SOCIAL ECOLOGY, CLIMATE CHANGE AND ENVIRONMENTAL SUSTAINABILITY AMONG URBAN/SEMI-URBAN SETTLEMENTS IN SOUTHEAST NIGERIA: PROBING ENVIRONMENTALLY RESPONSIBLE BEHAVIOUR AND COMMUNITY – SUSTAINABLE DEVELOPMENT

OKAFOR, S. O.[1] – IZUEKE, E. M. C.[2*] – ONAH, S. O.[1] – UGWU, C. E.[2] – CHUKE, N. U.[3] – NKWEDE, J. O.[4] – UDENZE, C.[2] – OKOYE, O. E.[3]

[1]Department of Sociology/Anthropology, University of Nigeria, Kwame Nkuruma Way, Ihe Nsukka 410105, Nsukka, Nigeria

[2]Department of Public Administration and Local Government, University of Nigeria, Kwame Nkuruma Way, Ihe Nsukka 410105, Nsukka, Nigeria

[3]Department of Adult Education & Extramural Studies, University of Nigeria, Nsukka 410002, Nigeria

[4]Department of Political Science, Ebonyi State University, Abakaliki, Nigeria

**Corresponding author*
e-mail: eddy.izueke@unn.edu.ng

(Received 2nd Aug 2022; accepted 14th Oct 2022)

Abstract. This study examined knowledge of symbiotic relationship between man and natural environment, climate change and their implications to sustainable environmental behaviour and sustainable development among the urban/semi urban settlers in southeast Nigeria. The study was guided by Environmentally Responsible Behaviour (ERB) model, to understand the extent of environmental and ecological knowledge, and pro environmental sustainability behaviour among the citizens. 640 respondents (18+) from 16 settlements across the region were randomly selected for the study, while survey design was adopted for the study with the aid of questionnaire instrument. The data collected were analysed with aid of descriptive and inferential statistics tools for testing the relationship of substantive variables in the study. From the findings of the study, positive predictors of knowledge of social ecology included public media enlightenment on environment ($p < .000$), public institution quality ($p < .000$) and environmental citizenship ($p < .000$). Knowledge of solid waste management ($p < 0.01$) positively correlate with pro environmental behaviour. Positive predictors of global climate change awareness include knowledge of the natural environment, public media enlightenment on environment and duration in the place of residence ($p < .000$).
Keywords: *ecological harmony, environmental literacy, environmental sustainability, CO2 emission; environmental policy*

Introduction

From water pollution to the pollution of the lithosphere, to that of the atmospheric pollutions and climate change, one thing is a common factor- the human knowledge and behavioural disposition towards the natural environment. While environmental degradation is subject to the level of consciousness and commitment to the natural environment among the human inhabitants, environmental consciousness and commitment to the protection of the natural environment is directly related to the level of environmental/ecological knowledge among the human inhabitants of the natural environment (Robins, 2012; Blankenberg and Alhusen, 2019; McGuire, 2015; Clayton

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

et al., 2013). Although some studies have raised empirical questions about the positive correlation between ecological knowledge and pro environmental behaviour (Tanner, 1999; Vining and Ebreo, 2006), the extraneous factors between social ecological knowledge and pro environmental behaviour have been traced to the socioeconomic conditions of the citizens (Grob, 1995; Huebner and Lipsey, 1981; Yoon et al., 2010; Akintunde, 2017).

From pre-industrialization to the post-industrialization eras, human knowledge and consciousness towards the natural environment has been observed in the socioeconomic activities and urbanization patterns among the population (Malcolm, 2016; Wang et al., 2020; Hayter and Patchell, 2019). For instance, beginning from colonial, through the post-colonial era in Africa and Nigeria in particular, environmental behaviour at least, from some historical evidences, has shown the dominant behaviour towards the natural environment among the colonialists and the colonized as connected around the prevailing socioeconomic life among the population (Rodney, 1972). While the pre-colonial Africa and Nigeria in particular operated agrarian society, which was more or less patterned to value every aspect of the relationship between man and the natural environment, the post-colonial African society including Nigeria is operating on the platform of capitalist and industrialist system, which had little or no regard for the natural environment. In the postcolonial era among the colonized nations, environmental behaviour seems to be following the trajectory of the colonialist era legacies, which in any case, is the irresponsible attitude towards the health of the natural environment. In the case of Nigeria, the colonialist quasi environmental policies, which in any case, were more of mockery to the health and protection of the natural environment, can better be understood through the colonialist's forest management regime, which inadvertently rendered postcolonial Nigeria a hotspot for illegal and unhealthy logging in the sub-Saharan Africa. The 1937 forestry Act, amended in 1956 in Eastern Nigeria created an atmosphere of environmental degradation in which the host country is used as the platform and conduit pipe for the harvesting and onward transmission of timber products to the colonialist countries' and other destinations for wealth creation for the power brokers. Such situation among the developing nations where domestic and humanitarian face of environmental matter received little or no attention has created a vacuum in the linking dots of global environmental observation and pro environmental behaviour control aimed at saving the planet.

However, the globalization of the emerging issues of climate change and its accompanying health/socioeconomic complications seems to have created wide spread of environmental consciousness among members of the United Nations through uniform policy agenda across the globe, which is sustained through some level of pressure and persuasion from the United Nations and the allied bodies charged with environmental protection (Thelen et al., 1992; UN-Habitat, 2012; Perrez, 2020). As a matter of fact, majority of the United Nations member states draw parts of their domestic environmental policies from the template of allied bodies of the United Nations on environment and climate change (Perrez, 2020). Within the framework of the United Nations' allied bodies on environmental management, the diffusion of innovation on environment and sustainable development is transmitted through the institutional structures from the developed nations to the developing nations across the globe, using the United Nations and the allied bodies on environment as interconnectivity. This process as captured in the concept of historical contingency and path dependency in new institutionalism model, point to the unseen dependency of nations on the ongoing global phenomenon of natural

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

environment as well as the logical framework of the past, present and the future in the achievement of sustainable development (Peters, 2005; Greener, 2005; Kay, 2006). Sustainable development, which is invariably connected to environmental sustainability is embedded within the consistency of the social institution through which knowledge of the natural environment and socio-ecological harmony is projected and sustained to achieve environmental responsible behaviour (ERB) and environmental citizenship (Hines et al., 1987; Akintunde, 2017).

With the observed impacts of climate change which is caused by human socioeconomic activities captured as anthropocene in the geological scale, human behavioural dimension of the management of the natural environment has gradually become a global phenomenon (Adelekan, 2010; African Development Bank, 2010, 2012; ACCRA, 2012; IPCC, 2012). Notwithstanding, environmental degradation and human socioeconomic activities responsible for climate change and other forms of environmental health hazards, still surfaces across the globe especially among the developing nations where weak public institutions and poor regulatory framework have continuously ignored anti-environmental behaviour (Adeuti, 2020; Tabassum and Alam, 2016; Malin and Wang, 2013; Gall et al., 2013). The partial or non-observation of the globally and domestically designed environmental protection policies among the developing and developed nations, has been responsible for sustainable climate change implicated in the innumerable damages affecting different dimensions of human, animals and aquatic lives existing in the natural environment (Bertram-Huemmer and Kraehnert, 2017; Hessl et al., 2018; Burns, 2019; ILO, 2017; Okafor, 2017 Niang et al., 2014; Magrin et al., 2014; Kovats et al., 2014; Romero-Lankao et al., 2014; Hoegh-Guldberg et al., 2018). These included the aquatic damages resulting from the environmental pollution as can observed in Nigeria among the rivers, streams and ocean lines surrounding Nigeria, agricultural productivity decline and soil fertility compromise, environmentally related health compromise among the population living in some environmental degradation designated areas, and the overall climate change impact affecting health, lifestyle and herders farmers conflicts across Nigeria. These have been blamed on the poor knowledge of environmental harmony as well as lack of environmentally responsible behaviour among the citizens in the developed as well as developing nations.

In Nigeria in particular, the impacts of environmental degradation on the public health and other socioeconomic activities have been enormous and alarming although these impacts are segmented in terms of regions affected and by what type of impacts (Federal Ministry of Environment, 2018). For instance, in the southeast Nigeria, the impacts of climate change have been visible on the activities of the farmers as well as other related activities (Federal Ministry of Environment, 2018) while, the health impacts of environmental degradation has been felt both in the rural and urban settings within the region (Okwesili et al., 2016; Daramola and Eziyi, 2010).

As a yardstick for peripheral knowledge of the condition of the natural environment and human behaviour in Nigeria, the recent global environmental index report, revealed the lapses in environmental policy as well as poor environmental responsible behaviour record in Nigeria. As documented by the annual report of the Yale Centre for Environmental Law and Policy (2020), Nigeria appeared to be one of the nations with poor environmental performance index sitting at the bottom of global and regional ranking (151st) with a score of 31.0. The cumulative indices of the study focused on environmental health, ecosystem vitality, with the issue category of air quality, sanitation, drinking water, heavy metals, waste management, biodiversity/habitat,

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

ecosystem services, fisheries, climate change, pollution emissions, agriculture and water resources (Papadimitriou et al., 2020). In general, high scorers in the environmental performance index (EPI) exhibit long-standing policies and programs to protect public health, preserve natural resources, and decrease greenhouse gas emissions, which in practicality, is the product of holistic environmental knowledge and environmental responsible behaviour. The low EPI score of Nigeria points to the inalienable need for the understanding of the extraneous variables between policy design and implementation and, the poor response to public environmental policies among the citizens. Equally, the empirical evidences as documented by Yale Centre for Environmental Law and Policy (2020) further spotlighted the need for greater attention to the spectrum of sustainability requirements, with a high-priority focus on critical issues such as air and water quality, biodiversity, and climate change (Wendling et al., 2020).

Poor environmental knowledge as well as lack of understanding of the symbiotic relationship between the natural environment and the inhabitants (ecological harmony) has partly been responsible for the increase in human socioeconomic activities fuelling the climate change crises. This human behavioural dimension of the climate change problem seems to be more on the side of the developing regions of the global community of which southeast Nigeria is among them. Equally, the situation had been suspected as originating from the poor institutional framework obtainable in most of these regions, which affected environmental management institutions in these regions. This for the southeast Nigeria is reflected on the extent of anti-environmental as well as indifferent behaviours displayed by the citizens in the region (Chukwuemeka et al., 2012; Ene, 2014; Okafor et al., 2022a, b). Nonetheless, the knowledge of ecological harmony which in itself, is the understanding of the dimensions of the natural environment and its implication to human existence as well as other life forms in the natural environment is yet to be ascertained among the population in the urban and semi urban areas of the southeast Nigeria. Environmental knowledge which in itself, is captured in different concepts such as environmental knowledge, ecological knowledge and ecoliteracy (McBride et al., 2013), is the key to sustainable environment and healthy living in the natural environment owing to the fact that the citizens in their private and public lives hold the responsibility in keeping the health of the natural environment. While some scholars have investigated the problem of environmental knowledge and ecological harmony in the framework of environmental responsible behaviour (ERB) in some other parts of the world (Hungerford and Volk, 1990; Hana, 1995), this is yet to be accorded attention in some developing nations such as in southeast Nigeria. Equally, as environmental citizenship model has captured in analysis and illustration before now, that in as much as the citizens hold the responsibility of keeping a healthy environment, any policy option and approach without the position of environmental knowledge and commitment among the citizens may unlikely achieve the desired end (Hungerford and Volk, 1990).

Some studies in different parts of Nigeria have revealed the poor environmental knowledge among the citizens at some extent (Erhabor and Osayande, 2017; Erhabor, 2016; Bosah, 2013; Oluremi, 2018; Anijaobi-Idem et al., 2015) while, other studies have focused on the issue of environmental knowledge and environmental pollution in the southeast Nigeria (Chukwuemeka et al., 2012; Ene, 2014; Okwesili et al., 2016). There is yet to be a scholarly attention to socio-ecological knowledge and pro environmental behaviour among the inhabitants of the urban and semi urban areas in the

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

southeast region of Nigeria where evidence of greenhouse gas emission appeared to be glaring in relative to other similar regions in Africa. According to meteorological computation, there is a cumulative of 86,694,435 t, 0.48 t per capita and 95.3 t/km² CO2 intensity among the urban/semi urban communities in the region (Moran et al., 2017). In view of the relatively significant position of semi urban/urban communities in southeast Nigeria in the greenhouse gas effect analysis at least, in sub-Saharan Africa, there is a gap in literature, which needed to be filled, for more comprehensive understanding of the citizens' position and capability in the phenomenon of environmental and ecological sustainability. Specifically, the study focused on common knowledge of the natural environment, climate change as well as the knowledge of the basic ecological harmony between the natural environment and human existence, and their implication to support to environmental protection and sustainability among the inhabitants of the region. All these and more were encapsulated in the research questions guiding the study such as:

i. What are the predicting factors to the knowledge of ecological harmony among the inhabitants of the urban/semi urban areas in southeast Nigeria?
ii. What are the predicting factors to pro environmental behaviour among the components of the knowledge of ecological harmony?
iii. What are the predicting factors to pro environmental protection behaviour among the inhabitants of the urban/semi urban areas in southeast Nigeria?
iv. What are the predicting factors to the knowledge of global climate change among the inhabitants of the urban/semi urban areas in southeast Nigeria?

Theoretical framework: environmentally responsible behaviour (ERB) (Hines et al., 1987)

According to Environmentally Responsible Behaviour (ERB) as proposed by Hines et al. (1987), possessing an intension of action is a major factor that can influence environmentally responsible behaviour. Although other factors could play out in an individual or group responding to the obligation of keeping a healthy natural environment, ERB model indicates that variables such as intension to act, locus of control, attitude, sense of personal responsibility and knowledge majorly determine whether a person would adopt a behaviour especially as it has to do with environmental protection.

The model emphasizes the importance of locus of control as the major determinants of action by the individual with regard to environmentally responsible behaviour. While the control centre (locus of control) substantially determines the possibility of action by the individual, there is a relationship between the control centre, attitude of individual and their intention to act (Akintunde, 2017). Equally, the attitude of an individual is seen to be influenced by the relationship between the control centre (locus of control) and the attitude, which can result to improved intention to act as well as improve behaviour towards a phenomenon.

The theory in its focus towards human behaviour and the natural environment postulates the possibility of more than one variable in the intention, action and attitude towards the natural environment. For empirical observation as this study set to achieve, human behaviour towards the natural environment otherwise known as pro environmental behaviour, is subject to a number of factors such as the knowledge of the natural environment, ability to react to an observed issue of the natural environment, personal responsibility, attitude as well as composed behaviour by an individual.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

The overall composite of environmentally responsible behaviour (ERB), which can be measurable through the test of individual response to pro environmental protection policies in their jurisdiction, presents an individual as environmental citizen. Although the individual can have knowledge about the natural environment and morally appear to be pro environmentalist, the ability of the individual to put to practice these elements of pro environmental behaviour via the support to pro environmental policy as well as carrying out some unpopular but necessary obligations in protecting the natural environment, prove the individuals' environmental citizenship as well as their environmentally responsible behaviour.

The plausibility of the theory of environmentally responsible behaviour (ERB) has been tested in a number of studies especially in the developed nations with some level of environmental knowledge and the understanding of ecological harmony (Yoon et al., 2010). However, the theory is yet to be tested among the developing nations where environmental knowledge is yet to gain ground especially the knowledge of ecological harmony and the management of climate change mitigation behaviour. This gap in literature informed the present study. As a matter of fact, the present study captures the indices of ecological knowledge and ecological harmony and the corresponding attitude towards the natural environment itself as well as attitude towards pro environmental policy among the inhabitants of the urban/semi urban communities in southeast Nigeria; to evaluate the realities of ERB in the face of different levels of environmental knowledge as well as socioeconomic differences among the population.

Methodology

The study was carried out between February and July 2022 among 8 urban and 8 semi urban settlements, randomly selected from the five states of the southeast region of Nigeria among which are Abia (Coordinates: 5°25′N 7°30′E; ISO 3166: NG-AB), Imo (Coordinates: 5°29′N 7°2′E; ISO 3166: NG-IM, Anambra (Coordinates: 6°20′N 7°00′E; ISO 3166: NG-AN), Enugu Enugu (Coordinates: 6°30′N 7°30′E; ISO 3166: NG-EN) and Ebonyi (Coordinates: 6°15′N 8°05′E; ISO 3166: NG-EB) States (*Fig. 1*).

The 16 urban and semi urban settlements involved in the study are Umuahia, Aba, Ubakala and Uturu (in Abia state), Onitsha, Awka, Nnewi and Ekwunobia (in Anambra state), Enugu, Nsukka, Ubollo-Afor and Udi (in Enugu state), Abakiliki, Afikpo, Ikwo and Ishienu (in Ebonyi state); Owerri, Okigwe, Oguta and Amaigbo (in Imo state). The population of the selected areas and their CO_2 emission distributions are shown in *Table 1*.

While semi-industrial outlets characterise these areas, most of the industrial activities in the areas are more of crude technologies warranting heavy pollution. Equally, among the inhabitants of these areas domestic activities capable of greenhouse gas effect such as energy utility are dominant warranting empirical investigation on the connectivity between the knowledge of global and domestic environmental issues, and environmental behaviour.

Adult males and females from 18 years and above were selected from the five states and the sixteen urban/semi urban areas using inclusive criteria such as duration of residence in the area, at least, five years of residency in the area. Also, their frequency of activities in these respective settlements and type of occupation in the area were considered to capture only those who are regular and familiar with these settlements.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

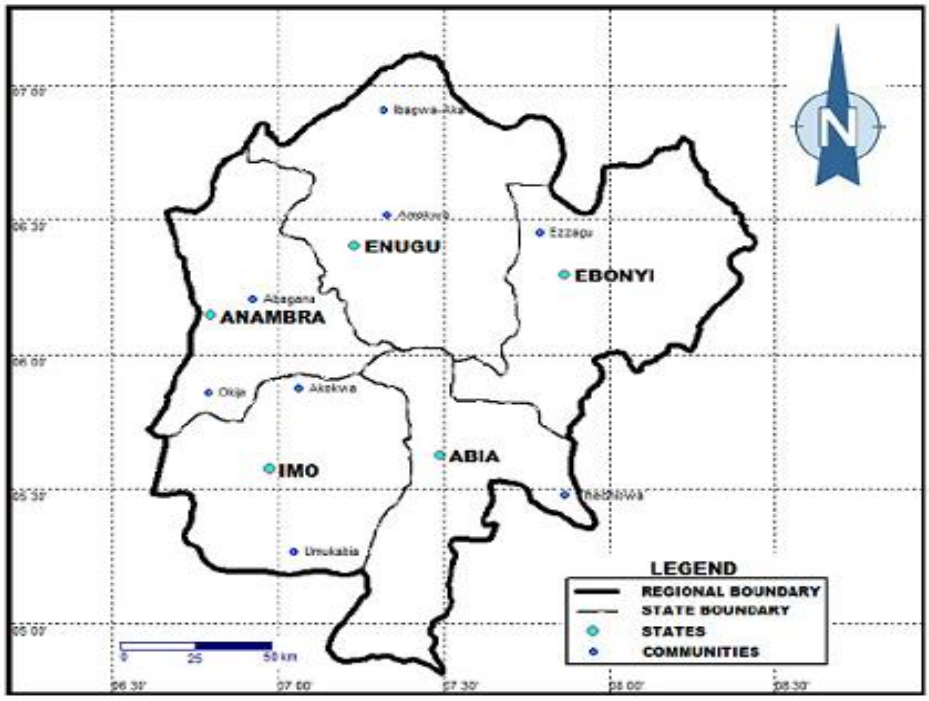

Figure 1. *A magnified map showing the states located in the Nigerian southeast region*

Table1. *Properties of the settlements (urban and semi urban areas included in the study)*

Area	State location	Population	CO_2 cumulative/per capita	CO_2 intensity
Umuahia	Abia	813,992	Not available	Not available
Aba	Abia	1,114,000	Not available	Not available
Ubakala	Abia	51,813	Not available	Not available
Uturu	Abia	43,183	Not available	Not available
Onitsha	Anambra	561066	Not available	Not available
Awka	Anambra	167738	Not available	Not available
Nnewi	Anambra	193987	Not available	Not available
Ekwunobia	Anambra	100, 021	Not available	Not available
Enugu	Enugu	688862	Not available	Not available
Nsukka	Enugu	309, 633	Not available	Not available
Obollo-Afor	Enugu	100, 402	49,068t/0.55t	38,574 t/km²
Udi	Enugu	370, 002	Not available	Not available
Abakiliki	Ebonyi	134, 102	121,314t/0.45t	207.6 t/km²
Afikpo	Ebonyi	343, 372	141,928 t/0.46t	590.7 t/km²
Ikwo	Ebonyi	309639	125,569t/0.46t	217.4t/km²
Ishienu	Ebonyi	230, 950	91,130t/0.44t	104.4 t/km²
Owerri	Imo	215, 038	Not available	Not available
Amaigbo	Imo	127, 300	Not available	Not available
Okigwe	Imo	210, 119	Not available	Not available
Oguta	Imo	201, 188	Not available	Not available

Source: Projected population from the National Population Commission (2006) and Moran et al. (2017)

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

The study adopted cross sectional survey design, to capture the ongoing behavioural exchange among the inhabitants of these settlements and the natural environment. While the behavioural display by the inhabitants towards the natural environment is a set of variables in relation to the socio-ecological realities, the extent of knowledge of the natural environment in relation to the symbiotic relationship between the environment and man was observed as a set of variables; these were captured quantitatively in the logic of social survey for empirical evaluation of the substantive issues to the study. In essence, for the possibility of empirical evaluation of the theoretical framework of the study, which is on Environmentally Responsible Behaviour (ERB), in connection with the behavioural exchange among the government institution on environment and the socio-ecological knowledge among the urban and semi urban dwellers in the region, the study utilized social survey logical data framework.

The study adopted both random sampling techniques in selecting the respondents. Yamani (1967) formula was applied to calculate the sample size from 6286407, which is the population of the area involved in the study, to 640 respondents who made up the study respondents. While the random sampling technique was adopted at the state level (for the selection of the 8 urban and 8 semi urban areas), urban and semi urban community levels (in the selection of streets and outlets) and the streets/outlet levels (for the selection of compound/household arrangements), modified random sampling was adopted in selecting the individual respondents based on the inclusive criteria).

Using equal probability sampling technique, each of the communities in the urban and semi urban areas were allocated 40 respondents, which were selected narrowing down to the streets and outlets involved in each locality. The streets/outlets and communities in each of the selected urban/semi urban areas were labelled for balloting technique, from which the study selected 5 streets/outlets/communities each, bringing together 80 streets/outlets, selected with simple random sampling technique. Among the 80 streets/outlets/communities selected, 4 residential compounds were randomly selected bringing together, 320 residential compounds. Among the selected 320 residential compounds, 2 respondents were selected from the available households using modified random sampling technique to maintain the inclusive criteria for the study. In total, 640 respondents were selected from 16 urban/semi urban areas.

The instrument for the study was survey questionnaire developed on nominal and ordinal scales with specific focus on the indices of individuals and group interaction on environment-related issues, behavioural exchange between the urban/semi urban dwellers and the government institution on environment, and other substantive issues. The questionnaire instrument was designed using relevant information from components of environmental literacy, adopted from Simmons (1995); Frameworks for ecological literacy advanced within the field of ecology and framework of ecoliteracy (MCBride et al., 2013), and domestic issues around indigenous behaviour towards the natural environment. The data for the study was collected through questionnaire interview, which was self-administered with some guidance from the researchers who visited the study areas to share the questionnaire instrument. The data collected were coded and analysed using Social Science Statistical Package (SPSS version23) while, the research questions guiding the study were answered with descriptive and inferential statistics such as percentages and linear Regression.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

Study findings and analysis

With the socio-demographic information of the respondents presented in *Table 2*, majority of the study respondents (52.5%) are males, while 47.5% of the respondents are females. The study quite involved a good number of youth who are invariably the future of environmental management especially in the developing nations such as Nigeria where there is much younger population in her demographic outlook. According to the age categories of the respondents, majority (50%) are in the age categories of 15-23 years, 27.5% are in the age category of 24-32 years, 10% are in the age category of 33-41 years, 7.5% are in the age category of 60 years and above, while 5% of the respondents are in the age category of 42-59 years. Majority of the respondents (52.5%) have acquired formal education up to the level of Higher National Diploma (HND) and first university degree; 27.5% were only educated to the level of primary education and high/secondary school certificates. 17.5% of the respondents have obtained training to the level of National Certificate in Education (NCE) and National Diploma while, only 2.5% have obtained training up to the level of Masters degree and above. Among the study participants, 37.5% are civil servants, another 37.5% are self-employed, and 20% are unemployed, while five percent are artisans/traders. 50% of the study participants have lived in the urban setting for more than 15 years, 20% have lived in the city for up to 10 years, and 17.5% have lived in the areas for less than 10 years, while 12.5% have lived in the city for up to 15 years.

Table 2. *Presentation of the socio-demographic information of the respondents*

Socio-demographic variables		**N**	**Percentage (%)**
Respondents' sex	Males	336	52.5%
	Females	304	47.5%
Age distribution	18-23	320	50.0%
	24-32	176	27.5%
	33-41	64	10.0%
	42-50	16	2.5%
	51-59	16	2.5%
	60 and above	48	7.5%
Respondents' education	Primary/high education	176	27.5%
	NCE/diploma	112	17.5%
	HND/degree	336	52.5%
	MSC and above	16	2.5%
Respondents' occupation	Unemployed	128	20.0%
	Artisan/trader	32	5.0%
	Civil servant	240	37.5%
	Self-employed	240	37.5%
Duration of the respondents in the city	Less than 10 years	112	17.5%
	Up to 10 years	128	20.0%
	Up to 15 years	80	12.5%
	More than 15 years	320	50.0%
Total		640	100.0%

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

Table 3a shows the knowledge as well as the perception of the components of the natural environment among the study participants. According to the distribution, 22.5% of the respondents disagreed that plants and trees ought to be preserved for the healthiness of the natural environment and that of the inhabitants of the natural environment while, 77.5% agreed that the trees and plants contribute to the healthiness of the natural environment and the inhabitants and therefore should be preserved. 57.5% of the respondents disagreed that all forms of animals contributes to the harmony of the natural environment and as such, should not be preserved while, 42.5% of the respondents agreed that all forms of animals contribute to the harmony of the natural environment and therefore should be preserved. About 30% of the respondents disagreed that poor sewage management contribute to environmental and human health problems while, 70% of the respondents agreed that poor sewage management contribute to human and environmental health problems. From the findings, the preservation of the natural environment can be seen as still facing with some level of hitches from the way people perceived such around, which in any case, is an indicator of indifference attitude to the natural environment.

Table3a. *Substantive issues to the study (attitude and perception towards the natural environment) 1*

Questionnaire items		N	Percentage (%)
Plants/trees in our environment contributes to the healthiness of the environment and the inhabitants therefore should be preserved	Strongly disagree	96	15.0%
	Disagree	48	7.5%
	Agree	288	45.0%
All forms of animals contribute to the harmony of our natural environment and therefore should be preserved	Strongly agree	208	32.5%
	Strongly disagree	80	12.5%
	Disagree	288	45.0%
	Agree	224	35.0%
Poor sewage management as contributor to environmental and human health problems	Strongly agree	48	7.5%
	Strongly disagree	144	22.5%
	Disagree	48	7.5%
	Agree	128	20.0%
Domestic activities such as cooking and other energy consumption contributes to greenhouse gas emission/air pollution	Strongly agree	320	50.0%
	Strongly disagree	112	17.5%
	Disagree	96	15.0%
	Agree	144	22.5%
Improper discharge of solid waste in the drainage system contributes to water pollution and other environment/human health hazards	Strongly agree	288	45.0%
	Strongly disagree	128	20.0%
	Disagree	64	10.0%
	Agree	144	22.5%
Indiscriminate dumping of solid waste and properties contributes to environmental pollution of the lithosphere (the surface environment)	Strongly agree	304	47.5%
	Strongly disagree	80	12.5%
	Disagree	128	20.0%
	Agree	96	15.0%
Total	Strongly agree	336	52.5%
		640	100.0%

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

Less than 40% of the respondents disagreed that domestic activities such as cooking and other energy consumption contribute to greenhouse gas (GHG) emission and air pollution while, more than 60% of the respondents agreed that domestic activities such as cooking and other energy consumption contribute to GHG emission and air pollution. 30% of the respondents disagreed that improper discharge of solid waste in the drainage system contribute to water pollution and other environmental/human health hazards while, 70% of the respondents agreed that improper discharge of solid waste in the drainage system contribute to water pollution and other environmental and human health hazards. More than 60% of the respondents agreed that indiscriminate dumping of solid waste and properties contribute to environmental pollution of the lithosphere (the surface environment) while, 32% of the respondents disagreed that indiscriminate dumping of solid waste and properties contribute to environmental pollution of the lithosphere (the surface environment).

Table 3b is the continuation of the substantive issues of the study. From the table, 47.5% of the respondents disagreed that air pollution can contribute to climate change while, 52.5% agreed that air pollution can contribute to climate change. On the observation of the current environmental situation across the globe, 47.5% of the respondents disagreed that the global community is experiencing climate change currently while, 52.5% agreed that the global community is experiencing climate change currently. About 60% of the respondents agreed that water, air and land pollutions are destroying the ecological harmony, while 40% disagreed that water, air and land pollutions are destroying ecological harmony. On the possibility of controlling climate change by man, 52.5% of the respondents disagreed that the problem of climate change can be controlled by man while, 47.5% agreed that climate change can be controlled by man. 47.5% of the respondents disagreed that climate change is affecting man and other living things in the natural environment, while 52.5% agreed that climate change is affecting man and other living creatures inhabiting the environment.

On the responsibility of protecting the natural environment, more than 60% of the respondents agreed that it is the basic responsibility of the citizens to protect the natural environment while, 37.5% of the respondents disagreed that it is the basic responsibility of the citizens to protect the natural environment. On the commitment to the protection of the surrounding natural environment, 52.5% of the respondents indicated that they have between good and excellent commitment to the protection of the natural environment, while 47.5% indicated they had between partial and no commitment to the protection of the natural environment.

Knowledge of ecological harmony was tested in *Table 4* to see the likely factors, which can predict the knowledge of ecological harmony among the population. With the commendable power of the model (82.5%), only three variables were picked as positive predictors of knowledge of ecological harmony. These include public media enlightenment on environment, nature of public institution and environmental citizenship. Knowledge of ecological harmony beyond the common knowledge of the natural environment requires a little step beyond what is taken as the common knowledge of the natural environment. In the case of socio-ecological knowledge, the basic elements of the natural environment are understood in relationship to their implication to human existence. By implication, there is evidence that this is a specialized knowledge of a kind, which does not appear as everyday knowledge among the population but, depended on the effectiveness of the educational institution in the management of knowledge on the nature around man, public media, public institution charged with environmental management as well as environmental citizenship.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

Table 3b. *Substantive issues to the study attitude and perception towards the natural environment 2*

Questionnaire items		N	Percentage (%)
Air pollution contributes to climate change	Strongly disagree	96	15.0%
	Disagree	208	32.5%
	Agree	256	40.0%
	Strongly agree	80	12.5%
The global community is experiencing climate change currently	Strongly disagree	64	10.0%
	Disagree	240	37.5%
	Agree	288	45.0%
	Strongly agree	48	7.5%
Water, air and land pollution are destroying the ecological harmony	Strongly disagree	144	22.5%
	Disagree	112	17.5%
	Agree	352	55.0%
	Strongly agree	32	5.0%
Climate change can be controlled by man to save the natural environment and human lives	Strongly disagree	96	15.0%
	Disagree	240	37.5%
	Agree	224	35.0%
	Strongly agree	80	12.5%
Climate change is affecting everything including man and every other living thing presently	Strongly disagree	144	22.5%
	Disagree	160	25.0%
	Agree	224	35.0%
	Strongly agree	112	17.5%
Commitment in protecting the natural environment against pollutions	Not at all	112	17.5%
	Partially	192	30.0%
	Good	304	47.5%
	Excellent	32	5.0%
Total		640	100.0%

Table 4. *The regression coefficient of knowledge of ecological harmony and other variables*

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. error	Beta		
(Constant)	2.102	.176		11.912	.000
Respondents' sex	-.487	.048	-.273	-10.151	.000
Age distribution	.052	.015	.098	3.479	.001
Respondents' education	-.170	.033	-.172	-5.209	.000
Respondents' occupation	-.099	.022	-.123	-4.463	.000
State of residence	-.104	.022	-.162	-4.816	.000
Public media enlightenment on environment	.213	.044	.173	4.798	.000
Nature of environmental policy	-.384	.042	-.280	-9.138	.000
Nature of public institution	.219	.034	.205	6.363	.000
Environmental citizenship	.529	.020	.671	26.421	.000

$R = 0.825$ (82.5%); $R^2 = 0.681$ (68.1%); Adjusted $R^2 = 0.675$ (67.5%); $F = 121.653$; $P = .000$

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

The variations in the extent of knowledge of the natural environment has some indicators such as the components of the knowledge of ecological harmony, which in any case show the developmental level obtainable in a particular population. From *Table 5* with the predicting power (R = 75.5%), there are indications that knowledge of the natural environment, among the population is affected by the two levels of knowledge of the natural environment such as common knowledge of the natural environment and the knowledge of the components of ecological harmony in relationship with their pro environmental behaviour. From the table, only three factors such as knowledge of improper discharge of solid waste in the drainage system as source of pollution, knowledge of indiscriminate dumping of solid waste and properties as source of environmental pollution and knowledge of air pollution as source of climate change can positively predict or rather positively correlate with pro environmental behaviour. The finding points to a spurious variable such as the level of environmental knowledge and awareness among the population and the corresponding environmentally responsible behaviour. Specifically, among the developing nations such as Nigeria, ecological harmony seems to be unfamiliar with the population especially in southeast Nigeria where environmental policies and the public institutions are weak and lack any efficiency in accommodating the current global practices on natural environment and social ecology.

Table 5. *The regression coefficient of pro environmental behaviour and the components of knowledge of ecological harmony*

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. error	Beta		
(Constant)	1.265	.097		13.030	.000
Knowledge of the contribution of the plants/trees to the healthiness of the natural environment	-.175	.031	-.210	-5.608	.000
Knowledge of the contribution of all forms of animals to the harmony of natural environment	-.059	.030	-.056	-1.963	.050
Knowledge of the contribution of domestic activities such as energy consumption as contributors to greenhouse gas/air pollution	-.168	.026	-.230	-6.376	.000
Improper discharge of solid waste in the drainage system as a source of water pollution	.397	.034	.561	11.713	.000
Indiscriminate dumping of solid waste and properties as a source of environmental pollution	.237	.048	.315	4.915	.000
Knowledge of air pollution as source of climate change	.153	.063	.165	2.442	.015

R = 0.755 (75.5%); R^2 = 0.571 (57.1%); Adjusted R^2 = 0.565 (56.5%); F = 104.808; P = .000

Table 6 displayed the predicting factors to commitment to the protection of the natural environment (pro environmental behaviour) among the respondents. From the table, the predicting power of the model appeared to be 88.1% with adjusted R^2 of 77.1%. Among the variables with positive predicting values are gender of the respondents, knowledge

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

and awareness of the current global climate change experience and observation of the impacts of climate change. Other predictors in the model appeared with negative values, which points to their negation of commitment to the protection of the natural environment among the respondents. These factors include age, education, occupation, knowledge of ecological harmony and seeing environmental protection as obligatory.

Table 6. *the regression coefficient of pro environmental behaviour and other variables coefficients*

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. error	Beta		
(Constant)	.973	.139		7.013	.000
Respondents' sex	.245	.049	.147	5.013	.000
Age distribution	-.065	.016	-.131	-4.121	.000
Respondents' education	-.151	.024	-.164	-6.192	.000
Respondents' occupation	-.099	.025	-.132	-3.917	.000
Knowledge of climate change	.545	.034	.508	15.834	.000
Knowledge of ecological harmony	-.236	.069	-.254	-3.420	.001
Knowledge of climate change effect	.399	.068	.492	5.861	.000
Environmental citizenship	-.107	.032	-.145	-3.288	.001

R = 0.881 (88.1%); R^2 = 0.777 (77.7%); Adjusted R^2 = 0.771 (77.1%); F = 135.577; P = .001

Table 7 presented the predictors of the knowledge and awareness of the ongoing climate change experience among the population. The predicting power of the model is 74.9% with adjusted R^2 of 55.4%. From the model, a number of factors appeared as positive predictors of knowledge and awareness of global climate change phenomenon such as, knowledge of the natural environment, strong coverage of enlightenment on environment by the public media, duration in the place of residence, respondents' occupation and age of the respondents. Other significant predictors but in the negative direction are the area of residence and formal education of the respondents.

Table 7. *The regression coefficient of knowledge of climate change effects and other variables coefficients*

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. error	Beta		
(Constant)	.100	.215		.467	.640
Knowledge of the natural environment	.622	.033	.671	18.748	.000
Public media enlightenment on environment	.162	.030	.151	5.373	.000
Duration of the respondents in the place of residence	.301	.027	.459	11.309	.000
Area of residence	-.123	.018	-.363	-6.953	.000
Respondents' occupation	.195	.024	.279	8.263	.000
Respondents' education	-.151	.027	-.175	-5.675	.000
Age distribution	.120	.015	.259	7.836	.000
Respondents' sex	-.116	.054	-.075	-2.132	.033

a. Dependent variable: knowledge of the global climate change experience

R = 0.749 (74.9%); R^2 = 0.560 (56.0%); Adjusted R^2 = 0.554 (55.4%); F = 89.263; P = .001

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

Discussion of the findings and conclusion

Basically, environmental knowledge visible in the extent of socio-ecological enlightenment among the citizens, is anchored on the social institution and structures obtainable among the population such as the educational system both the informal and formal educational system such that, where indigenous knowledge system could not capture the realities of symbiotic relationship between man and the natural environment, the formal education will capture such with more global outlook with the aid of conventional scientific recommendations.

Although policy wise, Nigeria has put into consideration, environmental knowledge for the sake of climate change (Fed. Min. of Env., 2016, 2020), this has not translated into actions and everyday realities. For instance, as a key strategy to combat climate change and other environmental degradation challenges, the federal government of Nigeria has stated in the policy framework, the readiness to create public awareness on environment with evidence-based information, educational curricular as well as setting up a system of teachers' training aimed at enlightening the primary and high school teachers on environmental knowledge so as to use them in consolidating on the framework of public enlightenment on the environment. However, from the findings of this study, education is one of the factors that negated the knowledge of global climate change as well as commitment to environmental protection among the citizens (see *Tables 4* and *6*). Specifically, the trans-generational education, which is visible in the data here from the number of people in different categories of educational qualifications (see *Table 2*) was enough to have injected the federal government public awareness agenda into the connectivity of educational institution and the mainstream societal life especially, with the number of years elapsed since the commitment of the federal government of Nigeria to the 1994 United Nations Framework Convention on Climate Change (FCCC) with the ratification of its Kyoto Protocol in 2004.

Going by the substantive issues the study focused to investigate, there are a number of findings filling some gaps in the literature on social ecology, environmental knowledge as well as climate change. From the model that was used to probe the knowledge of ecological harmony among the study participants, only three variables were picked as positive predictors of knowledge of ecological harmony. These include public media enlightenment on environment, nature of public institution and environmental citizenship. While the role of public media in globalization agenda appeared to have been useful in the familiarization of the population with the components of the concept of ecological harmony, the place of public institution in the popularization of the knowledge of ecological harmony is explained by the fact that the public institutions such as ministry of environment originates the form of public policy to guide the population in their relationship with the natural environment. This affirms the findings of (Marquart-Pyatt, 2015; Riva and Marquart-Pyatt, 2018) on the effects of the quality of public institutions, policy development and implementations. Equally, environmental citizenship in the model is an indicator of the will power that follows the ownership of responsibility in keeping the natural environment as Hungerford and Volk (1990) and Hines et al. (1987) affirmed in their model on environmental citizenship as well as the Environmentally Responsible Behaviour (ERB) model.

Knowledge of ecological harmony as this study specified is the ability of the individuals to understand the importance of the ecosystem to the human beings in the natural environment. However, the study made a further step in understanding the possible correlation between the knowledge of ecological harmony and pro

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

environmental behaviour. From the model, which was applied to probe the predictors of pro environmental behaviour among the components of ecological harmony, three factors such as knowledge of improper discharge of solid waste in the drainage system as source of pollution, knowledge of indiscriminate dumping of solid waste and properties as source of environmental pollution and knowledge of air pollution as source of climate change (see *Table 5*) could positively predict or rather positively correlate with pro environmental behaviour. By implication, there is a gap between the knowledge of the various components of ecological harmony and pro environmental behaviour among the population. In specific, the appearance of the three factors above in the model simply showed the level of comprehension, which the population can manage in relation to their knowledge of the natural environment and pro environmental behaviour. For instance, in the southeast Nigeria region, there is indiscriminate deforestation, hunting of all species of animals such that most of the birds and other animals have gone into extinction. Equally, bush burning and other activities contributing to greenhouse effects are rampant in the region as most people have poor or no knowledge of the effect of such on the overall natural environment.

In essence, knowing the components of ecological harmony but lacking the understanding of the relationship of these components of ecological harmony with the overall natural environment and man can be counterproductive to pro environmental behaviour. However, Hines et al. (1987) have earlier predicted that there is a relationship between the control centre, attitudes of individuals and their intention to act, before they can exhibit environmentally responsible behaviour. In advancing the thesis by Hines et al. (1987), the possible gap between the knowledge of the components of ecological harmony and pro environmental behaviour is the control, while the three factors above that predicted pro environmental behaviour displayed the level of familiarity and comprehensibility of the overall natural environment and man among the population.

For the concept of environmental sustainability to be realized among the citizens, the factor of pro environmental behaviour, which in itself, goes beyond the moral justification of the natural environment and observing the environment is vital. While pro environmental behaviour facilitates easy environmental policy implementation among the citizens, looking out for the factors that positively correlate with pro environmental behaviour can help in the formulation and implementation of environmental sustainability policy. From the findings, gender of the respondents, knowledge and awareness of the current global climate change experience, observation of the impacts of climate change and seeing environmental protection as the basic responsibility of the citizens, appeared in the model as the positive predictors of pro environmental behaviour among the population (see *Table 6*). While the surfacing of gender in the model can be partially explained as an indication that male citizens may likely be pro environmentalist as the socio-demographic variable tables showed that males were 52.5% compared to females who were 47.5% (see *Table 2*), the knowledge of the effects of climate change in the model indicates that public enlightenment on the global issues such as the realities of environmental pollution can activate pro environmental behaviour among the population. Although other researchers have discovered similar relationship between knowledge of climate change effects, gender and pro environmental behaviour (Berkes, 2017; Amare, 2018), the gap, which the present findings seems to have filled is the interfacing of settlements (urban and rural areas) in probing these indicators. Meanwhile, environmental citizenship in the model

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

supported the ultimate theses of ERB and environmental citizenship models (see Hungerford and Volk, 1990; Hines et al., 1987).

Consequent to the above findings on knowledge of climate change effects and pro environmental behaviour, understanding the factors propelling the knowledge of the global climate change effects can be valuable in building the momentum of pro environmental behaviour among the population. From the model applied to probe the predicting factors to the knowledge of the effects of global climate change, knowledge of the natural environment, public media enlightenment, duration in the place of residence, respondents' occupation and age of the respondents appeared to be positive predictors of knowledge of global climate change effects among the population. Although duration in the place of residency among the respondents appeared as positive predictor to the knowledge of the global climate change effects, the negative predictor value (B = .-363; t = -6.953), which appeared in the column of the area of residence can be understood from the fact that the regionalization of Nigeria mostly on ethnicity lines is likely to produce homogeneous appearance in behaviour over socioeconomic issues hanging on behaviour. Meanwhile the position of the knowledge of the natural environment (B = .671; t = 18.748) in the model is commendable with that of the public enlightenment from the public media (B = .151; t = 5.373). While in relation to the educational status of the respondents, knowledge of the effects of climate change appeared to be extraneous, with the public media, this can be explained as the outcome of the local media outlets bringing the environmental knowledge and concern closer to the citizens compared to the formal curricular in the educational system among the citizens. This is also connected to the duration of the respondents in the places of residence. With consistent flow of information and behavioural adaptation, many residents are bound to bend to the obtainable conditions in their places of residence. As it applies to the current study, among the southeast Nigerian states, there are some peculiarities that go with different states when it comes to environmental sustainability and orderliness. While in some of these states free riding overrides the issue of public environmental policy, in others, there are some level of obedience and commitment to public policy which can translate to environmental knowledge and protection as a responsibility for instance, more than 60% of the respondents agreed that it is the basic responsibility of the citizens to protect the natural environment (see *Table 3b*).

Conclusion

Conclusively, knowledge of ecological harmony which, which the study set out to understand as a research question can be predicted by public media enlightenment on environment, nature of public institution and environmental citizenship; this can be of great essence in building pro environmental behaviour. Equally, the study focused among other things, to understand the correlating factors to pro environmental behaviour; this was addressed in the model in *Table 5*. Pro environmental behaviour, which positively correlates with some components of knowledge of ecological harmony such as knowledge of improper discharge of solid waste in the drainage system as source of pollution and knowledge of indiscriminate dumping of solid waste and properties as source of environmental pollution can facilitate easy pro environmental policy implementation among the population. Pro environmental protection behaviour as one of the research issues raised in the study can be predicted by gender of the respondents, knowledge and awareness of the current global climate change experience

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

and observation of the impacts of climate change. Equally, knowledge and awareness of global climate change which can be predicted among the population by knowledge of the natural environment, public media enlightenment on environment, duration in the place of residence, etc. can be of relevance to certain policies targeting climate change effects and environmental sustainability.

REFERENCES

[1] Accra (2012): From Local to National: Supporting Local Government Action in Climate Change Adaptation, Disaster Risk Reduction and Development Planning. – ACCRA Briefs, Africa Climate Change Resilience Alliance (ACCRA), a consortium of Oxfam GB, the Overseas Development Institute (ODI), Save the Children International, Care International and World Vision International, funded by the UK Department for International Development (DFID) and the Climate Development and Knowledge Network (CDKN).

[2] Adelekan, I. O. (2010): Vulnerability of poor urban coastal communities to flooding in Lagos, Nigeria. – Environment and Urbanization 22(2): 433-450.

[3] Adeuti, B. R. (2020): Analysis of environmental pollution in developing countries. – American Scientific Research Journal for Engineering, Technology, and Sciences 65(1): 39-48.

[4] African Development Bank (2012): Congo Basin MRV Regional Project - Phase 1 Multinational: Project Appraisal Report. ADB/BD/WP/2012/47/Approval. – African Development Bank (AfDB), AfDB Statutory Headquarters, Abidjan, Ivory Coast.

[5] African Development Bank, UNECA, AUC, UNDP-RBA (2010): Assessing Progress in Africa towards the Millennium Development Goals. – MDG Report 2010, African Development Bank (AfDB): Economic Commission for Africa (ECA): African Union Commission (AUC) and United Nations Development Programme - Regional Bureau for Africa (UNDP-RBA): AfDB Statutory Headquarters, Abidjan, Ivory Coast.

[6] Akintunde, E. J. (2017): Theories and concepts for human behavior in environmental preservation. – J Environ Sci Public Health 1(2): 120-133. DOI: 10.26502/JESPH.012.

[7] Amare, Z. Y. (2018): Indigenous knowledge of Rural Communities for Combating Climate Change Impacts in West Central Ethiopia. – Journal of Agricultural Extension 22(1)181-195.

[8] Anijaobi-Idem, F. N., Ukata, B. N., Bisong, N. N. (2015): Environmental awareness and school sanitation in Calabar Metropolis of Cross Rivers State, Nigeria. – Journal of Education and Practice 6(4)1-5.

[9] Annual Report of the Yale Centre for Environmental Law and Policy (2020): Global Environmental Policy Assessment. – Yale University Publication, Yale.

[10] Berkes, F. (2017): Environmental governance for the anthropocene? Social-ecological systems, resilience, and collaborative learning. – Sustainability 9: 1232. DOI: 10.3390/su9071232.

[11] Bertram-Huemmer, V., Kraehnert, K. (2017): Does index insurance help households recover from disaster? Evidence from IBLI Mongolia. – American Journal of Agricultural Economics 100(1): 145-171.

[12] Blankenberg, A., Alhusen, H. (2019): On the Determinants of Pro-environmental Behaviour: A Literature Review and Guide for the Empirical Economist. Cege Discussion Papers, No. 350. – University of Göttingen, Center for European, Governance and Economic Development Research (CEGE), Göttingen.

[13] Bosah, V. O. (2013): Environmental education in Nigeria - issues, challenges and prospects. – Mediterranean Journal of Social Science 4(15) 159-168.

[14] Burns, V. (2019): Oceanic embodiments: living ENSO event in coastal Timor Leste. – Political Geography 70: 102-116.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

[15] Chukwuemeka, E., Igwegbe, D., Ugwu, J. (2012): Management and development implications of solid waste management in Nigeria. – Asian Journal of Business Management 4: 352-358.
[16] Clayton, S., Litchfield, C., Geller, E. S. (2013): Psychological science, conservation, and environmental sustainability. – Front Ecol Environ 11(7): 377-382. DOI: 10.1890/120351.
[17] Daramola, A., Eziyi, O. I. (2010): Urban environmental problems in Nigeria: implications for sustainable development. – Journal of Sustainable Development in Africa 12(1): 124-145.
[18] Ene, R. N. (2014): Environment hygiene in the Nigerian urban cities (a case study of Enugu Urban). – International Journal of Environmental Science and Development 5(4): 336-339.
[19] Erhabor, I. N. (2016): Actualizing the goals of environmental education in Nigeria. – Journal of Education and Practice 7(8)1-5.
[20] Erhabor, I. N., Osayande, E. I. (2017): Influence of adult literacy education on the environmental behaviours of women. – European Scientific Journal 13(20): 1-10.
[21] Federal Ministry of Environment (2020). Third National Communication (TNC) of the Federal Republic of Nigeria under the United Nations Framework Convention on Climate Change (UNFCCC). – Abuja: Federal Ministry of Environment.
[22] Federal Ministry of Environment (2018): Third National Communication to the United Nations Framework Convention on Climate Change (UNFCCC): Final Draft. – Federal Ministry of Environment.
[23] Federal Ministry of Environment (2016). Third National Communication to the United Nations. – Abuja: Federal Ministry of Environment.
[24] Gall, E. T., Carter, E. M., Earnest, C. M., Stephens, B. (2013): Indoor air pollution in developing countries: research and implementation needs for improvements in global public health. – American Journal of Public Health 103(4): e67–e72. https://doi.org/10.2105/AJPH.2012.300955.
[25] Greener, I. (2005): The potential of path dependence. – Political Studies Politics 25(1): 62-72 https://doi.org/10.1111/j.1467-9256.2005.00230.x.
[26] Grob, A. (1995): A structural model of environmental attitudes and behaviour. – Journal of Environmental Psychology 15(3): 209-220.
[27] Hayter, R., Patchell, J. (2019): Geography of industrialization. – Oxford Bibliographies DOI: 10.1093/OBO/9780199874002-0027.
[28] Hessl, A. E., Anchukaitis, K. J., Jelsema, C., Cook, B., Byambasuren, O., Leland, C., Nachin, B., Pederson, N., Tian, H., Hayles, L. A. (2018): Past and future drought in Mongolia. – Science Advances 4: 1-7.
[29] Hines, J. M., Hungerford, H. R., Tomera, A. N. (1987): Analysis and synthesis of research on responsible environmental behavior: a meta-analysis. – The Journal of Environmental Education 18: 1-8.
[30] Hoegh-Guldberg, O., Jacob, D., Taylor, M., Bindi, M., Brown, S., Camilloni, I., Diedhiou, A., Djalante, R., Ebi, K. L., Engelbrecht, F., Guiot, J., Hijioka, Y., Mehrotra, S., Payne, A., Seneviratne, S. I., Thomas, A., Warren, R., Zhou, G. (2018): Impacts of 1.5°C Global Warming on Natural and Human Systems. – In: Masson-Delmotte, V., et al. (eds.) Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty. Cambridge University Press, Cambridge.
[31] Huebner, R., Lipsey, M. (1981): The relationship of three measures of locus of control to environment activism. – Basic and Applied Social Psychology 2(1): 45-58.
[32] Hungerford, H. R., Volk, T. L. (1990): Changing learner behavior through environmental education. – The Journal of Environmental Education 21(3): 8 - 21. https://doi.org/10.1080/00958964.1990.10753743

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

[33] IPCC (2012): Summary for Policymakers. – In: Field, C. B. et al. (eds.) Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY, pp. 1-19.
[34] Kay, A. (2006): The Dynamics of Public Policy. – Edward Elgar Publishing Limited, United Kingdom.
[35] Kovats, R. S., Valentini, R., Bouwer, L. M., Georgopoulou, E., Jacob, D., Martin, E., Rounsevell, M., Soussana, J.-F. (2014): Europe. – In: Barros, V. R. et al. (eds.) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, pp. 1267-1326.
[36] Magrin, G. O., Marengo, J. A., Boulanger, J.-P., Buckeridge, M. S., Castellanos, E., Poveda, G., Scarano, F. R., Vicuña, S. (2014): Central and South America. – In: Barros, V. R. et al. (eds.) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, pp. 1499-1566.
[37] Malcolm, F. (2016): Externalities: why environmental sociology should bring them in. – Environmental Sociology 2(4): 375-384. DOI: 10.1080/23251042.2016.1196636.
[38] Malin, S., Wang, S. (2013): How should developing countries cope with pollution-migration? An extended model of north-south trade and its numerical simulation. – Energy & Environment 24(6): 939-951. www.jstor.org/stable/43735210. Accessed 31 May 2021.
[39] Marquart-Pyatt, S. T. (2015): Environmental sustainability: the ecological footprint in West Africa. – Human Ecology Review 22(1): 73-92.
[40] McBride, B. B., Brewer, C. A., Berkowitz, A. R., Borrie, W. T. (2013): Environmental literacy, ecological literacy, ecoliteracy: What do we mean and how did we get here? – Ecosphere 4(5): 67. http://dx.doi.org/10.1890/ES13-00075.1.
[41] McGuire, M. N. (2015): Environmental education and behavioural change: an identity-based environmental education model. – International Journal of Environmental & Science Education 10(5): 695-715.
[42] Moran, D., Kanemoto K; Jiborn, M., Wood, R., Többen, J., Seto, K. C. (2017): Carbon footprints of 13,000 cities. – Environmental Research Letters DOI: 10.1088/1748-9326/aac72a.
[43] National Population Commission, NPC (2006). Nigerian population census report 2006. – Abuja: National Population Commission.
[44] Niang, I., Ruppel, O. C., Abdrabo, M. A., Essel, A., Lennard, C., Padgham, J., Urquhart, P. (2014): Africa. – In: Barros, V. R. et al. (eds.) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.
[45] Okafor, S. O. (2017): Population and environmental policies in Nigeria: a part of the whole of the global environmental and population challenges. – J Res Development 5: 3 DOI: 10.4172/2311-3278.1000158.
[46] Okafor, S. O., Izueke, E. M. C., Nzekwe, I., Okezi, O., Isah, A. (2022a). Urban settlement and behavioural exchange towards environmental policy among urban settlers in Southeast Nigeria: implications for environmental policy administration and sustainability. – Public Policy and Administration 21(1): 55-81.
[47] Okafor, S. O., Igwe, J. N., Izueke, E. M. C., Okoye, O. E., Okechukwu, A. B., Obiozor, E. E. (2022b). Environmental knowledge and policy sustainability: a study of pro environmental policy support among the Southeast Nigerian rural communities. –

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889

International Journal of Sustainable Development and Planning 17(1): 341-350. https://doi.org/10.18280/ijsdp.170135.

[48] Okwesili, J., Ndukwe, C., Nwuzor, C. I. (2016): Urban solid waste management and environmental sustainability in Abakaliki Urban, Nigeria. – European Scientific Journal 12(23): 155-183.

[49] Oluremi, A. A. (2018): Environmental knowledge and behavior of Nigerian youth: an assessment, – Applied Environmental Education & Communication. DOI: 10.1080/1533015X.2018.1432431.

[50] Papadimitriou, E., Neves, A. R., Saisana, M. (2020): JRC Statistical Audit of the 2020 Environmental Performance Index. – EUR 30234 EN, Publications Office of the European Union, Luxembourg. DOI: 10.2760/849820, JRC120879.

[51] Perrez, F. X. (2020): The role of the United Nations environment assembly in emerging issues of international environmental. – Sustainability 12: 5680. DOI: 10.3390/su12145680.

[52] Peters, G. B. (2005): The problem of policy problems. – Journal of Comparative Policy Analysis: Research and Practice 7(4): 349-370. DOI: 10.1080/13876980500319204.

[53] Riva, C. H., Marquart-Pyatt, S. T. (2018): Environmental sustainability in Africa: what drives the ecological footprint over time? – Sociology of Development 4(1) 119-144.

[54] Rodney, W. (1972): How Europe Underdeveloped Africa. – Howard University Press, Washington, DC.

[55] Romero-Lankao, P., Smith, J. B., Davidson, D. J., Diffenbaugh, N. S., Kinney, P. L., Kirshen, P., Kovacs, P., Villers Ruiz, L. (2014): North America. – In: Barros, V. R. et al. (eds.) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, pp. 1439-1498.

[56] Simmons, D. (1995): Developing a Framework for National Environmental Education Standards. – In: Papers on the Development of Environmental Education Standards (pp. 10-58). Troy, OH: NAAEE.

[57] Tabassum, U., Nazeer, M., Alam, S. (2016): Environmental pollution and sustainable development in developing countries. – The Pakistan Development Review 55(4) 589-604.

[58] Tanner, C. (1999): Constraints on environmental behaviour. – Journal of Environmental Psychology 19(2): 145-157.

[59] Thelen, K., Steinmo, S., Longstreth, F. (eds.) (1992): Structuring Politics: Historical Institutionalism in Comparative Analysis (Cambridge Studies in Comparative Politics). – Cambridge University Press, Cambridge.

[60] UN-Habitat (2012): The State of Arab Cities 2012: Challenges of Urban Transition. – UN-Habitat, Nairobi.

[61] Vining, J., Ebreo, A. (2006): Predicting recycling behavior from global and specific environmental attitudes and changes in recycling opportunities. – Journal of Applied Social Psychology 22(20): 1580-1607.

[62] Wang, C., Cardon, P. W., Liu, J., Madni, G. R. (2020): Social and economic factors responsible for environmental performance: a global analysis. – PLoS ONE 15(8): e0237597. https://doi.org/10.1371/journal.pone.0237597.

[63] Wendling, Z. A., Emerson, J. W., de Sherbinin, A., Esty, D. C., et al. (2020): 2020 Environmental Performance Index. – Yale Center for Environmental Law & Policy, New Haven, CT. epi.yale.edu.

[64] Yamane, T. (1967): Statistics: An Introductory Analysis. – New York: Harper and Row.

[65] Yoon, J. I., Kyle, G., van Riper, C. J., Sutton, S. G. (2010): Climate change and environmentally responsible behavior on the great barrier reef, Australia. – Proceedings of the 2010 Northeastern Recreation Research Symposium, pp. 231-238.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_18691889