

Climate Change and Widening Endemicity of Diseases in Tropical Africa: The Ecological Stance of Households' Activities in Nsukka Urban

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Abstract

Climate change comes with numerous public health issues and prepares ground for emerging, re-emerging and expansion of diseases endemicity. If climate change continues in this trend, these health issues will be particularly worse in tropical Africa. Carbon(IV)oxide (CO₂) emissions from human activities including household level emissions have been implicated as the drivers of global climate change. Therefore, until households minimize or withdraw from activities that generate greenhouse gases and lead pro-ecological lives, Africa will be left awash with diseases in the nearest future. This study determined the ecological stance of household activities in Nsukka Urban of Enugu State in the context of climate change and widening endemicity of diseases in Africa. Descriptive research design was used for the study. The sample comprised of 470 households which was systematically sampled from 23,501 households in Nsukka Urban. Questionnaire was the instrument used for data collection. Frequencies, percentages, mean and ANOVA were used for data analysis. Result showed that the household energy consumption activities ($\bar{X} = 3.0$) and waste disposal methods ($\bar{X} = 3.6$) were above the criterion mean of 2.50. This indicated that those activities were both anti-ecological. There was a significant difference in the households' ecological stance based on level of income. The study recommended the development of a programme for enhancing pro-ecological behaviours among the household or any group.

Keywords: Climate change, Household, Endemicity, Ecological, Tropics, Nsukka Urban

Introduction

When people decide on how much and what to consume, they may not likely take into account how much waste they produce. Even when certain behaviours may damage the environment, people generally may not intend to damage the environment; at most, they are accepting the environmental impact as a side effect of some particular behaviour (Kaiser, Doka, Hofstetter, & Ranney, 2003). The off-shoots of human activities are changing the global climate, and humans are, in turn, grossly impacted by this change known as climate change. This makes climate change the most urgent global issue in view of the fact that it poses alarming number of threats to public health and the stability of the ecosystems that sustain life on earth.

Many of the major killer diseases are highly climate-sensitive and may worsen as the climate continues to change. The Working group II of the Intergovernmental Panel on Climate Change (IPCC) concluded that climate change is highly likely to result in more frequent temperatures, floods, drought, extreme storms, heat-related deaths, infectious disease epidemics, and decreases in crop yields and water quality (IPCC, 2001). Biello (2008) submitted that diseases like bird flu, cholera, Ebola, plague and tuberculosis emerged sequel to climate changes. Climate change will make it easier for many infectious diseases to spread and biodiversity will suffer as parasites and bacteria find a more welcoming environment (Walsh, 2013). These are just a few of the diseases likely to spread or get worse as a result of climate change. These health emerging issues seem to be lopsided to the developing world including Africa.

Many poor developing countries tend to be the most vulnerable to health impacts of climate change. Africa is one of the most vulnerable continents to climate change and climate variability with the least intellectual, institutional and technological capability to address the challenge (Ozor, 2010). Vidal (2013) projected increased

short rains in East Africa and heavier monsoons in West Africa. Unless action is taken to mitigate it, climate change may most likely give way for emerging, re-emerging and expansion of diseases where tropical Africa will be left awash with various health issues. Tropical climate permits malaria parasites to thrive in the region. This accounts for why malaria cases are more prevalent in the tropical region like Africa. Econews (2014) projected that by 2030, climate change may expose 90 million more people to malaria in Africa. On the other hand, outbreak of meningitis in Africa is strongly correlated with drought and both are likely to increase with climate change. The report further indicated that diarrhoea will rise five per cent by 2020 in Africa. This could be why the World Health Organization-WHO (2014) asserted that climate change is a significant and emerging threat to public health. Health educators, including the present researchers, are worried about the known roles that climate change has posed to play in emerging and re-emerging of diseases in Africa. In view of the foregoing, every anxious mind may be prodded to ask: what is this climate change?

In the usage of the United Nations Framework Convention on Climate Change-UNFCCC (2010), climate change refers to a change attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods. In other words, climate change refers to the increase above the average temperature of the earth leading to disasters like hurricanes, droughts and floods (Lindinger & Kunzemann, 2010). The primary cause of climate change is the accumulation of greenhouse gases in the Earth's atmosphere. Greenhouse gases (GHGs) are the gases in the Earth's atmosphere that trap the sun's heat and stopping it from leaking back into space (European Commission, 2015). The GHGs include: water vapour, carbon dioxide (CO₂), methane, nitrous oxide, aerosols, fluorine gases like chlorofluorocarbons (CFCs) among others.

Most of the GHGs are generated as man engages in various activities. The release of GHGs has increased significantly since the industrial revolution, mostly from the burning of fossil fuels for energy, agriculture, industrial processes, and transportation (Gifford, Kormos & McIntyre, 2011). These activities release a substantial amount of carbon dioxide into the atmosphere. According to European Environment Agency (2012), for every gallon (or litre) of gasoline one's car burns, 1300 times that volume of CO₂ is released (a gallon of gas weighs about 6 pounds or 2.8 kilograms, but the released CO₂ would weigh over 19 pounds or 8.75 kilograms). Other causes of climate change are the use of pesticide or insecticide (Dunn, 2009), oil flaring (Kahn, 2010), burning materials such as old cloths, tyres, firewood (Harvey, 2011), application of nitrogen-based fertilizer (Sanders, 2012), or deforestation and bush burning (Sumelong, 2014). These activities are commonly perpetrated at the household level. The implication of this is that climate change will continue to increase in its intensity so long as different sectors including households depend on burning of fossil for their various activities.

A household may be described as a person or all the persons living together in one house. According to National Population Commission (NPC) [Nigeria] and ICF International (2014), household was defined as a person or group of persons, related or unrelated, who usually live together in the same dwelling unit, have common cooking and eating arrangements, and acknowledge one adult member as the head of the household., while a non-family household consists of people who live alone or who share their residence with unrelated individuals. In this study, household refers to a person or group of persons living together as a domestic unit. Householder is contextualized in this study as bread winner and spokesperson of each household. Therefore, the householders constituted the respondents for this study.

Household GHG emissions around the world are massive. For instance, the greenhouse gas inventories show that households are responsible for around one third of GHG emissions in South Australia (Winefield, 2005). In the United States, households and individuals consume 38 per cent of total energy, more than the industrial sector (32.5%), the commercial services (17.8%), and the non-household transportation which is estimated at 11.7 per cent (Gardner & Stern, 2009). Even in Europe, households have also been shown to be largely responsible for emission increase in 2010, leading to an additional 90 million tones of CO₂ equivalence compared to 2009 (European Environment Agency-EEA, 2012). If GHG emissions are high in these countries where there are strict emission regulations, one wonders what the level of emission would be in African nations where regulation might not be all that strict. In Nigeria particularly, there is lack of and/or inadequate legal and institutional framework or sound environmental waste management (Olorunnimbe & Adejobi, 2012). However, to join in the fight against climate change, the households should strive to adopt pro-ecological behaviour.

Ecological behaviour may be described as intentional human actions directed at reducing green house gas emissions or avoiding conducts capable of causing harm to the environment in general or intensifying climate change in particular. It is behaviour that consciously seeks to minimize the negative impact of one's actions on the natural and built world (Kollmuss & Agyeman, 2002). In this study, ecological behaviour refers to person's behaviour which intentionally, and most times, painstakingly seeks to avoid or minimize the emission of GHGs. Also in this study, behaviours that were environmentally destructive were regarded as anti-ecological behaviours while those that promote environmental welfare were termed pro-ecological behaviour. Therefore, in determining the ecological stance of household activities, this study investigated the household activities and categorized them

either as pro-ecological or anti-ecological. The study emphasized on the source and extent of energy consumption and waste disposal which constituted the major climate-change-linked activities among Nigerian households including those in Nsukka Urban of Enugu State.

Energy consumption activities describe the various electrical appliances, methods and length of their use and the source(s) of power for the households. The use of high energy-consuming appliances like electric cookers, pressing iron, air conditioners and refrigerators is anti-ecological. There are pro-ecological alternatives. Albeit, these alternatives may be more costly or inconveniencing. For instance biogas cookers, charcoal pressing iron, and leaving the rooms aerated can be better options to the above named appliances. Burning charcoal may cause air pollution with ambient particulate matter. When children and women are present, especially pregnant women, burning of fuels, charcoal, etc can cause adverse health outcomes such as preterm birth, low birth weight, among others. Households can be more pro-ecological when they use more energy efficient appliances like Liquid Crystal Display (LCD) and Light Emitting Diode (LED) televisions than the Crystal Ray Tube (CRT) televisions. The LCD and LED televisions consume less energy compared to conventional CRT televisions. The same applies to the choice of household's lighting. The use of fluorescent rather than incandescent light bulbs, careful monitoring of home electricity usage (turning off the lights and television when not in use), and conversion to green energy alternatives such as wind and solar power which do not emit GHGs are better alternatives that households should adopt. The use of generators is associated high volume of GHG emission. Furthermore, researchers like Kaiser, Doka, Hofstetter and Ranney (2003) advised that people should take their old or unwanted materials to the recycler or give them out to the less privileged instead of burning them.. It may be that African households do not have this awareness or that they defy these warnings. This may be why anti-environmental activities are still being observed among them. One wonders if this is the case with the households in Nsukka urban.

In Nsukka Urban, there seems to be ushered in an era of sachet products. Observation by the investigators reveal that there is widespread demand and supply of sachet products ranging from sachet water, soap, pop corn, custard, sugar, milk, detergents, groundnut oil and almost all domestic products. Other local foods (like okpa, moi-moi, etc) and non-food items like cloths and shoes are packaged and sold in waterproof bags. Consequently, as many times as people buy these products, they generate high quantities of waste since the empty sachets and bags are not returnable to the seller. Sometimes, there are unwanted or old items at homes such as old clothes, hair extension, shoes, and beddings among others at home. This study investigated how these wastes are managed in relation to whether they are anti- or pro-ecological. This study investigated the household energy source(s), electrical appliances and extent of their uses and the extent of waste generation and disposal. However, the level of energy consumption and the quantity and manner waste disposal has much to do with the household's level of income.

As the household income increases, there is the likelihood of proportional increase in purchases, consumption and waste generation. Lucas and Gilles (2009) noted that high-income families consume more and thus produce more waste, but they are more likely to donate their old clothing to charities as opposed to discarding it, thus producing less waste. Cunningham and Cunningham (2012) argued that waste is greater for households with higher income. According to Tribbia (2007), people with larger incomes may have the resources to afford cars, heat and cool large homes, and consume more products that depend on fossil fuels, however, they may also be able to buy energy-efficient appliances and be educated about the causes of climate change. This study verified the link between household's level of income and their ecological stance. If the households should carry on their daily activities with minimal GHG emission, the trend of climate change will be slowed and the impending epidemic threat to Africa will be minimized if not totally reversed.

Therefore, there is the need for intervention(s) in order to promote pro-ecological behaviours among the household members. Without the baseline data on the various households' anthropogenic activities, the researchers, government or even the non-governmental organizations may not be spurred to bring forth emission control intervention tools or assistance to remedy this situation. No study accessible to the present researchers has been conducted to reveal the ecological stance of households' activities in Nsukka urban of Enugu State. This was what necessitated this.

Therefore, the purpose of this study was to investigate the households' activities in Nsukka Urban of Enugu State with emphasis on energy consumption and waste disposal methods so as to determine their ecological stance. To be able to do, this, the following questions were posed:

1. What is the ecological stance of energy consumption among households in Nsukka Urban?
2. What is the ecological stance of waste disposal among households in Nsukka Urban?

The researchers hypothesized that the ecological stance of households' activities does not differ significantly based on their level of income. The outstanding significance of this study is that it will constitute the baseline data for researchers, governments, non-governmental organization and all those interested in providing solution to climate change. Based on this, they may be impelled to come forward with intervention strategies to

curb GHG emissions at the household level. The study was delimited to households in Nsukka Urban of Enugu State.

Methods

The study adopted the descriptive research design. The population for the study consisted of all the households in Nsukka Urban of Enugu State estimated at 23, 501 households (Nsukka Town Planning Authority, 2014). In consonance with the rule of thumb of Nwana (1990), 470 households representing two per cent of the population were selected using simple random sampling techniques. The respondents were stratified as low and high income households. This was done by administering the initial 1000 baseline questionnaire to the cross section of households in Nsukka meant to only elicit information on their various levels of income. For the purpose of this discourse, those who earned below fifty thousand naira (N50, 000) per month were regarded as low income earners while those who earn N50, 000 and above per month were regarded as earning high. The respondents who were willing to participate were to indicate their level of income, addresses and phone numbers on the baseline questionnaire. From their responses, 235 low income households and their 235 high income counterparts were randomly selected.

The instrument for data collection was questionnaire validated by five environmental health experts. The instrument was subjected to reliability test using split half method and its degree of internal consistency was determined using Kuder-Richardson 21 (KR-21) formula which yielded 0.78 coefficient. The instrument had three sections. Section A was to solicit information on the respondents' level of income, section B was to elicit information on the household energy consumption activities while section C elicited information on the households' waste disposal methods.

The ecological stance of households' activities was analyzed and determined using criterion mean which was calculated from the summated ratings. The type and extent of utilization of household appliances, energy source(s) and manner of disposal of wastes were determined as the respondents indicated the following to options provided in the questionnaire: high extent, moderate extent, low extent, and never. These options were assigned 4, 3, 2, and 1 respectively for anti-ecological appliances or activities and reversed for pro-ecological appliances or activities. A criterion mean of 2.5 which was obtained thus: $\frac{4+3+2+1}{5} = \frac{10}{4} = 2.5$ was the bases for judgment. The score that was equal to or greater than the criterion mean, was regarded as anti-ecological activities while the score below the criterion mean was regarded as pro-ecological activities. The null hypothesis was verified with one-way ANOVA at 0.05 level of significance.

Results

Table 1

Summary of Findings on the Ecological Stance of Households' Energy Consumption Activities (n=470)

S/n	Items	Responses (n=470)				\bar{x}	Decision
		High extent	Moderate extent	Low extent	Never		
Anti-ecological items							
1	Generator*	351	74	27	18	3.6	Anti-ecological
2	Electric cooker*	201	113	124	32	3.0	Anti-ecological
3	CRT television*	119	132	179	40	3.4	Anti-ecological
4	Refrigerator*	216	107	83	64	3.0	Anti-ecological
5	Air conditioners*	153	118	102	97	2.7	Anti-ecological
	Cluster mean	208	109	103	50	3.14	Anti-ecological
Pro-ecological items							
6	Concern to switch off appliances not in use**	88	119	263	0	2.4	Pro-ecological
7	Concern to use energy-saving appliances**	21	114	203	132	2.9	Anti-ecological
	Cluster mean	54.5	116.5	233	66	2.65	Anti-ecological
	Grand mean					2.9	

KEY * anti-ecological appliances; **pro-ecological appliances

Table 1 reveals that overall; energy consumption activities at the household level were highly anti-ecological ($\bar{X} = 2.9$). Specifically, the extent use of generator was prominent anti-ecological activity ($\bar{X} = 3.6$). Other high anti-ecological activities was the extent of use of CRT televisions ($\bar{X} = 3.4$), refrigerators ($\bar{X} = 3.0$), electric cookers ($\bar{X} = 3.0$), and air conditioners ($\bar{X} = 2.7$). The households' concern for the use of energy-saving

electrical appliances was anti-ecological ($\bar{X} = 2.9$). However, the households were only slightly pro-ecological in their concern for switching off appliances when they are not in use ($\bar{X} = 2.4$).

Table 2
Summary of Findings on the Ecological Stance of Waste Disposal among Households (n=470)

S/n	Items	Responses (n=470)				\bar{x}	Decision
		High extent	Moderate Extent	Low extent	Never		
1	Recycling**	0	3	19	449	3.9	Anti-ecological
2	Dumping *	343	119	8	0	3.7	Anti-ecological
3	Giving them out**	32	32	401	5	2.8	Anti-ecological
4	Burning them*	422	26	22	0	3.9	Anti-ecological
	Grand mean	199	45	113	114	3.6	Anti-ecological

KEY * anti-ecological method; **pro-ecological method

Table 2 reveals that the households dispose of their wastes in the most anti-ecological manner (Grand mean= 3.6). The most preponderant waste disposal method was burning of old and unwanted materials ($\bar{X} = 3.9$). The recycling habits of the households were very poor making it anti-ecological ($\bar{X} = 3.9$). Also taking prominence in the household anti-ecological waste disposal method were dumping ($\bar{X} = 3.7$), and lukewarm attitude to giving out unwanted material to the less privileged ($\bar{X} = 2.8$).

Table 3
Summary of ANOVA Testing the Significant Difference of Households' Ecological Stance Based on the Level of Income

Variables	Sub-Variables	Sources of Variation	Sum of Squares	df	Mean	F	P.Val
Ecological Stance	Low Income	Between groups	209988.476	4	52497.119		
	High Income	Within Groups	266172.103	465	278.714	188.355	.000
		Total	476160.578	469			

Significant (P<.05)

Table 3 above indicates that the P value (.000) is less than 0.05 level of significance at degrees of freedom of 4 and 465. Based on this result, the hypothesis suggesting that there is no significant difference in the ecological stance of households in Nsukka Urban based on level of income was therefore rejected.

Discussion

This study found (in table 1) that energy consumption activities among households were anti-ecological ($\bar{X} = 3.0$). This finding was not surprising since most people are unaware of that their activities may harm their environment and in turn, their health. People are only concerned about immediate cost of their actions. For instance, if people are taxed heavily in their energy consumption, they will be forced to minimize their rate of energy consumption. This may be why the households in this study were found in table 1 to be slightly pro-ecological ($\bar{X} = 2.4$) as it concerns switching off appliances that were not in use, probably to cut down their electricity bills. However, if their actions do not affect them immediately, directly or personally, they may not likely bother about the outcome of their environmental behaviour. Kaiser, Doka, Hofstetter and Ranney (2003) had earlier remarked that even when certain behaviours may damage the environment, people generally may not intend to do the damage; at most, they are accepting the environmental impact as a side effect of some particular behaviour. This may account for why the households were found to be anti-ecological in energy consumption. This finding is consistent with a study conducted in the United States by Gardner and Stern (2009). In the United States, according to Gardner and Stern, households consume 38 per cent of total energy, more than the industrial

sector (32.5%), and the commercial services (17.8%). Green house gas emission through household waste disposal was also found to be high.

Data in Table 2 revealed that methods of waste disposal among the household were anti-ecological ($\bar{X} = 3.6$). The major method of waste disposal is incineration (burning) or dumping which constitutes landfill. The households had poor attitude to recycling or giving out their unwanted materials to the less privileged. This result was not surprising. It is either that most people do not clearly understand how their activities are linked to climate change and its monstrous impacts on their health or that they do not believe in it. Unlike other social problems such as war, terrorism or poverty that are more visible and evoke a strong emotional response, climate change appears somewhat imperceptible. The abstract nature of the risks of climate change does not evoke strong visceral reactions (Weber, 2006), which makes it difficult to mobilize around the issue. This finding is consistent with the study reported by European Environment Agency-EEA (2012). The EEA reported that households have been shown to be largely responsible for emission increase in Europe in 2010, leading to an additional 90 million tones of CO₂ equivalence compared to 2009.

Data in Table 3 revealed that the P value (.000) is less than 0.05 level of significance at dfs 4 and 465. This means that null hypothesis of no significant difference between level of income and household ecological stance was rejected. By extension, the household ecological stance varies according to their income. The high income households were more anti-ecological in energy consumption and waste disposal compared to their low income counterparts. This finding is supported by that of Tribbia (2007) which found that people with larger incomes may have the resources to afford cars, heat and cool large homes, and consume more products that depend on fossil fuels. However, Tribbia pointed out the larger incomes homes may also be able to buy energy-efficient appliances and be educated about the causes of climate change.

Conclusion

Sequel to the findings and discussion of this study, it is concluded that households activities in Nsukka Urban (particularly in the area of energy consumption and waste disposal) are anti-ecological. By extension, the households contribute immensely to the increasing intensity of climate change, an era which comes with emergence and expansion of diseases in Africa, and where African households are at the receiving end. This highlights the need for health educators to carry out climate change education across the communities in order to sensitize the households on the need to avoid or reduce their *per capita* green house gas emissions.

Recommendation

Based on the findings, discussion and conclusion, the following recommendations were made:

1. Climate change education should be made an integral but independent part of Health Education curriculum since climate change is a public health issue. This will enable the trainee health educators to be well groomed on the issues of climate change vis-à-vis the emerging and expansion of diseases. This will give room for inclusion of climate change as the health educators carry on their health campaign.
2. This finding creates the need for public health researchers to develop a programme for enhancing pro-ecological behaviours among households or any group to enable the people to understand: (a) how their behaviours may affect the environment, (b) how in turn, this may affect their health, and (c) the way out.
3. Nigeria government should create or strictly enforce CO₂ emission control regulation in order to help minimize emission at every sector and not just at the household level.
4. Health experts in collaboration with government agencies such as National Emergency Management Agency (NEMA), Federal Ministry of Environment and Nigerian Meteorological Agency (NIMET) should acquire scientific knowledge to guide wise decision making and to mobilize public support for implementing far-reaching economic, social and political change in relation to climate change policies in Nigeria.

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