

POTENTIALS OF WOOD AS A SUSTAINABLE CONSTRUCTION MATERIAL IN NIGERIA

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ABSTRACT

Emphasis on how to strategize the adaptation of developmental policies into the mainstreamed of Vision 2020:20 as propose by Nigerian Government, with the building sector having a greater potential to reduce CO₂ emission. Currently 40% of global resource consumption is as a result of building construction. The main goal is to optimize the environment performance of a building using a life cycle approach, in which most green building rating system are also trying to adopt and incorporate as well. Through a literature review of life cycles of various construction materials, it shows that solid wood is a very energy efficient raw material. Solid wood processing is environmentally friendly and should be relatively free of pollution. The energy efficiency of wood was confirmed that solid wood building products are ten to thirty times as energy efficient as the equivalent non-wood substitutes (steel, concrete, etc.). The paper conclude by emphasising on the need for creating awareness and establishing policies that would encourage the use of wood as a sustainable building materials against non-wood substitutes in Nigeria in order to continue greening the earth.

Keywords: Awareness, Construction Material, Nigeria, Sustainability and Wood

INTRODUCTION

There are environmental concerns that the atmospheric release of carbon from the use of fossil fuels will result in global warming. There are uncertainties about the size and life of the remaining reserves of fossil fuels (especially oil). Will the world's oil reserves last another 25, 50 or even 100 years? Although it is important commercially to know how long fossil fuels will last there is no uncertainty that fossil fuels are a finite resource. Their continued use is unsustainable. Once used, it will be millions of years before fossil fuels are formed again. Wood - The World's Most Sustainable Raw Material - Wood use does require tree harvesting but it is possible to harvest trees in an environmentally responsible manner (Sutton, 2003). Sustainability concerns have led to efforts to reduce consumption. However, consumption is a key driver of an economy.

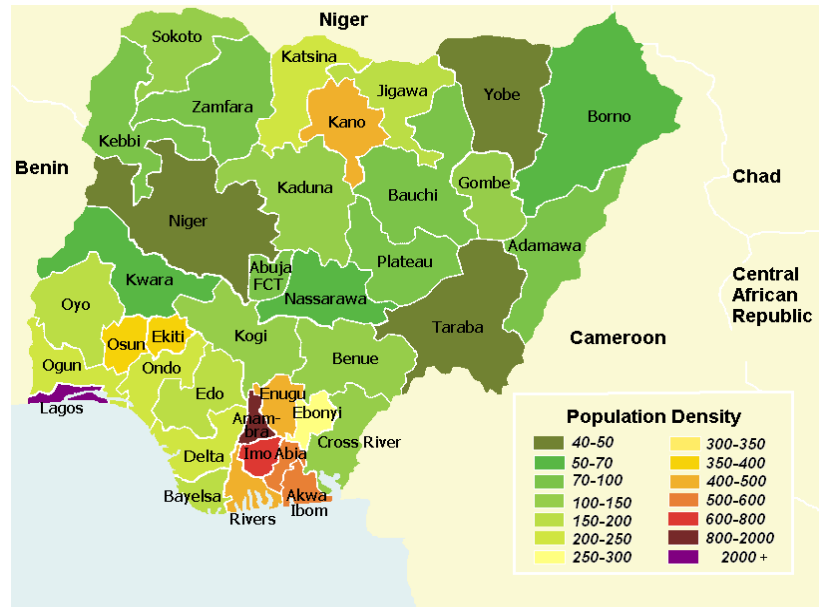


Figure 1: The Map of 36 States of Nigeria and the 6 Geopolitical Zones

Because economic growth requires increased consumption it is difficult for democratic Governments to act. Consumption is only a problem if we consume unsustainable (finite) resources: Consumption should not be a problem if we consume renewable resources. Fossil fuel use results in permanent additions of atmospheric carbon. In contrast, wood use can result in no long term increase in atmospheric carbon. Provided most of the world practices Sustainable Forest Management (SFM) the carbon released into the atmosphere by the use of wood is quickly requested by the regenerating forest. SFM, in both natural occurring and created (planted) forests, will ensure a continual and increasing harvest of wood. Wood should be increasingly promoted as a renewable and environmentally friendly raw material.

BACKGROUND

Sustainability and Sustainable Development

Sustainability involves two domains that should not be ignored or over simplified: economic/environmental on the one hand, and socio/cultural on the other. The question that should be raised at this point is: are architectural programs structured in a manner that is based on the above objectives of sustainability and sustainable development? The following section is devoted to this question.

Paradigm Change: Shifting Attitudes about the Environment

There has been a trend in the past decade to introduce a new paradigm of thinking about the manner in which architects, urban designers, and planners approach the design of built environments. This new paradigm places emphasis on the concept of sustainability, a concept that should become the focus and goal of architectural education worldwide

How Sustainable is Wood Production?

To maintain (and hopefully improve) average living standards the world has no option but to increasingly shift from its dependence on fossil fuels to environmentally friendly sustainable /renewable energy sources. Earth's sustainable /renewable energy sources are:

- The sun - solar energy (includes hydro and wind),
- Geothermal - heat from the earth's inner core,
- Tidal - from the gravitational pull of the moon's rotation on the oceans, and
- Nuclear.

Nuclear energy as currently supplied (from the controlled breakdown of the unstable atomic nuclei of U 235) cannot really be regarded as a sustainable and renewable energy source, e.g. Japan. The energy efficiency of wood was confirmed by an American study (Koch 1992) that established that solid wood building products are ten to thirty times as energy efficient as the equivalent non-wood substitutes (steel, concrete, etc.). Solid wood is a very energy efficient raw material.

Solid wood processing is environmentally benign and should be relatively free of pollution. Because it takes energy to breakdown solid wood into wood chips or fibres and then to recombine them, reconstituted wood products such as wood pulping (especially mechanical pulp), particleboard, medium density fibreboard, etc. are not as energy efficient as solid wood. Especially in the last few decades, wood substitution has increased. Probably every one of 100,000 different products made from wood could be substituted by a metal, concrete, plastic or ceramic product. As all wood substitutes require more energy and involve a more polluting process, a greater use of wood would reduce both energy use and pollution.

Sustainable Construction Materials

Of all the points that a building project may earn under the U.S. Green Building Council's LEED rating system for construction, building, and design, perhaps none is more heavily contested than that for sustainable wood. From its first iteration in 2000, LEED has used one standard as a benchmark for allocating sustainable wood points, that of the Forest Stewardship Council (FSC), an independent, nongovernmental, not-for-profit organization with international offices in Germany. At present, if half of the cost of all wood-based materials and products in a building meets FSC criteria, that project can earn one LEED point. If 95 per cent or more of the wood is FSC certified, there is an opportunity to earn two points. The USGBC's Materials and Resources

Sustainable Materials

This are 'materials and construction products which are healthy, durable, resource efficient and manufactured with regard to minimizing environmental impact and maximizing recycling' (Edward, 2005).

Table 2: Green Building Index (GBI) Malaysia Criteria for Rating New and Old Buildings

Part	Item	NRNC	NREB
1	Energy Efficiency (EE)	35	38
2	Indoor Environmental Quality (EQ)	21	21
3	Sustainable Site Planning & Management (SM)	16	10
4	Material & Resources (MR)	11	9
5	Water Efficiency (WE)	10	12
6	Innovation	7	10
	Total Score	100	100

Source: www.greenbuildingindex.org

In rating both New and old buildings in most of the rating system, points are awarded to building materials for almost all rating system this shows that wood can be harness and has shown the importance of wood. The table above shows an example of how points are allocated to the use of Materials and Resources for Non Residential New Construction (NRNC) 11 points and Non Residential Existing Buildings (NREB) 9 points are awarded. Likewise other aspect of the criteria in the rating systems, wood can find a place which it can suite or assist in gaining points

The Carbon Question

The following discussion could imply that the atmospheric carbon from wood use is somehow different from the atmospheric carbon that comes from the use of fossil fuels. While there is no chemical difference, there is a major difference in the rate at which carbon is subsequently reabsorbed. In the last 100 years, the concentration of carbon dioxide in the atmosphere has increased. This increase is (and will) probably adversely affect the global climate. Because of the burning of fossil fuels, the manufacture of cement, the destruction of forests, etc. human activity has been the major contributor to the increase. Although both fossil fuels and wood are essentially stored solar energy they have different origins and their use has different effects on the net levels of atmospheric carbon.

Fossil fuels slowly accumulated over hundreds of millions of years in the crust of the earth. When the carbon in fossil fuels is released into the atmosphere, which carbon will effectively stay there for millions of years until it is requested? The carbon in wood was sequestered in the decades or centuries before the extraction of the mature tree. With sustainable forest management the fate of carbon released by the burning or decaying of wood should not be equated with carbon coming from fossil fuels.

METHOD

A case study of two prominent cities in Nigeria, Lagos and Abuja were examined to its full potential in achieving one of the possible solutions to climate change and reduction in carbon release to the atmosphere '*green building*'.

RESULT AND DISCUSION

Wood comes from trees. Most trees grow in forests. These forests can be natural (including managed natural forests) or deliberately created forests – planted forests. Is it possible to supply all the wood requirements of the world from planted forests? No, there is currently too small an area of planted forests. Estimates of the current supply of industrial wood that comes from existing planted forests vary from 20% (Sutton, 1999) estimates to 35% (ABARE, 1999). The percentage of the world's saw logs that comes from planted forests (i.e. for the manufacture of solid wood products) is by my estimate less than 10%. Over millions of years, any existing forest ecosystem has survived countless natural catastrophes - disease, fire, hurricanes, volcanic eruptions, tsunamis, and even thousands of years of ice ages and other climate changes. The study of how forests survive and recover from even the powerful natural disasters demonstrates the resilience of forest ecosystems. Where only a part of a forest is altered or damaged complete forest recovery is almost always possible.

There are countless examples throughout the world of forest recovery following harvesting. It is doubtful if there is a single example of long-term permanent forest damage following any responsible harvesting operation.

Potentials of Sustainable Buildings with Wood in Nigeria

Nigeria is a country of huge potential, with vast human and natural resources (especially wood and other materials that can supplements wood for construction purpose) with a huge deficit of over 2 million housing unit in both urban and rural area and the need for major infrastructure to be put in place for it plan to be developed nation there is great potential for the construction and establishing green buildings in which wood can be major resources material for construction



Wood finished Building in Nigeria
www.googleimages.com.my



Wood finished Building in Nigeria
www.googleimages.com.my

Figure 2: Various Buildings with Wood Finishing Source; (Google Images)

CONCLUSIONS

Energy is one of our largest resource needs. Of the sustainable energy resources the sun is by far the most important. An environmentally friendly alternative for capturing and storing solar energy is through photosynthesis and the growing of wood. Because it is a sustainable raw material, wood use will help us to maintain consumption and employment. Because of wood's sustainability and environmental friendliness there must be greater efforts to promote wood use. There is also the need for more research and innovation in the development of new wood products. Wood is very versatile - being used for perhaps as many as 100,000 different products. Nigeria is yet to be at the forefront of climate change policy forum at regional and international levels despite the alarming effect of changing climate on lives and livelihoods across the 6 geo-political zones.

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REFERENCES

- ABARE (Australian Bureau of Agriculture and Resource Economics) and JaakkoPöyry Consulting 1999: Global Outlook for Plantations. Research Report 99.9 ABARE, Canberra, Australia.
- Edward, B. (2005). *Rough Guide to Sustainability*; London, RIBA Enterprises Limited. 2nd Edition.
- Koch, P. (1992). Wood Versus Non-wood Materials in Residential Construction: Some Energy Related Global Implications. *Forest Products Journal* 42 (5): 31-42.
- Sutton, W.R.J. (2003). Wood –The World's Most Sustainable Raw Material UNFF Inter-sessional Experts Meeting on the Role of Planted Forests in Sustainable Forest Management, 24-30 March 2003, New Zealand.
- Sutton, W.R.J. (1999). Does the World Need Planted Forests? *NZ Journal of Forestry* 44 (2): 24-29.
http://www.google.com.my/search?hl=en&sugexp=les%3B&cp=11&gs_id=1f&xhr=t&q=nigerian

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