Research Journal of Engineering and Environmental Sciences 1(1) 2016 pp. 117-128

Research Journal of Engineering and Environmental Sciences

Journal homepage: www.rjees.com

RJEES

Original Research Article

AN IMPACT ASSESSMENT OF MODEL HUMAN EXPLOITATION ON THE ENVIRONMENT

[1,2]* Azodo A.P. and [3]Ogban, P.U.

[1]Department Department of Mechanical Engineering, Federal University of Agriculture, P. M. B. 2240 Abeokuta Ogun State, Nigeria

[2]Federal University Wukari, P.M.B. 1020, Wukari, Taraba State, Nigeria

[3]Department of Mechanical Engineering, Memorial University of Newfoundland, 230 Elizabeth Avenue, St John's, AIB 3X9, Canada

*azodopat@gmail.com; peterogban@gmail.com

ARTICLE INFORMATION

Article history:
Received 14 November 2016
Revised 24 January 2016
Accepted 25 January 2016
Available online 20 February 2017

Keywords:
Human
Environment
Climate
Surface
Man

ABSTRACT

The whole essence of development and technology advancement is to transform and remodel man's natural environment for his needs and comfort. This is often effectuated through garnering the natural resources from the surroundings. Mutual interaction occurrences between man and environment are essentially demonstrated in their reciprocal effects and influences. In this study, investigation on the environmental resilience and sustainability adaption acts was carried out in the residential sector of Abeokuta metropolis, Nigeria. This study took place between the months of May and September, 2016. Subjective research approach by means of self-developed questionnaire was employed for data collection which allowed the researcher-participant contact with the study population sample systematically randomly selected in Abeokuta metropolis. The designed questionnaire used elicited information such as demography, nature conservative and mitigation practices as well as environmental impact operations. Basic classification of model human exploitation on the environment showed that 54.43% practices by the participants were appropriate whereas 45.57% were inappropriate. The various assessed resource exploitation approaches in this study showed that there is concerned rate of human interference on environment from the residential sector which results in environmental depletion and degradation. This necessitates balancing the perspectives of social challenges facing humanity and environmental quality.

1. INTRODUCTION

Overload of the natural environment from the complexity and varied human activities have affected the natural operation of the ecosystem and have also resulted in a number of hazards to both humans and the environment (Azodo and Ismaila, 2016). The degradation of ecosystems weakens the natural system's ability to provide essential services with an underlying risk of the ecosystem reaching its tipping point (EC, 2009). Every activity of man affects the environment in one way or another, either directly, indirectly or cumulatively (Stern et al., 1992; Rodrigue and Comtois, 2013). Activities such as urban development, migration, mining, agriculture, transportation, population growth, industrial and domestic wastes disposal have contributed to several imbalances in the ecology and environment (Dara, 2004; Arisukwu, 2011; Abdullahi et al., 2014). The various environmental problems arising from the impact of human activities on the environment are indications of the consequences that threaten destruction of the whole essence of development. The most common which is associated with land usage and leads to deforestation include agricultural, industrial, housing, fuel and urban need purposes (SOER, 2010). The activity may affect one or more elements of the environment or the interactions within and between these elements. Conversely, environmental factors such as climate, terrain, topography and geographical/physical conditions adversely influence man's well-being (Montanarella, 1999; Briassoulis, 2006; McMichael et al., 2006).

The large chunk of environmental changes effected by human actions include modification of the global climate system, reduction in stratospheric ozone, earth's biogeochemical cycles alteration, abundance of biological resources, distribution changes and decrease in water quality (Meyer and Turner, 1994; Mahlman 1997; Vitousek et al., 1997; Dale et al., 2001). Global climate change, the depletion of the ozone layer, desertification, deforestation, planet's biological diversity loss and the trans-boundary movements of hazardous wastes and chemicals are all global environmental problems that adversely affect the lives and health of every nation's populations (UNICEF & WHO, 2002; Crowther and Capaldi, 2008; Gumel 2015). It is believed that development must be guided by ecological principles whereby the regenerative powers of nature will be enhanced and the carrying capacity of the environment will not be exceeded (Daly, 1990). In other words, there should be conscious management of the environment including the protection of the environment against the onslaught of man and his technology. In recent years, activities undertaken by man for his sustenance and basic needs which influences the environmental factors as well as design of his surroundings need to be addressed for possibility of future climate change, modelling, adaption and adjustment process.

In this regard, the various human activities and exploitation approaches of the natural environment for man's basic needs need to be assessed in other to balance the resultant environmental challenges. Therefore this study investigated the various human activities in the residential areas of Abeokuta metropolis, Nigeria that has change and influence potentials on ecosystem's capacity pathways essentially its structure and resilience.

2. MATERIALS AND METHODS

2.1. Study Area

This study was carried out in Abeokuta the state capital of Ogun state, Nigeria (Figure 1). Abeokuta metropolis is located between Latitude 7.15° North and Longitude 3.35° East with 67 meters elevation above the sea level. The average number of Abeokuta residents is about 593,100. The average temperature of about 27.4°C and an annual rainfall of 128 cm in the Southern part of the city to 105 cm in the Northern part. Abeokuta has relative humidity of above 80% during the wet season (March-October) and 60-80% during the dry season (November- February). The metropolis has extensive free forest areas with two forest reserves of 61.19 Km^2 land area (Soaga and Segbenu, 2015). Major timber crops include Teak and Gmelina with other indigenous species. The major occupation of the people in the study area is farming. Major non-farm employments are provided by transportation and forestry activities such as timber exploitation, firewood, leaves collection and charcoal production (Soaga and Segbenu, 2015).

Figure 1: Map of the study area

2.2. Data Collection

The study area was first divided into ten smaller sections along the axis of Asero through to Osielle area. These areas were Asero, Fajol, Alogi, Somorill, Aso-rock, Odu-eran, Aregbe, Eleweran, Camp and Osielle (Figure 2). Using systematic random sampling technique, the participants were selected for even representation of the study population and equal chances of being selected in the study area. The participants were house owners in each of the sections. The tool used for data collection was a pre-tested questionnaire administered by hand delivery to the participants. Attached to the questionnaire was an introduction letter that explained the essence of the study as well as assurance of secrecy and confidentiality regarding their responses to the questionnaire items. The questionnaire was divided into two sections; the first part (part A) assessed demography while the second part (part B) assessed

environmental impact and nature conservative operations among the residents. Information elicited under demography included age, marital status and occupation.

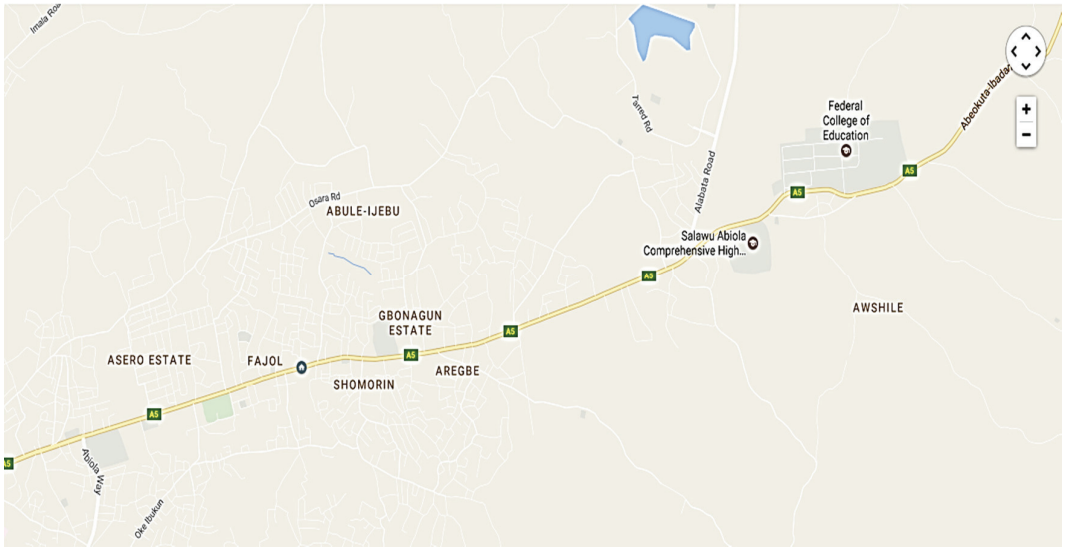

Figure 2: Study area roadmap along which the division was carried out

Information elicited under the environmental impact and nature conservative operations included tree and land conservations, waste treatments and biogas emission. The self-developed questionnaire was verified for appropriateness en masse with the study purpose by subjecting the questionnaire to modification according to the direction and instruction by research professionals in this field of study. No incentive was offered to the participants and participation was voluntary.

2.3. Data Analysis

Statistical package for social science (SPSS) version 16.0 was used in the analysis the data obtained. The analysis was done in frequency distribution and percentage ratio format and arranged in charts and tables.

3. RESULTS AND DISCUSSION

3.1. Demography Characteristics of Participants

Participants' age group distribution in Figure 3 showed that the predominant age group (from 48 participants) among the participants was within the age bracket 41-50 years. This represented 50% of the participants. This was followed by 51-60 years representing 26% of the participants. Age ranges 61-70 years and 71-80 years had only participant each (corresponding to 1.04% of the total respondent). No participant was of age 20 years and below. The "No" response for participants between the ages 20 years and below showed that no participant within that age bracket owns a house. The categories of the age ranges among the participants showed that majority are still within the workforce age groups. The

occupations of the participants are civil servants, private sector workers, entrepreneurs and housewives accounted for 50.5%, 12.9%, 14% and 2.2% of the total participants respectively. Other participants (20.4%) did not specify their professions.

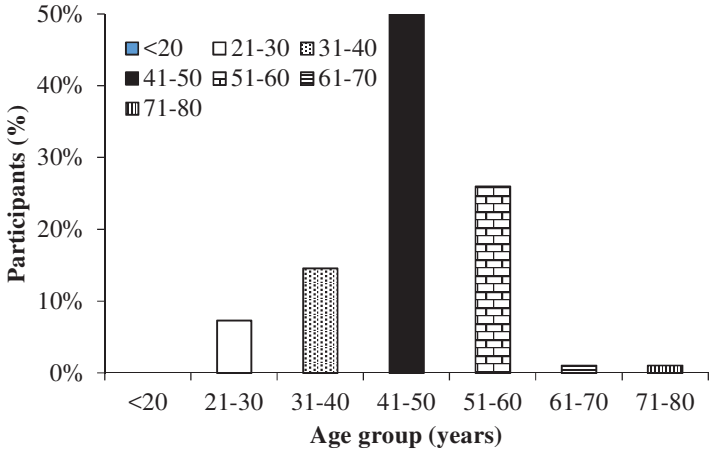

Figure 3: Participants age group distribution.

3.2. Nature Conservative and Mitigation Practices

The aspect of nature conservative mitigation was assessed based on deforestation practices and conservation of trees. The analysis performed and presented as appropriate and inappropriate practices showed that 54.43% practices by the participants were appropriate whereas 45.57% inappropriate as shown in Figure 4. The slight discrepancy between the appropriate and inappropriate nature conservative and mitigation practices notwithstanding 45.57% inappropriate practices observed in this study is considerably high. Inappropriate approaches supposedly mean lack of care of the environment. Disregard of environmental or natural resource management for carbon sequestration and storage implies carbon release, exacerbating climate change, intensifying global emissions of greenhouse gases and anthropogenic effects (CBD, 2009; Doswald and Osti, 2011). Aggravating environment impact of human exploitation on nature function and structure deformation according to Crowther and Capaldi (2008) affect over 250 million people in different nations of the world. The same have suffered direct desertification impact with 1 billion people at risk of the same in more than 100 countries (Crowther and Capaldi, 2008). The quantity of carbon known to be stored in the terrestrial ecosystems via living organisms, litter and soil organic matter is about 2100 giga-tonne (Gt), one-third of which has been released to the atmosphere (Canadell et al., 2007; Shepherd, 2009; Ni, 2014). Yearly estimated value of 0.8-2.2 Gt of carbon released is attributed to deforestation which is approximately 20% of global CO_2 emissions (Verbist et al., 2011). Deforestation practices in Nigeria showed yearly estimates of about 350, 000 hectares (ha) of forests and savannah woodland lost through infrastructural and urban development, fire and bush burning, lumbering, wood collection and farming. According to Anna (2011), 60 million ha of forests and woodlands in Nigeria as at 1897 has depreciated through various exploitations to only 10 million ha. These costly, wasteful, and

ecologically destructive effects have set the drive and exigency sense to ecological and environmental challenge (Anna, 2011).

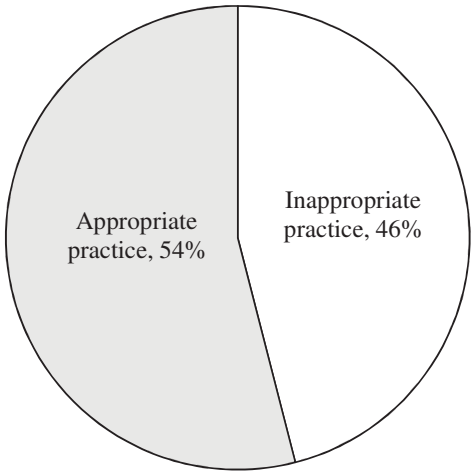

Figure 4: Nature conservative and mitigation practices

3.3. Environmental Impact Operations

Achieving conducive environment deals with relative practices of people to the various available supportive environmental mitigation and adaptation approaches. Fields, farm, forest and settlement in rural, suburban and urban centres, are being replaced by stone, brick, concrete and asphalt on a daily basis (Travers, 1977). Where this replacement takes place on the ground of the residential sector, it is usually from the ecstatic point of view. Tarmac and asphalt cover of the earth surface contribute to several degrees hot or warmer environment witnessed in urban cities which offer a dent to sustainable development. Observation made in this study showed that the characteristics of outside ground of various residents were concrete/cemented ground (33.7% of participants), asphalt (8.9% of participants), natural clear ground (41.6% of participants), grass (12.9% of participants) and others unspecified (3% of participants) (Figure 5).

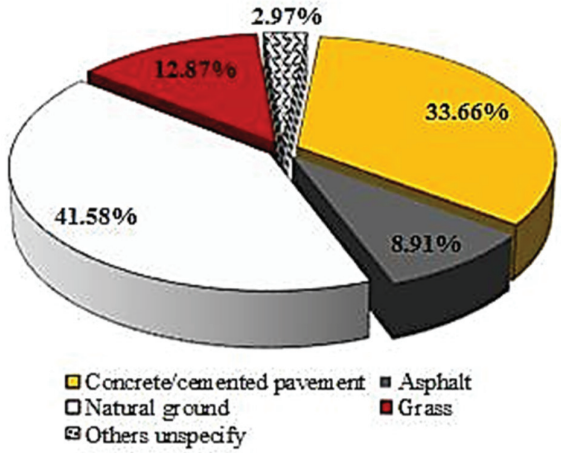

Figure 5: Land conservation practice by description of compound

The solar radiation is absorbed by all pavement materials, concrete/cemented ground, asphalt, natural clear ground and grass which increase the surface temperatures of these materials until ambient air temperatures reach and through convention the heat is emitted back to the atmosphere. Guan (2011) study showed the various average temperatures different materials emit as asphalt was (40.0 °C) brick pavers (37.28 °C) concrete (33.62 °C) and grass (25.37 °C). Asphalt and brick pavement which have highest average surface temperatures (Guan, 2011) are utilized in this study for ground pavement (concrete/cemented ground (33.7%) and asphalt (8.9%)) as such contribute to environmental problem. In addition the soil underside impervious surfaces absorbs very little water as such the natural aquifers below these surfaces can dry up and prevents the growth of plant life (Talk, 2007). Likewise impervious surfaces are sources of pollution as they do not allow penetration of pollutants into the ground for contaminants break down and mitigation (Frazer, 2005). Impervious surfaces collect particulate matter from the atmosphere, nitrogen oxides from car exhaust, rubber particles from tires, debris from brake systems, phosphates from residential and agricultural fertilizers, and dozens of other pollutants.

The environmental impacts caused by humans were shown to be predominantly related to air pollution such as biomass emission and waste treatments. Three aspects of emission sources assessed in this study were cooking, fossil fuel usage and waste treatment. Cooking stoves have been found to contribute significantly to local indoor and outdoor air pollution (Staton and Harding, 1998). Among the observed sources of heat used in various households in the metropolis, 41.9% and 7.2% representing households participants uses liquefied petroleum gas (LPG) and electricity respectively which are relatively "cleaner" combustion sources. The remaining 7.8%, 12.6%, 29.9% representing households of participants where fuel wood, charcoal and kerosene respectively used have combustion impact on the atmosphere from cooking sources in the metropolis (Table 2). These proportions were cumulatively higher than participants that utilise "cleaner" heating sources. Greenhouse gas emission from wood and other biomass fuels are relatively disadvantaged when compared with LPG or other "cleaner" fossil fuels (Staton and Harding, 1998). Kerosene, when burned in stoves, generates hydrocarbons such as benzene, styrene, xylenes and 1,3-butadiene which dangerous gases (Lam et al., 2012; Zhang and Smith, 1995). Whereas particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide which are greenhouse gases that contribute significantly to air pollution are associated with biomass fuel (Zhang and Smith, 2007).

Residential waste consists of durable and nondurable goods, containers and packaging, food scraps, newspaper, paper, cardboard, plastics, disposal diapers, textile, yard waste, rubber, leather, some organic waste etc (Demirbas, 2004; Kinti et al., 2013). Analysing the various content of domestic waste according to six categories in Azodo and Ismaila (2016) showed that not all domestic wastes are combustible. Table 2 also shows that 33% of the participants preferred treating combustible waste by burning. Other responses included "very often", "sometimes", "rarely", and "never" and these responses were provided by 8.5%, 27.7%, 16.0% and 14.9% of the participants. Combustion of waste releases gases according to its composition and these have negative environmental consequences tendency such as global warming. Open burning of waste according to Guendehou et al., (2006) is the combustion of

unwanted combustible materials such as paper, wood, plastics, textiles, rubber, waste oils and other debris in nature (open-air) or in open dumps, where smoke and other emissions are released directly into the air without passing through a chimney or stack. It has been reported that open burning of waste at the backyard poses more serious threat to the environment and public health (Draft, 2004, Verma, 2006; Hussain, 2016). Guendehou et al. (2006) stated that relevant gases emitted when unwanted combustible materials are burned include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) with CO_2 emissions being the most significant in terms of the quantity produced. Other studies have shown that emissions from combustible waste materials could also include dioxins, furans, ash, carbon monoxide, halogenated hydrocarbons, carbon dioxide, sulphur dioxide, lead, barium, cadmium, chromium, mercury or arsenic (Costner, 2001; Quina et al., 2011). The combustion of polystyrene polymers found in products like foam, cups, meat trays, egg containers, yogurt and deli containers release styrene gas that is readily absorbed into human skin and lungs. Exposure to combustion waste emission gases such as carbon monoxide, sulphur dioxide, styrene, butadiene, furans etc at high level and long term have both acute and chronic hazard effects (Beetseh and Onum, 2013).

Table 2: Environmental impact operations

Characteristics	Variables	Frequency (n)	Percentage (%)
Household source of heat for cooking	Fuelwood	13	7.8
	Charcoal/Coal stove	21	12.6
	Kerosene stove	50	29.9
	Liquid petroleum gas (LPG) cooker	70	41.9
	Electric stove (hot plate)	12	7.2
	Other(s) unspecified	1	0.6
Predominant source of heat for cooking	Fuelwood	1	1.1
	Charcoal/coal stove	11	12.4
	Kerosene stove	21	23.6
	Liquid petroleum gas (LPG)	53	59.6
	Electric stove (hot plate)	3	3.4
Obvious emissions from fossil fuel combustion technologies	Yes	23	24.0
	No	63	65.6
	I don't know	10	10.4
Treating combustible waste by burning	Always	31	33.0
	Very often	8	8.5
	Sometimes	26	27.7
	Rarely	15	16.0
	Never	14	14.9

Fossil fuel combustion technologies such as electricity generating plants, grass mowers, motorcycles, vehicles etc contribute to the environmental impact through emission. Analysis of obvious emissions from fossil fuel combustion technologies owned and utilised by various households showed responses of “Yes” (24.0% of participants), “No” (65.6% of participants), “I don't know” (10.4% of participants) as shown in (Table 2). 65.6% No of participants showed that most participant equipment are fuel efficient with minimal or no obvious emission Table 2. However most equipment used were adapted with fossil fuels combustion. This raises serious concerns on human and organisms’ health, and their immediate

environment (Suberu et al., 2012). The over reliance on fossil fuels threatens to alter the earth's climate to an extent that could have grave consequences for the integrity of both natural systems and vital human systems (Ahuja and Tatsutani, 2009).

4. CONCLUSION

Human activities have greatly harmed, yet hold a great deal of hope for the environment. This must be addressed in order to achieve environmental resilience and sustainability. This study observed disregard of environmental or natural resource management through various resource exploitation approaches. The different human environmental impact operation through earth surface imperviousness and emission showed practices which are rudimentary to sustainable environment. The aspect of nature conservative mitigation showed 54.43% appropriate and 45.57% inappropriate practices. It therefore demanded that the various resource exploitation models by man must be appropriately guided by ecological principles for resilient regenerative powers of nature and the sustained carrying capacity of the environment.

5. CONFLICT OF INTEREST

There is no conflict of interest associated with this work.

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