissions from Transport, Electricity and Heating, Manufacturing and Residential in Nigeria (1970-2008)

Source: Same as Figure 38.1

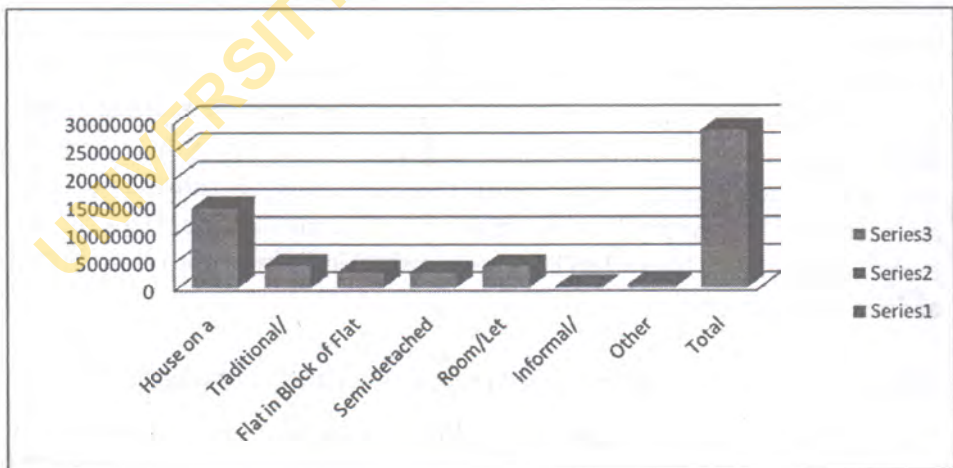


Fig. 38.6. Type of Housing Units in Nigeria

Source: Nigerian Census Priority Table Data (2006)

The characteristics of the housing units will be examined by the type of materials used for the wall, roof, floor, cooking fuel and lighting fuel. It is observed that cement bricks remain the most widely used walling materials accounting for 48.3 per cent of the entire housing stock of 28,197,085 housing units. This is followed by mud or reed wall with about 38.5 per cent. The rate of usage of wood/bamboo (6.8 per cent) is more than that of metal/zinc sheet (3.8 per cent). Also, Figure 38.7 reveals that cement/concrete is used in more than 50 per cent of the housing units while 36.6 per cent are floored using earth or mud bricks. This simply suggests that over 85 per cent of houses in Nigeria have either cement or earth brick floors. By implication, houses in Nigeria have not attained high level of modernization as suggested by the type of materials used for flooring. Nevertheless, modern materials used for flooring of houses like ceramic/marble tiles, terrazzo and vinyl tiles are now increasingly being used by house developers or estate managers as the case may be.

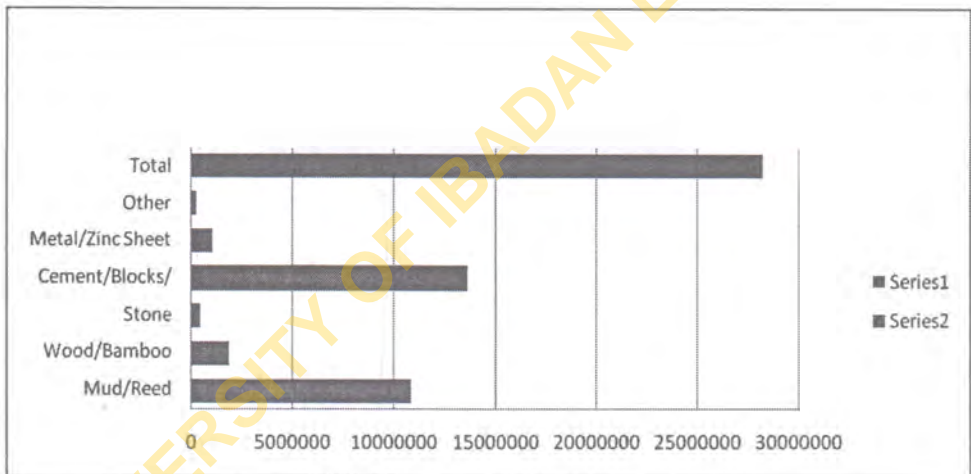


Figure 38.7. Housing Units in Nigeria by the Type of Walling Materials

Source: Same as Figure 38.6

It is observed that the predominant type of roofing sheet in use in Nigeria is the corrugated metal sheet which claims as much as 47.3 per cent of the entire housing units. It is also interesting to note that the use of thatched roof is far higher than that of slates/asbestos while thatched roof has as much as 15.8 per cent, asbestos has only 10.2 per cent. The use of wooden/bamboo, earth/mud and cement are also substantial given their number in the total housing stock. Figure 38.9 reveals that firewood and kerosene provide the main cooking fuel type used extensively by households in Nigeria. In concrete terms, 57.0 per cent of households make use of

firewood while 28.7 per cent use kerosene for cooking. All together, over 80 per cent find firewood and kerosene more accessible and affordable to use over other available alternatives.

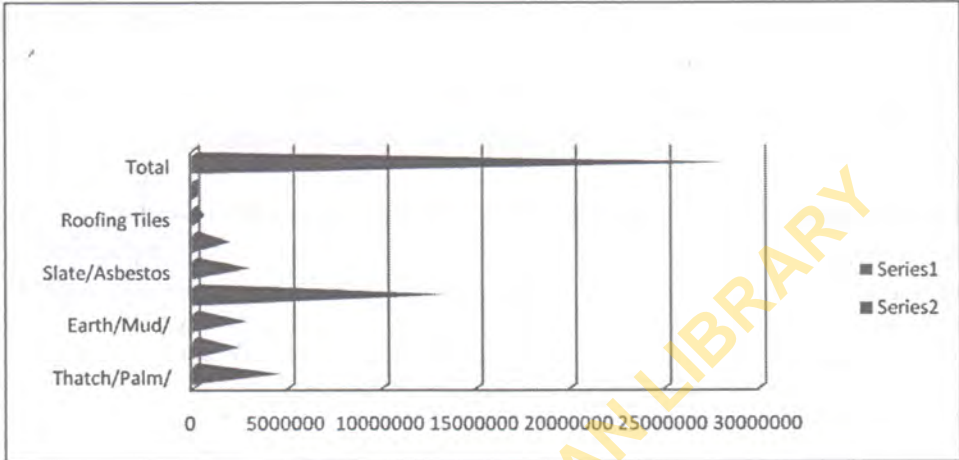


Figure 38.8. Housing Units in Nigeria by the Type of Roofing Materials

Source: Same as Figure 38.6

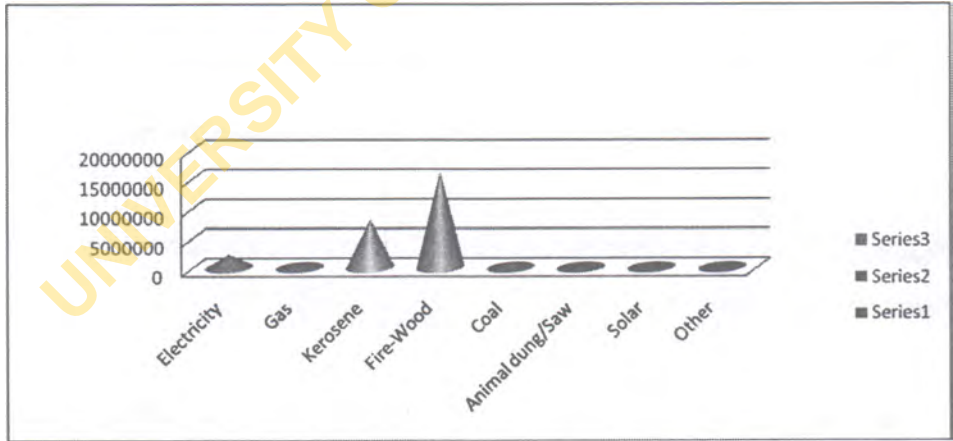


Figure 38.9. Housing Units in Nigeria by the Type of Cooking Fuels

Source: Same as Figure 38.6

The distribution of households by the type of main lighting fuel in Nigeria is presented in Figure 38.10. It reveals that 58.2 per cent of the households use kerosene as their main fuel for lighting. A possible explanation for this may be the incessant failure of electric power supply by the Power Holding Company of Nigeria (PHCN) which is the sole supplier of electricity in Nigeria. Another main source of lighting in Nigeria is through electricity which accounts for as much as 37 per cent of the entire lighting fuel types. The use of gas and candle also serve useful purpose as far as lighting is concerned in Nigeria. The use of solar is quite negligible as it only accounted for 0.3 per cent of the entire source of lighting fuel types in the country.

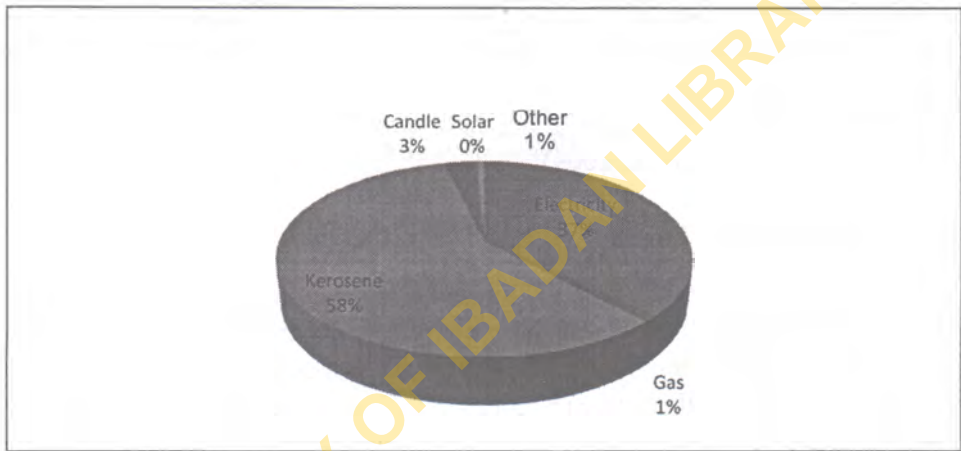


Figure 38.10. Housing Units in Nigeria by the Type of Lighting Fuels

Source: Nigerian Census Priority Table Data (2006)

### 38.3 Insights from International Experience<sup>1</sup>

The European Union (EU), United States of America and China are the prototype markets for green residential buildings development. Therefore, insights from these countries are succinctly provided in turn.

#### 38.3.1 The European Union

Some 40 per cent of the EU's energy is used in the building sector and accounts for 38 per cent of its emissions with a saving potential of 55 per cent (Osterkorn, 2008). By 2020, the EU aims to reduce CO<sub>2</sub> emission by 20 per cent, improve energy efficiency by 20 per cent and consume 20 per cent of energy from renewable resources. There is a target for each member state to make all new building a passive house or

zero-energy house by 2015. Energy performance certification will be set for new and existing buildings. These goals are ambitious. Progress has been made in some EU member states. For instance, Germany, UK, France and Denmark have broadened the scope of their building codes to all building types including refurbishments. Each member state has different regulations to meet the EU target requirements. For example, Denmark requires all new buildings to reduce energy consumption by 25-30 per cent. The subsidies and incentives for efficient gas boilers and efficient windows have helped green innovation products penetrate the market in Denmark. In Germany, upgrading old boilers installed before 1978 with highly efficient new boilers is compulsory with a subsidized loan through the KfW scheme. In Portugal, legislation includes mandatory use of solar heaters in all buildings (Baden et al., 2006). Green building, particularly refurbishment, offers a huge opportunity for growth in green jobs. In the UK, it is estimated that a refurbishment programme of half a million homes per year in the domestic sector alone could create 50,000 jobs (UK Green Building Council, 2009).

### 38.3.2 The United States

In the US, construction is the second largest industry accounting for 8 per cent of GDP. It is set to make all new building carbon neutral or zero emissions by 2030, improving new construction efficiency by 50 per cent and existing building efficiency by 25 per cent. This will start with federal government buildings and plans are underway to increase federal building energy efficiency by 40 per cent within five years through retrofit. Meanwhile, there is also supply of financial support for the retrofits of low-income homes (Osterkorn, 2008). The USGBC Green Jobs Study, by consultant company Booz Allen Hamilton, shows that green building and energy efficiency industries supported more than 2 million jobs and generated more than \$100 billion in gross domestic product and wages in the US during 2000-2008 (USGBC, 2009). With new regulation to cut energy use and apply more renewable energy and the financial crisis between 2008-2009 promoting energy users to cut costs, there is an increase in job opportunities in the green building industry. Energy auditors, renovation builders, green building trainers and energy efficiency project managers have all seen an increase in job opportunities. The number of green jobs is increasing, mainly from construction of new non-residential commercial and healthcare buildings. Builders, plumbers, electricians and service technicians all see the evidence of increasing opportunities in the job market. It is predicted that renewable energy and energy efficiency industries will create at least 16,000 jobs. They will be worth about US\$1,900 billion in 2030 (Bezdek, 2007). Green innovation is perceived as contributing to the solution for the US to recover from the financial crisis of 2008-2009.

### 38.3.3 China

The building sector is China's 4th largest industry, contributing about 8.9 per cent of GDP. The Chinese government set the goal to reduce energy consumption in the 11th five-year plan (2005-2010). It targeted reduction of building energy consumption by 50 per cent; improvement in the energy efficiency of government institutions by saving 10 per cent energy per unit construction area and per capita; and reduction in electricity consumption of appliances by 29 billion kWh (Osterkorn, 2008). The Ministry of Housing and Urban-Rural Development, the Ministry of Finance, and the National Development and Reform Commission have passed some laws and regulations on building standards over the past few years. Six key areas are focused on to promote energy efficiency. State and local government supply financial support for a range of demonstration projects in some major cities (The Climate Group, 2009). EMC is an active private company in China which has been involved to develop energy-efficient green buildings.

## 38.4 Climate Change and Green Housing: Insights, Prospects and Challenges

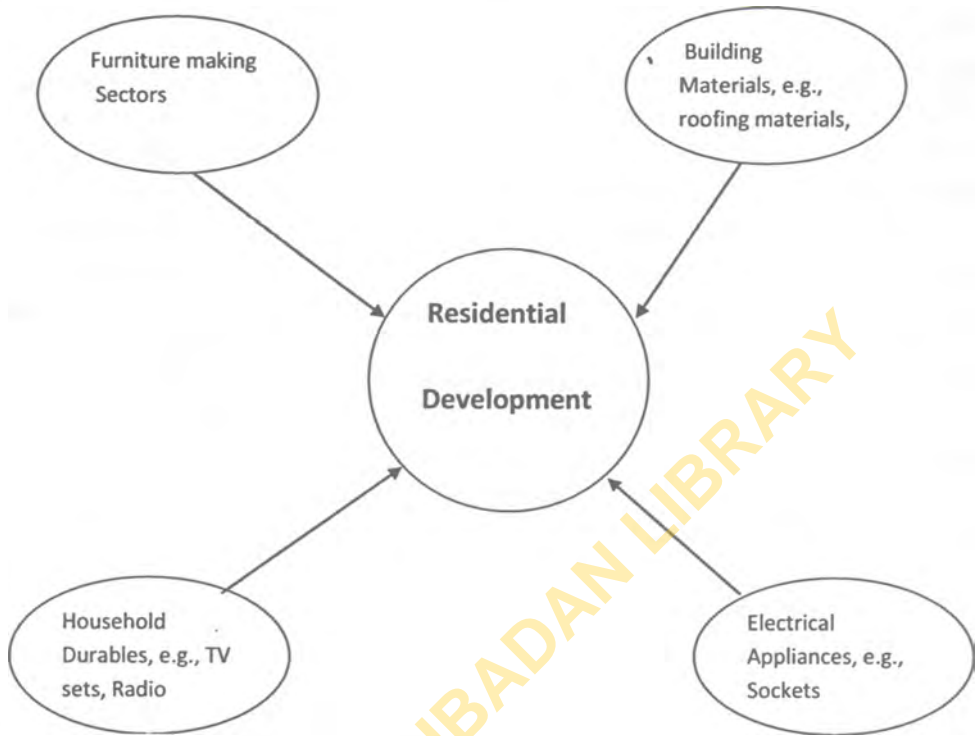
### 38.4.1 Insights on residential development and climate change

The schema depicts how residential development promotes emissions of CO<sub>2</sub> thus contributing to climate change. The process of residential housing construction and reconstruction determines, to a greater extent, the level of environmental degradation. From the diagram, for instance, the types of residential development determines the type of building materials to be used (in terms of roofing, walling and flooring materials), the type of furniture used (whether wood or metal materials), households durables used (e.g., type of television sets, radio sets etc) and types of electrical appliances (e.g., sockets). The types of materials of which any of the aforementioned are made up of, will determine both the extent of energy usage and level of CO<sub>2</sub> emission.

### 38.4.2 Prospects for green housing in Nigeria

Observance of underlisted points can make green housing deployment achievable in Nigeria.

- i. *Green Growth and Economy.* The issue of climatic change and green house gas has made green growth and green economy imperative. Keeping abreast with development in the world, makes it easier for green economy to be deployed with minimum amount of effort. Green economy and growth remain critical policy issues among countries in the world. In order not to be left behind every country, Nigeria inclusive, is also striving hard to promote green growth and green economy



Schematic Illustration of Residential Development as key components of energy releasing source

respectively. With the global drive to promote green, the probability of buying into green residential building is likely to be high.

ii. *Renovation of Existing Housing Stock.* Apart from encouraging the full installation of energy efficient materials for the construction of new residential dwellings, the existing housing stock might as well be renovated so as to comply with the specifications of green residential buildings. With this type of arrangement in place, it will become easier to achieve green residential housing in not too distant future.

iii. *Registration of New and Existing Housing Stocks.* There is a high likelihood of achieving green residential housing to mitigate the effects of climate change if efforts are made to register all available housing stocks in each locality. It is one medium through which green residential buildings can be achieved. In this way, it will become possible to monitor any housing stock that is yet to comply with residential building requirements.

iv. *Appropriate Sanctions against Flouting Development.* Laws should be enacted to

deal with any official that fails to comply with laid down regulations concerning green residential housing. Once these are codified and defaulters are made to face the consequences, this will serve as a deterrent to others who might wish to flout the laid down rules and regulations.

v. *Development of Parallel Market for Energy Efficient Building Markets.* Energy efficient market for building materials should be created outside the conventional market. The development of this type of market makes it easier to be patronized and hence ease green residential housing deployment.

### 38.4.3 Challenges to Green Housing in Nigeria

The following constitute threats to green housing deployment in Nigeria:

- i. *Prevalence of Corruption among the Enforcement Officials.* Strict adherence to the residential building codes and designs requires corruption-free officials who would ensure full compliance without any fear or favour. If green residential buildings are to be fully operational, this requirement is imperative. Corruption has become commonplace in Nigeria. Thus, for green building to be achieved, efforts should be geared towards eradication of any form of corrupt practices or other corruption-related offences. Otherwise, all the efforts will be an exercise in futility.
- ii. *Predominance of Illiterates.* The bulk of people in Nigeria are illiterate. For a green programme to yield the required results, people need to be enlightened. Not until this is achieved, the programmes might not be able to yield the expected results. Problem of illiteracy poses a serious challenge for achieving green residential buildings. In countries where green residential buildings are to be fully operational, the problem of illiteracy would have to be drastically reduced, at least people should be able to read and write.
- iii. *Inordinate Ambition of Private Housing Developers to Maximize Profits.* Another serious challenge that may be encountered has to do with the inordinate ambition of private housing developers to maximize profits. Majority of private developers are mainly interested in maximizing profits not minding how it comes about. This situation clearly explains the several cases of collapsed buildings currently facing the country. Usually, developers appear to be fond of using cheap materials for the construction of houses in order to reap a wide margin of profits. This decision is often taken at the expense of people whom the houses are constructed for.
- iv. *Inadequate Budgetary Allocation to the Sector.* For green residential building to be achieved, government should be focused and purposeful so that

meaningful progress can be recorded. For several decades, Nigerian budget has not been channelled towards provisions of both economic and social goods but rather highly skewed towards defence expenditure and government recurrent expenditures that do not seem to contribute meaningfully to economic progress.

### 38.5 Conclusion

This paper presents a narrative on climate change and the deployment of green housing in Nigeria. It specifically focuses on the insights, prospects and challenges arising in the context of an emerging economy like Nigeria. Several aspects of the prospects for green housing in Nigeria were dealt with namely: the linkages between green growth and the broader economy, renovation of existing housing stock, issues bordering on the registration of new housing, sanctioning mechanisms via appropriately enacted legislation among others. In terms of challenges, prevalence of corruption in enforcement agencies, low literacy rates, insufficient budgetary allocation are key factors highlighted. Moreover, a flavour of international best practices was also gleaned from the distinct experiences of China, the EU and the US. In conclusion, the budget should be canalized towards provisions of both economic and social goods that make significant contribution to economic progress.

### Endnote

1. The section is drawn largely from the report by Fangzhu Zhang and Philip Cooke on 'Green Buildings and Energy Efficiency'.

### References

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