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EVALUATION OF ECOLOGICAL FOOTPRINT OF HOUSING BY HOUSEHOLDS IN MINNA, NIGER STATE

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ABSTRACT. This research is aimed at evaluating the household ecological footprints(EF) within the residential developments in the city; the following objectives; estimate the ecological footprint of the housing by households, estimate the size of dwellings, appraise the construction materials used, determine the household energy sources and estimate the ecological footprint of Minna. This research was conducted through an empirical survey that requires structured questionnaire that established the calculation of EF and bio-capacity potential of Minna. The procedure involved in the calculation of the EF of Minna through the EF calculator to estimate the total consumption for all the components of the EF by households (usually in tonnes), conversion of the resources consumed to EF (gha) and calculating EF per capita (gha). Electricity consumption account for 25.0% (45,770,538.75 GJ) of the total energy in the city that is usually demanded for lighting and cooking (PHCN, 2012). An extra 12,992,086GJ of energy is used for embodied energy within the building construction and maintenance in Minna. Concluding, therefore, Urbanization has become the cornerstone of globalization; cities must therefore play a greater role in determining sustainability potentials of any society.

Keywords. Ecology, Ecological Footprint, Housing, Energy, Household.

INTRODUCTION

Several problems emanate from the issue of sustainable development which is prerogative to this research. The first of the problem of sustainable development that relates to the consumption of resources is the level of consumption of such resources. Theories have proved that resources on the earth are constant and require proper management so as to be able to cater for the need of the present and future society (Adams, 2006; Satterthwaite, 2011; Brown et al., 2007). This research is aimed at evaluating the household ecological footprints(EF) within the residential developments in the city; the following objectives were also set; estimate the ecological footprint of the housing by households, estimate the size of dwellings, appraise the construction materials used, determine the household energy sources and estimate the ecological footprint of Minna. Minna is situated at latitude 9 0 37' North and longitude 60 33' East. The northeast part of the city has a rock outcrop that act as physical constraint to development (Minna Master Plan 1980). But the event of urbanisation has led to the encroachment of the basement of the hill for urban development. The city of Minna has grown from a mere settlement to a city that now has a dual function of Niger State capital and the headquarters of Chanchaga Local government. Due to expansion of the city Minna has now annexed part of Bosso Local Government.

RESULTS AND DISCUSSION

Ecological Footprint Calculation for Housing by Households

This section of the research estimates for the EF of housing in Minna. This involves calculating the land enclosed by housing in addition the area that is part of the house including courtyard, garden and garage. Also the forest area utilized to supply building materials and the embodied energy used for the construction and operate the houses. Table indicated the land types that make up the EF for housing in Minna:

Housing and Sustainability of Minna

Buildings EF is the largest energy flow in Minna urban metabolism (235,050,499 GJ). Electricity consumption account for 25.0% (45,770,538.75 GJ) of the total energy in the city that is usually demanded for lighting and cooking (PHCN, 2012). An extra 12,992,086GJof energy is used for embodied energy within the building construction and maintenance in Minna. Residential buildings account for 50% of electricity demand and land area for construction in the city. The total CO2 emissions from building, operating energy using electricity is 217,412.71tonnes, larger percentage is associated with residential dwelling operations. The amalgamation of CO2 emissions associated with the embodied energy of the dwellings in Minna compared to the lifespan of the buildings indicated that the total CO2 emission of the house construction materials increases annually. The residential land-use is simply divided into the densely populated area of the city, which comprises the inner city and the older suburb, this shoe that the EF is lower compared to the sparsely populated area which comprises of the urban fringe and the newer suburb. This is due to high distance covered on a daily basis as the distance to city centre also indicated that moderate distance has a higher EF than the nearer places in the city center. Furthermore, the type of dwelling also indicated that households with single family house (usually at the fringes) has a higher EF than the households living in the other types of housing such as tenement, terrace, block of flats and row building.

CONCLUSION

Urbanization has become the cornerstone of globalization; cities must therefore play a greater role in determining sustainability potentials of any society. This research initiates a detailed measurement of micro EF in developing countries. Urban metabolism and EF analysis for an African country is examined. Explanation of the component approach in the methodology for local EF analysis based local consumption. The use of component method for estimating the sustainability potential of low income countries more effectively is favoured to address local capabilities and benefits within sustainability potentials of the people. Cities are the leading form of human habitat in the 21st century, and nearly 75.0% of the global resources are either directly or indirectly consumed within the cities. The research has proved that within cities, income is highly correlated with consumption, but urban morphology and management policies adopted by the government at all levels also perform a significant role in the process of resource consumption. A two way method need to focus on urban sustainability that try to reduce overall consumption (EF) and the ethical and moral responsibility of higher income consumers to reduce their personal consumption, is emerging in the urban sustainability literature (e.g., Newman and Jennings, 2008; Holden, 2004; McGranahan and Satterthwaite, 2003; Karr, 2000). However, as one of the low income city in the world, Nigerian cities have been slow to adopt EF that checkmates urban consumption with available bio-capacity. The EF of Minna footprint in 2013 is 1.096 gha. Minna city dwellers have an average EF that is lower than the national average of 1.44 gha/ca in Nigeria and nearly three times lower than the world average bio-capacity demand, estimated at 2.70 gha/ca. The analysis of the bio-capacity of Minna indicated that its bio-capacity is lower than the global per capita bio-capacity supply, estimated at 1.8 gha/ca (GFN, 2010). In other words, if everyone in the world consumed at the rate commensurate with that of an average inhabitant of Minna, the world will be sustainable because it will take 14 months to consume the resources of the world and sequestrate the CO2 so produced and will definitely support a lifestyle. The use of the direct component method of estimating EF limits comparison with national level because the compound method is usually used to estimate the national EF.

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