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Assessment of Human Development Status and Personal Ecological Footprints of Residents of Ile-Ife, Nigeria

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Abstract
This study assessed the human development status (level of education, health and standard of living) – HDI, and personal ecological footprints (indicated by food consumption pattern, frequency of travel, energy consumption, strength of home installations and environmental friendliness of purchased life supporting materials) – PEFP of residents of Ile-Ife, Osun State, Nigeria and determined the relationship that existed between these two variables. These were with the view to providing a baseline information that could guide further studies on how to reconcile human development with ecological sustainability of Nigerians, especially those of the educational advantaged Southwestern Nigeria. The study employed the survey research design to collect data on human development status (HDS) as a measure of HDI, and the PEFP of the respondents to the study. The data collected were analysed using the arithmetic mean, Geographic Information System packages and correlation statistics. The results showed that the residents' HDI of 0.68 was higher than the United Nations developmental categorization of 0.5 for Nigeria; their personal ecological footprint was not statistically significant (2.45 ± 0.18, $p>0.05$); and the relationship between the Human Development Status and Personal Ecological Footprints of residents was not statistically significant ($r = 0.31$, $p>0.05$). It concluded that further studies will be needed to confirm this study in the educationally advantaged Southwestern Nigeria on a larger scale.

Keywords: Assessment; Human Development Status; Personal Ecological Footprints; Residents; Ile-Ife; Nigeria

1. Introduction

In environmental science, two factors are regarded as the main indices of sustainable development. These are Human Development Index (HDI) and Ecological Footprint Index (EFPI). These indices are referenced to defined standards that are provided by agencies that promote matters of sustainability such as the United Nations Environment Programme – UNEP, United Nations Development Programme – UNDP and Global Footprints Network - GFN, to mention but few. Lazarus, Zokai, Borucke, Panda, Iha, Morales, Wackernagel, Galli and Gupta (2014) remark that an HDI higher than 0.8 is considered high human development, while an Ecological Footprint of less than 1.8 global hectares per person makes a country's resource demands globally replicable. According to Lazarus *et al,* it is when these two indicators are cross-referenced that they give a clear minimum conditions for sustainable human development.
By way of explanation, Human Development (HD) goes well beyond the Human

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Development Index (HDI), with which it is often equated. Human Development has been defined as 'a process of enlarging people's choices. The most critical ones are to lead a long and healthy life, to be educated, and to enjoy a decent standard of living. Additional choices include political freedom, guaranteed human rights and self-respect' (HDR 1990). The Human Development Index (HDI) however measures achievements in three aspects of human development: health, education and living standards. The global HDI, first presented in the 1990 Human Development Report (HDR), measures a country's success in the following human development achievements for its citizens: a long and healthy life (using health data), access to knowledge (using education data) and a decent standard of living (using income per capita). The HDI is usually determined using the parameters of aggregation of the dimension indices of education, health (life expectancy) and income. For this, the geometric mean of the three dimension indices is used: where $HDI = 3\sqrt{^{I}Health \times {}^{I}Education \times {}^{I}Income}$. This is explained further viz

HDI Dimension Index = $\dfrac{\text{Actual value – Minimum value}}{\text{Maximum value – Minimum value}}$

In order to calculate each dimension index with actual value, each approach is given below:

Calculating the HDI for Life Expectancy = $\dfrac{\text{Actual value – Minimum value}}{\text{Maximum value – Minimum value}}$

Calculating the HDI for Education: The first step is to calculate each sub-index using the equation viz:

Mean years of schooling index = $\dfrac{\text{Actual value – Minimum value}}{\text{Maximum value – Minimum value}}$

Expected years of school index = $\dfrac{\text{Actual value – Minimum value}}{\text{Maximum value – Minimum value}}$

The second step is to calculate the education index which is the arithmetic mean of the two sub-indices, where

Education index = $\dfrac{\text{mean years of schooling index + Expected years of schooling index}}{2}$

HDI Calculation for Income Index

Dimension Index = $\dfrac{\text{Income actual value – Income minimum value}}{\text{Income maximum value – Income minimum value}}$

Third step is aggregating the dimension indices using the formula:

$$HDI = 3\sqrt{^{I}Health \times {}^{I}Education \times {}^{I}Income}$$

The actual value derived from this last step is the Human Development Index of a particular area of study.

In this study, human development status is taken to be the status of an individual and the value attached to it in reference to the level of education, life expectancy and standard of living. The average of factors within an individual when pooled together alongside others therefore become the HDI of that scope of study and it is expressed in terms of the

minimum expected and the maximum expected value. In Nigeria for example, the minimum life expectancy (in years) according to the United Nations Development Programme (UNDP) Human Development Report (2014) is 20 and the maximum is 85. The minimum for education is zero (0) and the maximum is 18; while the minimum and maximum value of standard of living (income) is $100 and $75000 respectively.

The ecological Footprint is however the extent of the impact that a person's or a group of persons' way of life creates on the environment, usually in food consumption pattern, frequency of travel, energy consumption, strength of home installations and environmental friendliness of purchased life supporting materials (WWF, 2015). The Ecological Footprint (EF) according to David (2010) is "a leading indicator of biophysical or ecological dimension of sustainability, which is interpreted as a metrics of human demand on ecosystem services.

The ecological Footprint is thus an ecological accounting tool that compares a particular human demand on the Earth's biosphere in a given year to the available biological capacity of the planet in that year (Global Footprint Network, 2006). According to the Global Footprint Network, ecological footprint can also be compared to the bio-capacity of a nation or a region in that year as it documents what has occurred which can be regarded as a snapshot in time; but that which does not predict future demand or capacity, nor prescribe allocation. It however attempts to answer one central sustainability question about how much of the bio-productive capacity of the biosphere is used by human activities. Ecological footprints also seeks to correspond demand for the use of the resources of the environment and what the environment has to offer. This opinion was expressed by Ewing *et al. (*2008). According to Ewing and colleagues, the ecological footprint has to correspond with the demand in terms of "the amount of biologically productive land and water area required to produce all the resources an individual, population, or activity consumes, and to absorb the waste they generate, given prevailing technology and resource management practices". The ultimate goal of ecological footprint is therefore that sustainable human development will occur when all humans can have fulfilling lives without degrading the planet (Global Footprint Network, 2014).

There are many approaches to calculating ecological footprints, as none is actually globally advocated. This authors are however endeared to the World Wildlife Fund – WWF (2015) footprint indices as they seem to pragmatically suggest those things to look for when considering the personal ecological footprint of people and against which the ecological footprint of 1.8 global hectares per person of a country's resource demands replicability is referenced. Examples of such things as derived (by the authors) from their personal ecological footprint questionnaire are itemised below (*the words in italics are inferences drawn by the authors in respect of the paraphrased ideas*):

In food consumption - Type of diet - meat eater, fish eater, meat and fish eater, vegetarian or vegan - vegetarians *and vegans will have less ecological footprints; frequency of* purchase or consumption of organic meat, vegetables or dairy products - the *more, the less footprints*; frequency of buying locally produced meat, vegetables or dairy products – grown or produced in natural sunlight, in season and not artificially with fertilizer, pesticide or chemical feeds - *the more, the less footprints*; strength of packaging of

transported imported foods normally bought (in terms of being slightly, averagely packed, well packed or strictly packed) – the more average or slight, the better in ecological footprints)

In transportation – number of cars owned by a person or family; number of the cars that are functioning – *the more the number, the higher the footprints*; mode of transport on a daily routine (public, rented, shared, personal) – *the more personal, the higher the footprints*; fuel efficiency of vehicle in litres per 60 kilometres and number of hours spent in a vehicle per day – *the more the hour, the higher the footprints*; bigness of the car being used on a typical day – *the bigger, the higher the fuel consumption and consequently, the footprint*; number of hours spent on walking or running on leg per day – *the more the hour, the less the footprints*;

In energy consumption - the source of electrical energy of the home (Public electricity, Generator, Solar Inverter or Battery Inverter) – *the more solar, the less the footprint*; points of electric bulbs used in the house - *the less the point, the lower the footprint*; type of electric bulbs are you using - *Energy efficient bulbs will produce less footprints*; number of electrical appliances (Radio, TV, DVD, Refrigerator, Freezer, Iron, Washing Machine, water pumping machine etc.) - *the less the number, the lower the footprint*; source of cooking energy (Fire wood, Charcoal, Kerosene, Cooking gas) – *cooking gas will have less footprint*; and frequency of usage of source of cooking energy in hours per day – *the less the hours, the lower the footprint*.

In Purchased Life Supporting Materials (Stuff) - Frequency of turning the fully-loaded refuse bin, daily or week – *the more frequent, the more the footprints*; the size of refuse disposed in each time, in baggage or basket – *the bigger the size, the higher the footprints*; how used papers, cans, glass, plastics and electronics waste are disposed, either by burning, dumping in drainage, through commercial refuse collectors or through the recycling process - *properly handled recycling and refuse collection will have less footprints*; purchase of disposable items – *the less disposable, the less the footprints*; reusing items rather than throwing them out – *will generate less footprint*; repairing items rather than throwing them out - *will generate less footprint*; and using rechargeable appliances - *will generate less footprint.*

By and large, in a statement made by the European Economic and Social Committee (2008), determining the Human Development Index (HDI) and Ecological Footprint Index (EFPI) of a place is a contribution to the discussion of sustainable development. This is because such effort is democratic, useful for change and as well serves a sophisticated approach towards providing avenue for socially inclusive economic growth in a democratic society. A major shortcoming of the opinion is that it suggested that such efforts should be limited to the European Union member countries and other developed economy, forgetting that the developing countries also contribute data against which the global HDI which could also have a reasonable relationship with the EFPI is determined. Conducting a study on the HDI, the EFPI and their relationships in a developing country like Nigeria and especially in one of the emerging cities in one of her educationally advantaged regions may therefore provide some pieces of information that could contribute to the sustainable development discourse.

This opinion could also be buttressed with that of Meidad (2010) which said

unequivocally that in spite of the fact that ecological footprint (EF) of any nation is "spread all over the globe, most footprint studies are not yet sensitive to the specific locations on which the footprint falls and to the unique production characteristics of each supporting region" because they "count hectares of globally standardized bio-productivity, or 'global hectares' and do not tell whether impacts occur within the consuming country or abroad". Therefore the idea of not restricting studies of ecological footprints to the European Union goes along with the opinion of Meidad here and also provides a gap that this study fills in term of investigating and providing information about the Nigeria community of people's human development status and ecological footprints.

Qing and Pushpalal (2010) remarked that more use of resources, even though promoting comfortable livelihood and boosting the human development status of people and a location, generally has the capacity to increase people's ecological footprint; and that when ecological footprints result from an attempt to raise the HDI, sustainable development is technically being eroded in that context. In their 2010 study of four Chinese Provinces, Qing and Pushpalal observed that the ecological footprint of three of them exceeded the 1.8gha which was more than the World's average BC available per person in 2003 and far above the BC per person for each of their provinces in that year. The report made by Qing and Pushpalal has a very good bearing with the purpose and intent of this study, because of the need to first of all examine the human development status of residents of Ile-Ife, an emerging city in the South West Region of Nigeria and as well examining the extent to which they relate with their ecological footprint - the essence of which was also to determine whether their EFPI do not exceed World's average BC available per person: in addition to addressing the fact that the index of EF of Nigeria as a country also does not enjoy sufficient reportage in the Global Footprint Network diary. This idea has therefore provided the platform upon which this study rested.

By and large, it is observed that despite growing commitments to sustainable development, most countries today do not seem to have met both minimum requirements of the HDI as well as the EF; whereas as individuals, organizations, countries and regions work on advancing sustainability and human development, decision makers would need data and metrics in order to set goals and track progress. Measures such as the Ecological Footprint and the HDI are therefore critical to setting such targets and managing development projects. In addition, the dominance of pollution and deforestation as factors responsible for environmental degradation in previous sustainable development research reports provided conflicting information about the contribution of the educated and non-educated people to environmental degradation. It also neglected how ecological footprints of people could be predicted from their human development status. Nigeria seems culpable in this context, because the reports of such measures are not very sufficiently available, especially of the contributions of different categories of human development status (the educated-but-poor, the educated-but-rich, the non-educated-but-rich and the non-educated-but-poor) to environmental degradation.

Moreover, the South-West Region from which an emerging city has been selected for this study presents a typical region in Nigeria where a variety of human development

status (high, middle, low) could be found; and as well a habitat for several industries as it controls 52% of the Nigerian economy. Bounded by land as well as sea borders, its involvement in varying degrees of trade, agricultural practices and transportation activities, the region has potential for certain degrees of ecological footprints. The level of individual HDI and EFPI of each of the six states in the region and as well as the overall indices of the two variables within the region deserve some investigation. This is not only necessary for knowing sake, but to serve as a projection of what the overall HDI and EFPI of regions of like attributes such as South-East and North Central could look like and to also contribute to the extension of the sustainable development discourse by providing information from developing countries, in order to extend the scope of the Ecological Footprint beyond the European Union and the developed countries as earlier propagated. Using Ile-Ife which is regarded as the 'source of human race', a university emerging city and cosmopolitan in nature could provide a clue into the results that may be derived when the study is conducted on large scale; and also provide insight into how to go about determining the overall HDI and EFI of Nigeria as a whole.

2. Specific Objectives of Research

The aim of this study is to assess the human development status and personal ecological footprints of people of the South-West Region of Nigeria, using Ile-Ife as a baseline study.

The specific objectives of this study are therefore to:

(a) examine the human development status (level of education, health and standard of living) of people of the South-West Region of Nigeria;
(b) investigate their personal ecological footprints (in food consumption pattern, frequency of travel, energy consumption, strength of home installations and environmental friendliness of purchased life supporting materials); and
(c) determine the strength of relationship between the peoples' human development status and their ecological footprints.

3. Research Questions

The study sought answers to the following questions:

i. Is the overall human development status (level of education, health and standard of living) of residents of Ile-Ife in the South-West Region of Nigeria up to the UN HDI standard recommended for Nigeria?
ii. Do residents of Ile-Ife in the South-West Region of Nigeria have personal ecological footprints (in food consumption pattern, frequency of travel, energy consumption, strength of home installations and environmental friendliness of purchased life supporting materials) at the level that is not injurious to the environment? ; and
iii. How strong is the relationship between Ile-Ife residents' human development status and their ecological footprints?

4. Method

The design of this study was survey. In this study, the survey design applies because information was sourced from selected respondents and the information is attributed to all members of the Ile-Ife communities. A total of 300 residents of Ile-Ife comprising two local government areas (Ife Central and Ife East Local Government Areas) constituted the sample for the study. The sample was selected using the multistage sampling technique. At the first stage, thirty percent of the 11 wards in each of the Local Government Areas were selected for this study. Six wards (30%) of 11 wards in Ife Central Local Government Area and 30% of 10 wards in Ife East Local Government Areas, making six wards) within the study area were therefore randomly selected from the 21 wards in Ile-Ife. Six residential quarters, one from each ward, with a variety of housing units were picked randomly from each of the wards. Consequently, 50 residents were selected in each of the residential quarters among the various categories of housing units using the stratified random sampling technique. The various housing units are sorted into high Eleyele, Medium, Ile Canaan, Ajebamidele, Opa, Iraye and Ondo Road.

The two instruments used to collect data for the study were (i) Human Development Status Assessment Questionnaire which was used to examine the human development status of Ile-Ife residents in terms of level of education, access to healthcare, type of occupation, income level, recreation and leisure and children education; and (ii) Human Ecological Footprints Assessment Questionnaire, which was used to investigate the personal ecological footprints of the residents in terms of food consumption pattern, frequency of travel, energy consumption and energy capacity of home installations and environmental friendliness of purchased life supporting materials. The data collected were analysed using the Geographic Information Systems tools for spatial data analysis and descriptive approaches of the Statistical Package for the Social Sciences. Results obtained were referenced to the UN standard for Human Development and that of the ecological footprints.

5. Results

Results obtained are reported hereunder as guided by each research question

Research Question 1.

Is the overall human development status (level of education, health and standard of living) of residents of Ile-Ife in the South-West Region of Nigeria up to the UN HDI standard recommended for Nigeria?

Table 1 provides explanations about the categories of Human Development Status of the respondents (residents of Ile-Ife) of the study in this order: Health Index, Education Index, Income Index, and the overall Human Development Index.

Table 1: Categories of Human Development Status in Ile-Ife

Location	Education index	Income index	Health index	HDI
Ajebamidele	0.9852	0.8609	0.558	0.7832**
Ile Canaan	0.4000	0.7401	0.6317	0.5721**
Iraye	0.5579	0.7736	0.748	0.6859**
Eleyele	0.7854	0.836	0.5129	0.6958**
Ondo-Rd	0.4198	0.6887	0.6148	0.5623**
Opa	0.8441	0.8441	0.689	0.7792**
Mean	0.6764	0.7906	0.6257	0.6798**
Range	0.5852	0.1722	0.2351	0.2209
Std. Dev.	0.260	0.068	0.085	0.096

United Nations threshold for Human Development

*	≤0.5	Low
**	0.5 - 0.8	Medium
***	0.8 - 0.9	High
****	>0.9	Very high

Table 1 explains that the Health index which is a measure of life expectancy was observed to be 58.32 years in Ajebamidele. This value is the lowest across Ile-Ife which is the only residential area that recorded life expectancy value lower than the overall mean for the study area. The mean life expectancy (in years) across the sampled residential areas was calculated to be 68.79 ± 8.13 years. Furthermore, the overall mean of the health index was 0.6257 and it had a range of 0.2351. Residential areas such as Ile Canaan (0.6317), Iraye (0.748) and Opa (0.689) exhibited health index values higher than the overall mean for the study area while Ajebamidele (0.558), Eleyele (0.5129) and Ondo Road (0.6148) respectively recorded lower values than the mean.

The Education Index, derived by computing the average of means years of schooling and the year a child is expected to be enrolled for school, ranged between 0.9852 and 0.4000 in the study area. Ile Canaan had the lowest education standard, while Ajebamidele recorded the highest. The Education Index at Ile Canaan (0.4000), Iraye (0.5586) and Ondo Road (0.4198) were lower than the overall mean (0.6764) while Ajebamidele (0.9852), Eleyele (0.7854) and Opa (0.8441) exhibited higher literacy value than the overall mean.

The income level which is also regarded as the standard of living Index was calculated from the respondents' income and expenditure data in Naira. The overall mean of income data was derived to be 0.7906 ± 0.068. Across the sampled residential areas, Income Index was highest at Ajebamidele (0.8609) while Ondo Road (0.6887) exhibited the lowest living standard in Ile-Ife. Ile Canaan, Iraye, Eleyele and Opa recorded 0.7401, 0.7736, 0.836 and 0.8441 respectively.

The overall mean HDI of the study area is 0.6798 which is higher in value than the United Nations low developmental categorization of 0.5. The most developed residential area among the sampled areas is "Ajebamidele" having an HDI of 0.7832, while the least developed area (Ondo Road) recorded an HDI of 0.5623. Other areas, such as Iraye, Eleyele and Opa recorded 0.6859, 0.6958 and 0.7792 respectively, which are higher than the mean value for the entire study area.

Research Question 2:

Do residents of Ile-Ife in the South-West Region of Nigeria have personal ecological footprints (in food consumption pattern, frequency of travel, energy consumption, strength of home installations and environmental friendliness of purchased Life Supporting Materials - LSM) at the level that is not injurious to the environment?

Table 2. Overview of sub-categories of Personal Ecological Footprint in the study area

Category	Ajebamidele	Ile-Canaan	Iraye	Eleyele	Ondo-Road	Opa	Mean (Ile-Ife)	F	Significance
Food	0.48	0.46	0.45	0.45	0.45	0.46	0.46	4.44	$p < 0.05$*
Transport	0.19	0.21	0.20	0.23	0.22	0.17	0.20		
Shelter	0.29	0.29	0.30	0.33	0.30	0.32	0.31		
Energy	0.61	0.64	0.67	0.63	0.65	0.65	0.64		
Cloth	0.41	0.36	0.37	0.37	0.35	0.36	0.37		
LSM	0.49	0.47	0.49	0.49	0.48	0.47	0.48		
$Total_{(PEF)}$	2.47	2.44	2.49	2.50	2.45	2.45	2.47		

**Significant difference existed and traceable to food consumption patterns*

The overall mean of Food consumption subcategory of personal ecological footprint of people in selected residential areas in Ile-Ife is 0.4568 ± 0.04. Areas, such as Ondo Road (0.4494 ± 0.04), Iraye (0.4451 ± 0.04) and Eleyele (0.4546 ± 0.03) recorded values less than the overall mean; while other sampled areas recorded values higher than the mean. The lowest minimum value was collectively recorded in Ile Canaan, Iraye, Eleyele and Ondo Road (0.3721) while the highest minimum were recorded in Opa and Ajebamidele (0.3953). However, the highest maximum values were recorded in Ondo Road and Opa (0.5581) while the lowest was recorded in Ile Canaan and Iraye (0.5116). The result of comparison of food across the selected sampled residential areas, using analysis of variance, showed a statistical difference ($F = 4.44$, $p < 0.05$) in food consumption amongst individual respondents across the study area.

The highest and lowest minimum values for transportation across the study area were 0.01311 and 0.0984 respectively. The highest values were recorded in Ajebamidele, Iraye and Ondo Road areas while the lowest was recorded in Ile Canaan. However, the highest and lowest maximum values were 0.3279 and 0.3115 respectively. The highest values were recorded in Ondo Road and Opa while other areas collectively recorded the same value which is lower than the aforementioned areas. The overall mean is 0.2041 ± 0.05.

Other areas, apart from Ajebamidele (0.1864 ± 0.04), Opa (0.1731 ± 0.04) and Iraye (0.2009 ± 0.05) recorded a higher mean value than the overall average. Comparison of mode of transportation across the selected sampled residential areas showed that there was statistical difference in the pattern of transportation across in the study area ($F = 11.018$, $P < 0.05$).

The overall mean shelter subcategory of personal ecological footprint of people in selected residential areas in Ile-Ife was 0.3063 ± 0.15. Eleyele (0.3251 ± 0.15) and Opa (0.3238 ± 0.15) recorded values higher than the mean, while other sampled areas recorded values lower than the mean. The highest minimum value (0.1923) were collectively recorded in Ajebamidele and Iraye while other areas recorded the same values which is lower than the aforementioned areas. However, maximum values for shelter varied between 0.3846 and 0.4615. The lowest maximum value was recorded Ile Canaan while the highest maximum was recorded in other areas except at Ajebamidele which recorded 0.4231.

Furthermore, the result of comparison of shelter across the selected sampled residential areas, using analysis of variance, showed that there was statistical difference ($F = 3.67$, $p < 0.05$) in the type of shelter amongst individual respondents across the study area.

Energy consumption in Ile-Ife varied between 0.4063 and 0.8958. The lowest minimum value (0.4063) was recorded at Iraye while the highest minimum value (0.4375) was recorded at Opa. The highest maximum value (0.8958), however, was recorded at Ondo Road and the lowest maximum (0.8750) was recorded at Ajebamidele. The overall mean is 0.6436 ± 0.14. Iraye (0.6728 ± 0.14), Ondo Road (0.6505 ± 0.14) and Opa (0.6536 ± 0.14) recorded mean values greater than the overall mean with Iraye having the highest food consumption value.

Comparison of household pattern of energy consumption, across the selected residential areas considered for this study, showed that there was no statistical difference in the pattern and mode of energy consumption across the study area ($F = 1.086$, $p > 0.05$).

The overall mean value for cloth subcategory of people in selected residential areas in Ile-Ife was 0.3718 ± 0.06. Some of the residential areas, Ajebamidele (0.4082 ± 0.06) and Eleyele (0.3737 ± 0.06) recorded their mean values to be greater than the mean, while the other areas recorded values lower than the mean. The highest minimum value (0.2571) were collectively recorded in Eleyele and Ondo Road while other areas recorded similar values the same as the overall minimum mean of the study area. However, maximum values for clothing varied between 0.4571 and 0.4857. The lowest maximum value was recorded Iraye, Ondo Road and Opa while the highest maximum was recorded in other areas. Furthermore, the result of comparison of clothing across the selected sampled residential areas, using analysis of variance, showed that there was statistical difference ($F = 5.965$, $p < 0.05$) in the pattern and mode of clothing styles amongst individual respondents across the study area.

Purchase of life support materials in Ile-Ife varied between 0.3250 and 0.6500. The lowest minimum value (0.3250) was recorded at Ile Canaan, Eleyele, Ondo Road and Opa while the highest minimum value (0.3875) was recorded at Iraye. The highest maximum value (0.6500), however, was recorded at Iraye and the lowest maximum (0.6250) was recorded at Eleyele and Opa. The overall mean is 0.4829 ± 0.07. Ile Canaan (0.4740 ± 0.07), Ondo Road (0.4799 ± 0.07) and Opa (0.4728 ± 0.08) recorded mean

values lower than the overall mean, while Ajebamidele (0.4875 ± 0.08), Iraye (0.4949 ± 0.06) and Eleyele (0.4873 ± 0.08) recorded values higher than the overall mean. The result of analysis of variance performed on the data indicated that there was no statistical significant difference in the pattern of life supporting materials used among inhabitants across the selected sampled residential areas in Ile-Ife.

The overall mean personal ecological footprint of individuals sampled across the selected residential areas in the study area was 2.4656 ± 0.18. The result indicated that Eleyele (2.4993 ± 0.22) and Iraye (2.4869 ± 0.17) recorded mean values greater than the overall mean, while the mean value was lower in the other areas. The lowest minimum personal ecological footprint was recorded in Eleyele (1.8531) while the highest minimum was recorded in Ajebamidele (2.1053). However, the maximum values of personal ecological footprint across the residential areas varied between 2.6846 and 2.9268, these values were recorded at Ile Canaan and Ajebamidele respectively.

The results compared across the selected residential areas indicated that the difference in mean of personal ecological footprints across the residential areas was not statistically significant.

Research Question 3

How strong is the relationship between Ile-Ife residents' human development status and their ecological footprints?

Answer to this question is provided in Table 3

Table 3. The Personal Ecological Footprint and Human Development Status of residents of Ile-Ife and the Relationship between HDI and Personal Ecological Footprint

	Mean	Mean	Correlation	
Location	HDI	Footprint	r	$P_{0.05}$
Ajebamidele	0.7832	2.4654	0.314	0.492
Ile Canaan	0.5721	2.4357		
Iraye	0.6859	2.4869		
Eleyele	0.6958	2.4993		
Ondo Road	0.5623	2.4505		
Opa	0.7792	2.4465		

Table 3 presents the relationship between Human development of Ile-Ife and the mean personal ecological footprint of the selected residential areas. The result showed that a weak positive correlation ($r = 0.314$, $p > 0.05$) exists between the Human Development status and Personal Ecological Footprint of people in Ile-Ife. However, the strength of relationship is not statistically significant.

6. Discussion

The relationship between people and the environment has been shaped by many factors throughout history. The means of subsistence, social context and land affinity are all important determinants of how humans have chosen to use and shape the specific environment in which they live (Haberl *et al.,* 2001; Ostlund & Bergman, 2006). The aim of this study was to investigate the aforementioned statement and the objectives were to examine the human development status of the selected areas, investigate the personal

ecological footprint, and also to determine the strength of relationship between the residents' human development status and ecological footprints. The results have indicated a variation in spatial pattern of both human development index and personal ecological footprint across the sampled residential areas in Ile-Ife.

Human development status were assessed across some selected residential areas (Ajebamidele, Eleyele, Ile Canaan, Iraye, Ondo Road and Opa) in Ile-Ife. The result have shown that developmental status, in terms of literacy level was high across Ile-Ife as all of the sampled respondents had undergone the basic primary education. However, few of the respondents, about 12 percent live below the United Nations One-to-Two Dollar per day poverty benchmark. The high value of poverty recorded in Ile-Ife may probably be due to the high rate of unemployment and underemployment that has been reported to have scourged Nigeria (Asaju *et al.,* 2014). Although, most of the sampled respondents live above $3.00 a day, which is often considered to be fairly medium income earning, having 12 % of people below the poverty line is however higher than the World Banks' 2014 rating for Osun State (10.9 %) but lower than Nigeria's rating (33 %).

Furthermore, health index, which is a measure of life expectancy (in years) in Ile-Ife was derived to be 64.5 years. The life expectancy value in Ile-Ife is 10.2 years higher than the World Health Organization's 2012 life expectancy rating for the whole of Nigeria. However, the higher value in mean life expectancy in Ile-Ife despite being a fairly medium incoming semi-urban settlement does not correlate with previous studies which have shown that life expectancy is often a function of one's income level. Although, Nigeria as a country, was ranked to be a low income earner (Human Development Report, HDR, 2015).

The overall human development status of Ile-Ife, as measured by Human development index, was 0.67654 which according to United Nations Development Program (UNDP) grouping is classified to be fairly developed. The human development index values however showed a disparity in value across the sampled residential areas in Ile-Ife. Studies have shown that this disparity may be as a result of variations in the level of poverty (in terms of employment and income), difference in literacy level and other demographic and social reasons. For instance, in Ajebamidele and Opa, which according to this study exhibits the highest developmental status, had the highest literacy level and most of the inhabitants in these areas are well educated to the level of tertiary education. Also, these two residential areas recorded the highest values of Income Index, implying that standard of living is highest in these areas unlike Ile Canaan and Ondo Road.

Based on the difference in human development index across the residential areas, disparities were recorded in food consumption patterns, frequency of travel (reported as transportation mode), energy consumption level (which includes strength of home installations and its environmental friendliness) and other life supporting materials across Ile-Ife. The disparity is however low ($r = 0.314$). The result of this study have shown that the ecological footprint of people in Ile-Ife from different are not the same. This can be tallied with a study by Kleinhans (2004), which noted that people of the same culture and norm generally share the same value, although in this present study, there were variations from individual to individual: on a larger scale, these variations were negligible. In terms of frequency of transportation, other areas aside Ajebamidele and Opa recorded a high value. This is however difficult to explain because these two residential areas has been

pointed out by this study to exhibit the highest human developmental ratings. It as well negates finding by other studies that state that "high income earners travel more" (Carlsson-Kanyama & Lindén, 1999; Jang *et al.,* 2004), although one might attribute the low frequency of travel, as pointed out in Adepoju (1994), to comfortability in their lifestyles, and the nature of the job they engage in. In Ajebamidele for instance, most of the inhabitants in the areas where this survey was carried out who were either civil servants, private business employee or retired civil servants and often times, this class of people are restricted in movements, except during weekends and as well planned ahead.

In addition, life support materials and energy consumptions in Ile-Ife was also shown to be statistically similar among individuals sampled for this study. Although, energy consumption was lower in some residential areas and lowest in Ajebamidele. The low energy consumption in some of these areas may be due to their awareness of environmental sustainability and their often preference for recent technological innovations which has been shown to be energy efficient (Herring & Roy, 2007; Gillingham, *et al.,* 2009). However, life supporting materials which includes shelter, water use (consumption), food and clothing were as well statistically similar among people in Ile-Ife.

The result of this study did not state the personal ecological footprint in terms of per acre contribution to available land, rather, it measured the contribution of high, low and medium income earners and their contribution to the ecological footprint of their residential areas. This study could therefore be concluded that the pattern and relationship that exists between the personal ecological footprint and human development status of respondents in Ile-Ife had similar ($P > 0.05$) and weak relationship ($r = 0.314$) across the sampled residential areas in Ile-Ife. Although, little variations were noticed as high income earning residential areas tend to consume less energy and travel less which thus influences the overall footprint. The result of this study may only be applicable to Ile-Ife or other semi urban settlements in close proximity with Ile-Ife.

References

Adepoju, A. (1994). *Gender, work & population in sub-Saharan Africa*. CABdirect. Retrieved from: http://www.cabdirect.org/abstracts/19941806875.html; jsessionid=9A78CB5D0F7F8936116744 7C2F26FDE7 on 27/1/2016

Adeniyi, I. F., Olabanjia, I. O. (2005). The physico-chemical and bacteriological quality of rainwater collected over different roofing materials in Ile-Ife, Southwestern Nigeria. *Chemistry and Ecology*. 21(3). 149-166. DOI: 10.1080/02757540500117318

Asaju, K., Arome, S., & Anyio, S. (2014). The rising rate of unemployment in Nigeria: the socio-economic and political implications. *Global Business and Economics Research Journal,* 3(2): 12-32.

Carlsson-Kanyama, A., & Linden, A. L. (1999). Travel patterns and environmental effects now and in the future: implications of differences in energy consumption among socioeconomic groups. *Ecological Economics*. 30:405–17.

David, V. (2010). Ecological footprint, ecosystem services and biodiversity: an analysis of global indicators. In Bastianoni, S. (Ed). *The State of the Art in Ecological Footprint Theory and Applications*. Italy: Footprint Forum

Ekanade, O. (1984). Soil changes associated with forest/savanna boundary. *The Nigerian Geographical Journal.* 27(2). 44-50.

European Economic and Social Committee (2008). Opinion of the European Economic and Social Committee on Beyond GDP – measurements for sustainable development

(Own-initiative opinion of the Sustainable Development Observatory). NAT/392 Brussels, 22 October 2008. Available from the Internet on http://www.eesc.europa.eu

Ewing B., Reed A., Rizk, S.M., Galli A., Wackernagel M. & Kitzes J., (2008). *Calculation methodology for the National Footprint Accounts*, 2008 Edition. Global Footprint Network, Oakland, 19 pp.

Gillingham, K., Newell, R. G., Palmer, K. (2009). Energy Efficiency Economics and Policy," *Annual Review of Resource Economics, Annual Reviews*, 1(1), 597-620, 09.

Global Footprint Network. (2006). *Africa Factbook*. http://www. footprintnetwork.org/africa.

Global Footprint Network (2014). *Advancing the science of sustainability*. http://www.footprintnetwork.org/en/index.php/GFN/

Haberl, H., Schulz, N. B., Plutzar, C., Erb, K. H., Krausmann, F., Loibl, W., Moser, D., Sauberer, N., Weisz, H., Zechmeister, H. G., Zulka, P. (2004). Human appropriation of net primary production and species diversity in agricultural landscapes. *Agriculture, Ecosystems & Environment*. 102(2), 213–218 doi:10.1016/j.agee.2003.07.004

Herring, H. & Roy, R. (2007). Technological innovation, energy efficient design and the rebound effect. *Technovation*. 27(4) 194–203. doi:10.1016/j.technovation.2006.11.004

Janga, G., Kima, Y. Y., Choib, K. K. (2004). Remesh-free shape optimization using the wavelet-Galerkin method. *International Journal of Solids and Structures*. 41(22–23). 6465–6483 doi:10.1016/j.ijsolstr.2004.05.010

Kleinhans, R. (2004). Social Implications of Housing Diversification in Urban Renewal: A Review of Recent Literature. *Journal of Housing and the Built Environment* , 19(4), pp. 367-390.

Lazarus, E., G. Zokai, M. Borucke, D. Panda, K. Iha, J. C. Morales, M. Wackernagel, A. Galli, N. Gupta.(2014). *Working Guidebook to the National Footprint Accounts: 2014 Edition*. Oakland: Global Footprint Network.

Meidad, K. (2010). Managing trade with the Ecological Footprint Analysis–The case of Israel's grain supply. In Bastianoni, S. (2010) Ed. *Footprint Theory and Applications FOOTPRINT FORUM 2010 Academic Conference Short Communications*. Eco-dynamics Group and Global Footprint Network.P.85.

Oslund, L., Bergman, I. (2006). Cultural Landscapes in Northern Forest-Time, Space and Affiliation to land. *The Conservation of Cultural Landscapes*. 30-37

Sterling, S. (2008) Education in change. In Huckle, J. and Sterling, S.(2008) Eds. *Education for Sustainability*.London: earthscan. p.24. Ibid. p.25.

Qing, W. & Pushpalal, D. (2010). Evaluation of Sustainable Human Development Using Ecological Footprint and Human Development Index: A Case Study of Chinese Provinces. In Bastianoni, S. (2010) Ed. *Footprint Theory and Applications FOOTPRINT FORUM 2010 Academic Conference Short Communications*. Eco- dynamics Group and Global Footprint Network. P.175

United Nations Development Programme (UNDP) (2014). *Human Development Report. Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience*. Retrieved from http://hdr.undp.org/en/content/human-development-report-2014

United Nations Development Programme (2015). *Human Development Report, 2015,* Palgrave Macmillan: New York.

Wackernagel, M., Schulz N.B., Deumling D., Callejas Linares A., Jenkins M., Kapos V., Monfreda C., Loh, J., Myers N., Norgaard R., Randers J., 2002. Tracking the ecological overshoot of the human economy, *Proceedings of the National Academy of Sciences of the United States of America,* 99, 9266-9271.

WCED (1987). *Our common future*. Oxford: Oxford University Press. p.43.

World Wildlife Fund (2005). *Footprint Calculator*. Retrieved from http://footprint.wwf.org.uk/home