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OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

EDITOR-IN-CHIEF
M.A.O ALUKO

ENVIRONMENT AND SUSTAINABLE DEVELOPMENT IN THE 21ST CENTURY

(SPECIAL ISSUE)

EDITORS
T.O. AKINBOBOLA
M.O. OLAWOLE
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Appreciation 1

We are taking the opportunity to express our sincere appreciation to the scholars and experts listed below who have taken from their time to serve as plenary session's Chairpersons, Rapporteurs, Technical persons and peer reviewers. The contributions of the scholars are greatly valued and will continue to be appreciated.

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Dean's remark

An Address delivered by Prof Chris Olugbenga AJILA,

Dean of the Faculty of Social Sciences, Obafemi Awolowo University, Ile-Ife at the National Conference held on 29th and 30th March, 2016

It is my pleasure on behalf of all the staff and students of the Faculty of Social Sciences, Obafemi Awolowo University, Ile-Ife, to congratulate everybody for a successful National Conference. I am thankful to the Almighty God for granting everyone the grace to be part of the Conference.

The theme of our Faculty's 2016 National Conference "Environment and Sustainable Development in Nigeria in the 21stCentury" can never be over-flogged especially in this present-day Nigeria where sustaining the environment poses regular challenge not only to the government, but to all the citizens. The theme is not only appropriate and relevant, but germane to events and issues that all nations of the world face which include fostering sustainable communities, waste management, climate change, desertification, urban sprawl and deforestation.

Environmental problems, issues and concerns span a continuously growing range of pollutants, hazards and eco-system degradation factors that affect areas ranging from local through regional to global. Some of these concerns arise from observable chronic effects on, for instance, human health, while others stem from actual or perceived environmental risks such as possible accidental releases of hazardous materials.

The potential of the natural environment to sustain these anthropogenic changes while continuing to function as an ecosystem is an issue of major concern. The sixty-seven papers presented at the Conference did justice to all the issues.

I am appreciative of the inputs, efforts and dedication of the 2016 Faculty Conference Committee for their commitment in organizing a hitch-free conference. All the staff and students of the Faculty are well appreciated for their unquantifiable contributions. I equally express my profound appreciation to the first Keynote speaker, His Excellency, Governor of the State of Osun, Ogbeni Rauf Aregbesola who was ably represented by the Head of Service of the State of Osun, and the second Keynote speaker, Dr. Kingsley Akinroye, Director, Nigerian Heart Foundation.

I thank you all for your support and contributions. May God bless you.

Prof. Chris Olugbenga AJILA

Dean, Faculty of Social Sciences, OAU, Ile-Ife.

2015-2017

skilled human capital, and found gross inadequacy, which he concluded is a potent threat to Nigeria's aspiration to becoming one of the world's technology giants.

Though Omitogun observed that population growth and increased food production have not contributed significantly to Nigeria's development, Oyeleke *et al* agree that rural development is a strong catalyst for poverty reduction and recommend that capital flows should be geared into rural areas and sectors where poverty can be substantially minimized. This however is a deviation from Olagbaju *et al* that expressed optimism that Nigeria's hope of achieving sustainable economic growth lies in the manufacturing segment of the industrial sector and not in the service or the agricultural sector. Therefore, the need for manufacturing-focused industrial policy is recommended. Ajetunmobi interrogated vegetation changes, which he blamed on agricultural and other life-sustaining activities and suggested that sustainable vegetation reversals could only be achieved through vegetation-friendly practices in agriculture, lumbering and mining as well as providing alternative to wood-fuel.

While Yoade drew attention to the deplorable state of the physical environment in traditional core areas of Nigerian urban area and advocated that sustainable development efforts in Nigeria be extended to these areas, Agaja and Ajibade noted that the sustainability of development is measured by the degree of the friendliness of adopted technology to the environment, and suggested that Nigeria should embrace cleaner technologies.

Ajide and Emmanuel were optimistic that with overwhelming positive attitudes of urban-dwellers in Lagos, Nigeria has very high hope of attaining sustainable renewable energy through the use of bio-fuel. However, Ojakorotu and Olaopa observed that Nigeria's oil-exploration contributes significantly to global environmental degradation and climate change, weak enforcement of environment policies constitutes an impediment to sustainable environment in the Niger Delta. This corroborates Agunyai *et al* positive perception of militancy in the Niger-Delta, because it has helped in drawing government attention to the plight of the people of the region.

Orimoogunje and Faniran expressed pessimism in the workability of any approach to sustaining the environment as long as humans' quest for modernization is devoid of intellectual stewardship restraints. To them, ideal environmental sustainability pathway involving the use of humans' powers and intellects sustainably, is the key to human development.

While Akinola and Ayodele provided fresh insight into the often-underemphasized benefits of Boko Haram insurgency which could be harnessed for the sustainable socioeconomic development of the Northeastern Nigeria, Adegbite and Akinloye linked the declining agricultural production and the emerging food insecurity to the insurgency in the northeast where internal displacements are rife.

Eludoyin drew our attention to the susceptibility of urban-dwellers to noise pollution as well as their helplessness and cautioned against imminent deafness. The enactment of new laws mandating installation of sound-insulated windows/ceiling in all noise-generating facilities was recommended.

Faiyetole, Adesina and Oyebisi noted that no particular climate pathway delivers absolute benefits to the African region due to its poor economic status, and suggested an hybrid of the four climate policies.

Adopting an interpretive analysis of Ààtan (waste-sites), Owoeye et al provide useful insights into waste practices, waste-management and entrenched beliefs that affect sustainable environment in Yoruba communities.

Temidayo AKINBOBOLA *(Ph. D)*

Chairman, 2016 Faculty of Social Sciences Conference Committee

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TESTING CONVERGENT AND DISCRIMINANT VALIDITY FOR THE DIMENSIONS OF SOLID WASTE POLLUTION CONCERN IN LAGOS

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ABSTRACT

This study was primarily motivated by the non-existence of a continuous level scale for measuring solid waste pollution concern in its related economic valuation studies. Consequently, this study employed confirmatory factor analysis (CFA) technique to determine the most appropriate specification among its popular dual-factor and tripartite factor specifications. This was achieved by conducting both the convergent and discriminant validity tests as well as the chi-square difference test for the two popular theoretical frameworks for the variable. The result obtained shows that both model specifications significantly explain the variation in households' concern for solid waste pollution. However, the tripartite-factor model was observed to offer a better specification for measuring solid waste pollution concern.

Keywords: *CFA, Solid Waste, Pollution Concern, Waste Management*

INTRODUCTION

The discussion of environmental sustainability in Nigeria will be incomplete without capturing the sustainability of solid waste management which has impaired environmental beauty in most urban centers (Imam et al., 2008). While remarkable improvements have been achieved in some states, the economic valuations studies contributed to explain the welfare effect of solid management related policy changes have been noted to omit "solid waste pollution concern" as non-economic determinant of welfare change (Adam et al., 2015). Solid Waste Pollution Concern (SWPC) as an aspect of environmental concern is recently acknowledged as an important non-economic motivator of solid waste pro-environmental activities such as source-separation and willingness to pay for service improvement. When broadly expressed in the context of environmental concern, SWPC could be conceptualized to have a few distinct dimensions and all dimensions are believed to concurrently exist in all humans (Stern et al., 1993; Stern & Dietz, 1994; ——Ojea & Loureiro, 2007; Whittaker et al., 2005)Thompson & Barton, 1994; .

"Concern" is a form of attitude that connotes ethical consideration towards the environment (Stern et al., 1993; Stern & Dietz, 1994; Ojea & Loureiro, 2007). However, since all forms of attitudes, including "concern" are deemed psychological variables, they attract little attention in estimating economic value associated to environmental goods (Moissennen, 1990; Ojea & Loureiro, 2007). Nevertheless, environmental economics literature has acknowledged the relationship between attitude and economic value (Mitchell & Carson, 1989; Bateman et al, 2002). As such, some economic valuation studies have analyzed the impact of attitude, in the context of "environmental concern" on economic value (Moisseinen 1990; Stern et al., 1993; Ojea & Loureiro, 2007). However, one general weakness of the above studies lies in their adoption of "general environmental concern." Such broad conceptualization of concern, which cannot be confined to specific environmental issue, could be misleading as concern on specific environmental issues might have unique results Adam et al (2015).

To avoid this, –Van Liere and Dunlap (1980) have long suggested studies to be focused on concerns specific to distinct environmental issues. Accordingly, Mohai and Bryant (1994) and Mohai (2003) have recognized solid waste pollution concern as one of the specific types of environmental concerns. This variable is commonly applied in economic valuation studies on different aspects of solid waste management service. A survey of existing studies reveals that all the previous studies that include solid waste pollution concern found it statistically significant in determining economic value estimates (Jamelske & Kipperberg, 2006; Jin et al, 2006; Afroz & Masud, 2011).

Notably, all aforementioned studies measure solid waste pollution concern using "Yes-No" nominal level of measurement, allowing a great deal of information to be lost. This is because the adoption of such level of measurement (scale) ignores the distinct theoretical dimensions of the variable (environmental concern). In theory, at least, two to three dimensions of such concern exist simultaneously in every individual but not all may be triggered to influence solid waste management related pro-enviromentalism such as recycling (Stern & Dietz, 1994; –Thompson & Barton, 1994). Thus, outcomes of solid waste pollution concern based on "Yes-No" nominal measure as conceptualized in existing economic valuation research provides no information on what dimension of its structure could be activated in support of value ascription. At best, such conceptualization of concern only gives insight on the relationship between economic value and concern. Meanwhile, information on "*what dimension could be activated?*" is important to inform policy on what dimension to focus when designing awareness campaign programmes to trigger support for solid waste management improvement or related policies.

To address the above issue Adam et al (2015) adapted and factor-analyzed a new continuous level measurement scale for solid waste pollution concern. Since factor analysis of Likert-scale items only provides information about the descriptive structure of variables, the empirical validity of the underlying theories using the instrument could not be confirmed. As such, the objective of this study is to test both the convergent and discriminant validity of the different dimensions of solid waste pollution earlier analyzed by Adam et al (2015). To the best of our knowledge, this study is the first to examine such for solid waste pollution concern scale.

The remaining sections of this paper are organized as follows. Section 2 discusses the dimensions of concern based on relevant frameworks, followed by discussion on the method of analysis in section 3. Section 4 presents the study's results and discussion, and the final section concludes.

Concern Dimensions in Theory

Stern and colleagues (Stern et al., 1993, 1995; Stern and Dietz, 1994) offer some incredible contributions to the value bases of environmental concern. These authors believe environmental concern, attitude or environmentalism of any form has at least, three dimensions. They conceptualize the dimensions to include the egoistic, social-altruistic and biospheric concerns. They describe egoistic value as a dimension of environmental concern triggered by the motivation to protect the environment to the benefit of one's self. In addition, the authors draw from Schwartz's theory of altruism (Schwartz, 1968a, 1968b, 1970, 1977) to establish the rationale for social or altruistic motivation for environmental concern. They describe the social-altruistic dimension of concern as a form of value held in favour of the environment solely to promote the welfare of other human beings. They describe the third dimension which they dubbed the biosperic concern as a form of value held in favour of the environment majorly to enhance the welfare of non-human species and the biosphere itself (Stern and Dietz, 1994). While they emphasized that each dimension represents distinct value of concern, the authors acknowledge that the three dimensions may be compatible and people's environmental concern reflects some mixture of the three orientations.

On the other hand, Thompson and Barton (1994) conceptualize environmental concern in a similar yet different framework based on anthropocentric-ecocentric distinctions. They posit that there are at least two distinct dimensions of concern for environmental issues called the ecocentric and anthropocentric values. In correspondence with Stern et al. (1993), they assert that individuals holding either or both forms of values engage in pro-environmental activities, but the motivation behind their engagement differs. Those whose concern orientation is overwhelmed by ecocentrism value the nature (biosphere) only for its sake and promotes its protection based only on its intrinsic value. Meanwhile, anthropocentrics are motivated to engage in pro-environmental activities so far as it enhances the quality of life for humans (Thompson & Barton, 1994). Thus, anthropocentrism is human-centered whereas ecocentrism underscores the wellbeing of nature even at the expense some costs.

Thompson and Barton (1994) compared their framework of environmental concern to the earlier conceptualization by Stern et al. (1993) and concluded that both egoistic and social-altruistic values by Stern and colleagues are equivalent to their concept of anthropocentric value. Meanwhile, they noted that the biospheric value by Stern and colleagues is equivalent to their ecocentric motive. Figure 1 shows a schematic presentation of

the relationship between the two environmental concern frameworks proposed both by Stern and colleagues as well as Thompson and Barton.

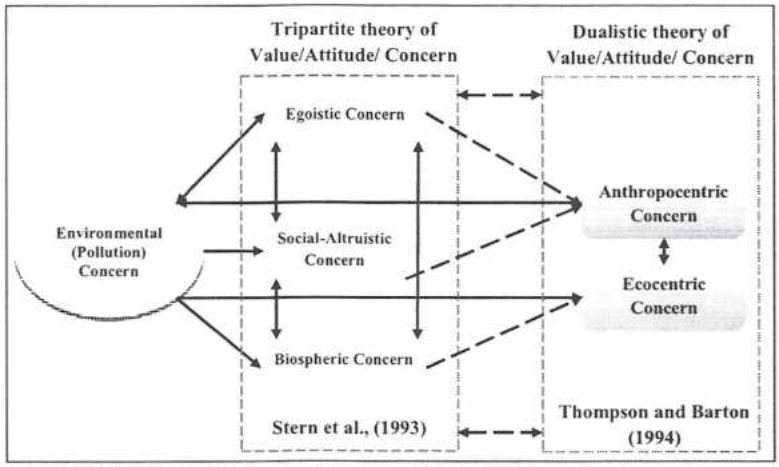


Figure 1: Theoretical frameworks for environmental concern dimensions

From Figure 1, it could be concluded that Stern and colleagues propose a tripartite model for concern while Thompson and Barton suggest a dualistic model. A close assessment of both frameworks in Figure 1 depicts that both models are consistent in terms of scope. The difference lies in the disaggregation of the underlying concern dimensions into specific concerns that provide the bases for influencing pro-environmental actions. Thus, these two conceptualizations of concern (the dualistic and tripartite structures) are contrasted in this study to test the discriminant and convergence validity of the new instrument introduced for measuring solid pollution concern by Adam et al (2015).

METHODS

Participants

Household representatives in urban-slum areas of Lagos state constitute the unit of analysis in this study. UN-HABITAT (2007) describes slums areas as communities characterized by limited provision of housing and basic services. These attributes are apparent in the urban-slum areas of Lagos as a consequence of the city's high rate of urbanization which causes urban sprawl (Aluko, 2010; Felix, 2007). The urban-slum segment of the population has been targeted based on the outcome of a state-wide survey by the National Bureau of Statistics (NBS, 2010). The survey shows that about 86% of the total incidence of improper waste disposal in Lagos state occurs in rural areas which have turned into slums due to a combination of urban sprawl and limited infrastructure (Adam et al., 2015).

Further, the choice of this fragment of the state's population is also informed by the outcome of a prior interview with private waste collectors whom in consistence with the findings of Anestina et al. (2014), noted that relatively poor cooperation are encountered with households in those communities. It is thus, perceived that this stratum of Lagos population will provide a conservative measure of concern for solid waste pollution since they appear to be relatively less concerned about solid waste related pollution. Hence, the recruitment of households from such communities to constitute the study's participants.

Sampling and Questionnaire Administration

Data collection was done through face-to-face administration of questionnaire to representatives of households. Household members above 18 years old were considered suitable for recruitment as relevant respondents, with priority given to household-heads. Copies of the questionnaire, which were distributed by ten trained interviewers, were broadly divided into three sections, including the demographic, attitudinal concern and economic valuation section. Three hundred (300) copies of questionnaire were completed via in-home survey where interviewers went

house-to-house to conduct face-to-face interviews. Since population list of households do not exist in such slum areas, multistage cluster sampling technique was used to recruit households using wards and streets as relevant clusters. Firstly, Apapa Iganmu LCDA, a low-income local government area of the state was selected among fifteen potential areas. This was succeeded by the second cluster of randomly sampling two administrative wards namely, Badia and Sari. In the third cluster, five streets selected from each of the two wards.

Subsequently, 30 households were selected randomly from each street chosen as clusters in the previous stage. Finally, a household representative was chosen and administered the questionnaire. The limitation of this procedure lies in the fact that the final respondent chosen from each household was not randomized as preference was given to household heads, where available. This is because they are expected to be more sensitive since they are the ones who pay for the households' solid waste management service. It is nonetheless worth mentioning that the non-randomness of selection in the final stage is common in household surveys (Bateman et al., 2002). Yet, it is acknowledged that beyond its practical relevance, such non-randomness could bias estimated parameters. Out of the 300 copies of questionnaire administered, only 249 respondents reasonably completed the concern questions with a response rate of 82%.

Scales and Measures

The data for this study was collected from September to December in 2012. The questionnaire was part of a bigger research and the mean time for completing the concern questions was about six minutes. To measure concern about the environment, specific to solid waste pollution, we adapted the concern instrument by Amérigo et al., (2007), which is a reduced version of the scale by Thompson and Barton (1994). The original instrument is generic to myriad of environmental issues but adapted by rewording items to reflect only solid waste concern issues. The questionnaire contains 12 items for measuring each of the hypothesized dimensions. These include egoistic (4 items), biospheric (4 items), and social-altruistic (4 items), as shown in Table 1.

Table 1: Test items for environmental concern in the questionnaire

Egoistic Concern Items	
1.	I am happy to be in an environment clean of solid waste pollution (2)
2.	When I am unhappy, I find comfort in environmental beauty (3)
3.	I am sad to see the environment polluted with solid waste (4)
4.	A tidy environment is a source of stress reducer for me (5)
Biospheric Concern Items	
5.	Prevention of solid waste is more important than proper disposal (1)
6.	A clean natural environment is valuable in its own right (2)
7.	A clean environment is meant for the benefit of all living things (4)
8.	The negative impact of solid waste pollution on the environment has been exaggerated (10 &12)
Social-Altruistic Concern Items	
9.	I support proper management of waste because it generates income (4).
10.	I am sad about communities' exposure to diseases in dirty places (1)
11.	Increase in solid waste generation is not too bad if it assures satisfaction (5)
12.	I support proper management of waste because itcreates more jobs in Lagos (3)

Source: Survey questionnaire

The response anchor for all items contain five-point Likert-scale both extremes denoted by 'strongly disagree' and 'strongly agree.' The figures in parentheses in Table 1 indicate the corresponding numbers assigned to the original items in the sources used. All items were adapted from Amérigo et al. (2007) except for item 8 which is worded in the questionnaire as "*the negative impact of solid waste pollution on the environment has been exaggerated.*" This item was adapted from Dunlap and Van Liere (1978) and Dunlap et al. (2000). The inclusion of this item was deemed worthwhile because it was found repeatedly underscored both in the original and revised scales of the popular New Ecological Paradigm (NEP) scale. The items by Dunlap and colleagues were worthwhile of consideration as it is the most widely used in social psychology of environmentalism (Stern et al., 1999).

Confirmatory factor analysis (CFA) technique

Relative to the exploratory factor analysis (EFA) which is descriptive in nature, CFA is a more sophisticated technique for evaluating the existence of variable groupings. It is used to confirm or test specific hypotheses or theories about the dimensional structure that underlies a set of variables (Thompson, 2004). It is applied purposefully to confirm whether or not, theoretically posited structure of latent variables exist –(Anderson & Gerbing, 1982). This is termed construct validity. Construct validity is evaluated by examining convergent validity and discriminant validity –(Houston, 2004; Hair et al., 2010). Convergent validity measures the degree to which indicators of latent variables converge by sharing percentage of variance in common.

Discriminant validity is concerned with the extent which indicators of different latent variables are distinct (Houston, 2004; –Bertea & Zait, 2011; Zaiț & Bertea, 2011). Convergent validity could be established through the computation of average variance extracted (AVE) and composite reliabilities (CR) for each of the variables (Hair et al., 2010). Based on this approach, convergent validity is achieved when CR>0.7, AVE>0.5 and CR>AVE. Likewise, discriminant validity is established when both the maximum shared squared variance (MSV) and average shared squared variance (ASV) are less than AVE.

CFA model is obtained using covariance matrix estimated via maximum likelihood (ML) technique when the multivariate normality criterion is fulfilled (Fabrigar et al., 1999; Hair et al., 2010). However, the method is proven to be fairly robust even where such assumption is violated (Hair et al., 2010). Multiple fit indicators are used in the assessment of model fitness to observed data. These include the evaluation of fit indices such as comparative fit index (CFI), goodness-of-fit index (GFI), root mean square error of approximation (RMSEA) and standardized RMR (SRMR), and a few others —(Fornell & Larcker, 1981; Hoe, 2008; Hooper, Coughlan, & Mullen, 2008; Weston & Gore, 2006; Tang et al., 2013). The indices and their expected threshold ranges are shown in Table 8 in the appendix. The most important indices to be examined include the normed chi-square, RMSEA, CFI, and TLI/NNFI (Hoe, 2008). These indices are used to assess the fitness of the measurement model. Among the indices, the chi-square is said to be sensitive to large sample size –(Bentler & Chou, 1987), as such, the use of normed chi-square is recommended when sample size exceeds 200 (Tabachnick & Fidell, 2006; Kline, 2011; Marsh & Hocevar, 1985).

Empirical Model Specification

In comparing between the dual and tripartite models, CFA specification and re-specification procedure suggested by Anderson and Gerbing (1988) was adopted. As demonstrated by –Hsiao and Oxford (2002), the procedure requires, firstly, the estimation of a theoretically specified least restrictive model followed by more restricted nested model (s). A model M_1 is said to be nested within another model M_0 if its set of freely estimated parameters constitute subset of parameters in M_0. Thus, some freely estimated parameters in M_0 are constrained in M_1 (Anderson & Gerbing, 1988). Finally, a saturated model M_s which is the most restrictive is estimated. M_s is specified such that all parameters are fixed at zero, called the null model.

Model comparison based on this approach is achieved by applying statistical chi-square difference test to determine the existence or non-existence of statistically significant difference across specifications. However, before proceeding to comparison, it is necessary to report respective models' fit indices to determine model fitness to data. Bentler and Bonett (1980, in Anderson & Gerbing, 1988) recommend the use of the null model as a baseline against which less constrained or restricted models such as M_0 and M_1 are tested. Besides, the chi-square difference test paves way for testing M_0 against M_1 (Hsiao & Oxford, 2002).

In all models, one of the indicators of each dimension is constrained to one for the purpose of identification. Thus, the indicators are fixed as such to assign measurement scales to the unobserved variables representing each dimension (Tang et al., 2013).

$$M_3 \equiv \begin{bmatrix} EGO1 \\ EGO2 \\ EGO3 \\ EGO4 \\ BIO1 \\ BIO2 \\ BIO3 \\ BIO4 \\ SOCTR1 \\ SOCTR2 \\ SOCTR3 \\ SOCTR4 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} \text{Egoistic} \\ \text{Biospheric} \\ \text{Social} - \text{Altruistic} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \\ \varepsilon_9 \\ \varepsilon_{10} \\ \varepsilon_{11} \\ \varepsilon_{12} \end{bmatrix}$$

$$M_0 \equiv \begin{bmatrix} EGO1 \\ EGO2 \\ EGO3 \\ EGO4 \\ BIO1 \\ BIO2 \\ BIO3 \\ BIO4 \\ SOCTR1 \\ SOCTR2 \\ SOCTR3 \\ SOCTR4 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ \lambda_{2,1} & 0 & 0 \\ \lambda_{3,1} & 0 & 0 \\ \lambda_{4,1} & 0 & 0 \\ 0 & 1 & 0 \\ 0 & \lambda_{6,2} & 0 \\ 0 & \lambda_{7,2} & 0 \\ 0 & \lambda_{8,2} & 0 \\ 0 & 0 & 1 \\ 0 & 0 & \lambda_{10,3} \\ 0 & 0 & \lambda_{11,3} \\ 0 & 0 & \lambda_{12,3} \end{bmatrix} \begin{bmatrix} \text{Egoistic} \\ \text{Biospheric} \\ \text{Social} - \text{Altruistic} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \\ \varepsilon_9 \\ \varepsilon_{10} \\ \varepsilon_{11} \\ \varepsilon_{12} \end{bmatrix}$$

$$M_1 \equiv \begin{bmatrix} EGO1 \\ EGO2 \\ EGO3 \\ EGO4 \\ BIO1 \\ BIO2 \\ BIO3 \\ BIO4 \\ SOCTR1 \\ SOCTR2 \\ SOCTR3 \\ SOCTR4 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ \lambda_{2,1} & 0 \\ \lambda_{3,1} & 0 \\ \lambda_{4,1} & 0 \\ \lambda_{5,1} & 0 \\ \lambda_{6,1} & 0 \\ \lambda_{7,1} & 0 \\ \lambda_{8,1} & 0 \\ 0 & 1 \\ 0 & \lambda_{10,3} \\ 0 & \lambda_{11,3} \\ 0 & \lambda_{12,3} \end{bmatrix} \begin{bmatrix} \text{Anthropocentric} \\ \text{Social} - \text{Altruistic} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \\ \varepsilon_9 \\ \varepsilon_{10} \\ \varepsilon_{11} \\ \varepsilon_{12} \end{bmatrix}$$

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

The demographic characteristics of respondents are shown in Table 2. Their gender distribution is such that the male (n=162) dominated with a proportion of 54% while the female (n=138) constitute 46%. The literacy profile of respondents shows that 75% are literate adults, meanwhile, their occupational distribution reveals that majority (52%) of them are self-employed. Others include private sector workers (22%), civil servants (9%), and housewives (5.7%) while the pensioners and unemployed respectively constitute 3% and 8.7%. Summary on the number of households in each residential building shows an average of 13 households in each residential building. This figure conforms to the findings of Lukeman et al., (2014) who noted that there are a minimum number of 7 households in residential building in such areas.

A relatively high income disparity is observed among the households as majority (89%) reported monthly total household income ranging between ₦10,000 to ₦100,000. The mean monthly household income across respondents stood at ₦58,000. According to UNICEF, the 2012 monthly average income in Nigeria is ₦19,067. This implies an average daily income of USD3.9 per day. Meanwhile, even if a very conservative estimate of the national household size of 5 members per household is used to compute monthly and daily income based on the income reported by the respondents, the figures fall below UNICEF's estimate. This shows that households in Lagos slum areas are, on average, the poor who earn below the estimated national per capita income.

Confirmatory Factor Analysis Result

The data obtained was initially subjected to exploratory factor analysis (EFA) to determine the descriptive structure of solid waste pollution concern. In conformity to theoretical expositions, the data was found to exhibit both the dual and tripartite dimensions of concern as reported in Adam et al (2015). However, the CFA is conducted since EFA is not theory-driven and not suitable for hypothesis testing as to what structure most truly holds for the variable in the context of the sample population. The specified CFA models were estimated using Amos™ 20 software. Beginning with M_0, the first attempt with all 12 items shows the model has considerably good fit to the data, as evident in Figure 2.

Table 2: Respondents' Summary Statistics

Socioeconomic Variables	Frequency	Percentage	Mean	Std. Deviation
Gender			0.54	0.49
Male	162	54		
Female	138	46		
Marital Status				
Single	65	21.7		
Married	229	76.3		
Others	6	2		
Age			35.43	8.99
Years of Educational Attainment			9.87	6.23
Never been to School	75	25		
Primary School	23	7.7		
Secondary School	82	27.3		
N.C.E/Diploma	82	27.3		
University/HND	38	12.7		
Occupation				
Civil Servant	27	9		
Private Sector	65	21.7		
Pension	9	3		
Self-Employed	156	52		
Housewife	17	5.7		
Unemployed	26	8.7		
Number of households in Apartments			12.96	4.95
Monthly Family Income (₦)			58,333.3	39132.6
₦10,000–₦50,000	158	52.7		
₦51,000–₦100,000	110	36.7		
₦101,000–₦200,000	31	10.3		
>₦200,000	1	0.3		

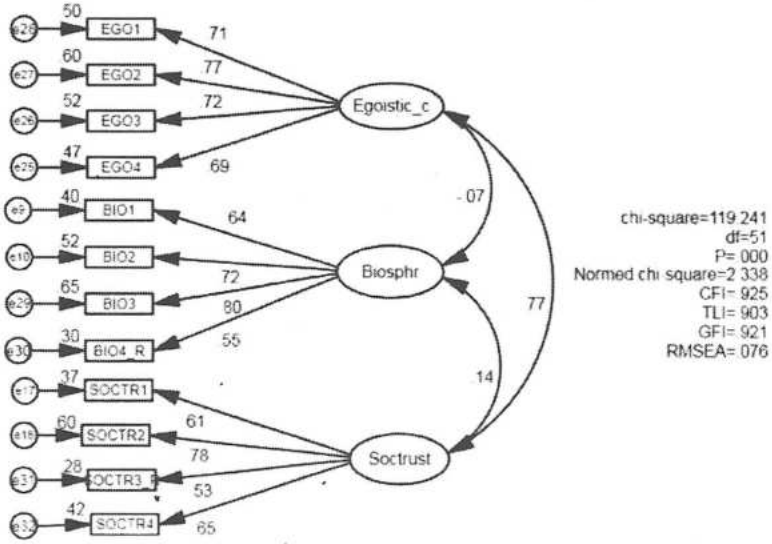


Figure 2: Initial Standardized Three-Factor Structure Model of Concern

The normed chi-square (CMIN/DF) is 2.34; the root mean square error of approximation (RMSEA) value is 0.076; comparative fit index (CFI) is 0.925; goodness of fit index (GFI) value is 0.921; Tucker-Lewis Index (TLI) value is 0.903. In addition, all factor loadings (coefficients) individual items on each dimension substantially exceed the minimum threshold of 0.2 or the ideal value equal to and above 0.3 '(Jöreskog & Sörbom, 1996, 2001; Hoe, 2008). However, on the bases of discriminant and convergent validity, the model was rejected. Table 3 shows the rationale behind the invalidity of the initial model.

Thus, model re-specification is required but there exists no justification to exclude any variable solely on the value of the coefficient as well as significance since all are within acceptable range. One of the logical options could be to return to EFA to detect and delete indicators that are significantly cross-loaded across dimensions as such will induce multicollinearity. The removal of such will reduce the values of ASV and MSV; thereby allowing the fulfillment of discriminant validity (Hooper et al., 2008). In addition, individual items fitness to the data could also be assessed to reduce measurement error. This could be done by deleting weak items with R^2 value less than 0.20 (Hooper et al., 2008). Besides, Hair et al., (2010) recommends the assessment of the standardized residual covariance for values close to and greater than 4.0 as such exceeds acceptable degree of error. Yet another strategy entails the examination of the modification indices to detect the parameter that could be freed to improve the model fit (Hair et al., 2010: 712) or in some cases those that could be correlated to improve model fit (Hooper et al., 2008).

Accordingly, items that share relatively higher numbers of large standardized residual covariances with other items were deleted as indicators for possible misspecification. This was also confirmed via modification indices (M.I) which shows the extent to which overall model $\chi 2$ will reduce by constraining respective paths (Hair et al., 2010). Following this procedure, a total of 4 items including Ego1, Soctr1, Soctr3, and Bio4 were removed from the specification, leaving 8 items. Subsequently, as depicted in Figure 3, the second estimation attempt yielded a better result but the p-value (0.004) was still significant while the RMSEA value of 0.07 is somewhat low considering the recently adopted stringent cut-off value of 0.06-0.07.

Table 3: Non-fulfillment of validity in the initial concern model

	CR	AVE	MSV	ASV	Social-Altruistic	Biospheric	Egoistic
Social-Altruistic	0.741	0.421[c]	0.598[d]	0.309	0.649[a]		
Biospheric	0.776	0.469[e]	0.021	0.013	0.144	0.685	
Egoistic	0.815	0.524	0.598[f]	0.301	0.773	-0.073	0.724[b]

The validity concerns in the above model as shown in Table 3 include;
[a]Discriminant Validity: the square root of the AVE for Social-Altruistic is less than the absolute value of the correlations with another factor.
[b]Discriminant Validity: the square root of the AVE for Egoistic is less than the absolute value of the correlations with another factor.
[c]Convergent Validity: the AVE for Social-Altruistic is less than 0.50.
[d]Discriminant Validity: the AVE for Social-Altruistic is less than the MSV.
[e]Convergent Validity: the AVE for Biospheric is less than 0.50.
[f]Discriminant Validity: the AVE for Egoistic is less than the MSV.

Hence, more specification improvement was warranted. An examination of the result shows that e27 and e25 had the largest M.I value of 5.110. Following suggestions by Hooper et al., (2008), the two errors belong to the same dimension (egoistic), thus they were correlated, freeing an additional parameter.

This significantly improved the model with the p-value turning insignificant (p = 0.150) while RMSEA significantly reduced to 0.039, which indicates an excellent fit below the threshold. In addition, the chi-square ($\chi 2$) = 21.785, df = 16, normed chi-square ($\chi 2$/df)= 1.362, CFI = 0.989, TLI = 0.981, and GFI=0.978. Given that all diagnostics are acceptable, the p-value of 0.150 shows that the null hypothesis of the true existence of a tripartite solid waste pollution concern model could not be rejected. This implies that the three pollution concern dimensions of egoistic, biospheric and social-altruism are acceptable representation of concern structure for solid waste pollution. Details of all estimates are shown in Table 4 and Figure 4.

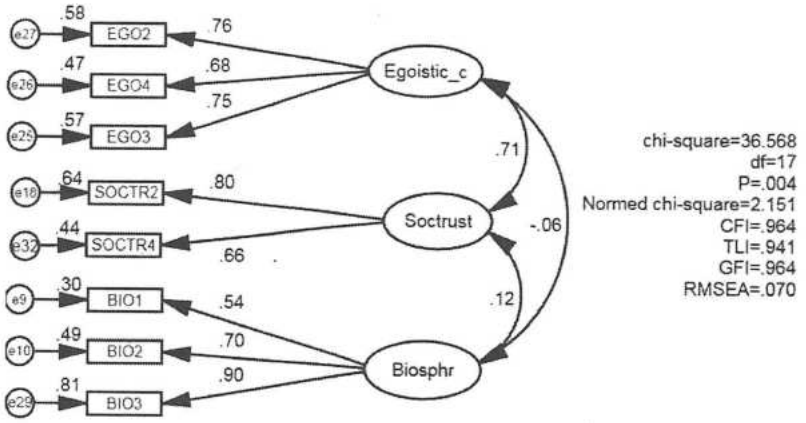


Figure 3: Second CFA Result for standardized three-factor Structure Model of concern

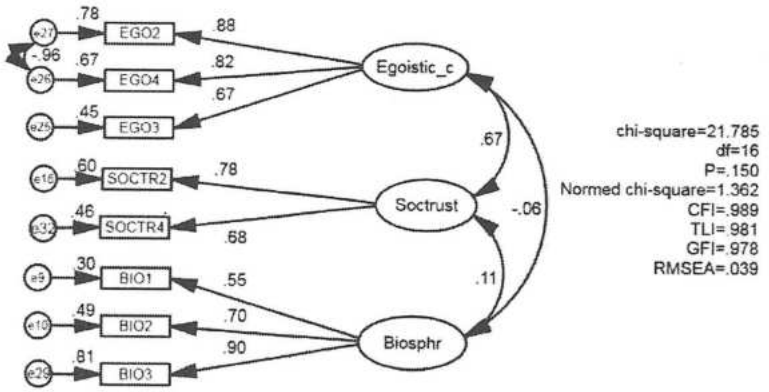


Figure 4: Final CFA result for unstandardized three-factor Structure Model of concern

Table 4: Regression Weights for Concern Items

			Standardized Estimates	Unstandardized Estimates	S.E.	C.R.	Probability
BIO1	<---	Biosphr	0.546	1.000			0.0000
BIO2	<---	Biosphr	0.703	1.225	.164	7.473	0.0000
SOCTR2	<---	Soctrust	0.777	1.000			0.0000
EGO3	<---	Egoistic_c	0.670	1.000			0.0000
EGO4	<---	Egoistic_c	0.817	1.232	.174	7.087	0.0000
EGO2	<---	Egoistic_c	0.884	1.376	.186	7.402	0.0000
BIO3	<---	Biosphr	0.899	1.514	.223	6.776	0.0000
SOCTR4	<---	Soctrust	0.681	.869	.112	7.737	0.0000

Validity and reliability of the tripartite measurement model (M0)

Convergent validity is examine by examining the values of composite reliability (CR) and average variance extracted (AVE). Both CR and AVE computed for the model meet the cut-off minimum values of 0.7 and 0.5, respectively. In Table 3, the values in parentheses indicate correlation between dimensions. The CR values greater than 0.7 indicate the fulfillment of composite reliability. Meanwhile, values along the diagonal represent the square roots of AVE for each dimension.

Besides, convergent validity is achieved since all CR values corresponding to different dimensions exceed their respective AVE values. Discriminant validity is assessed by examining both maximum shared variance (MSV) and average shared variance (ASV). This form of validity is achieved when both MSV and ASV values are less than their

corresponding AVE values for all dimensions. Alternatively, discriminant validity is met if the square root of AVE is greater than the squared correlation among variables (Hair et al., 2010; Fornell and & Larcker, 1981; '–Teo & Lee, 2010). The results depicted in Table 5 shows that this validity is fulfilled. In the last three columns of Table 5, the diagonal values are the square roots of respective variable's AVE while off-diagonal values are the squared correlation among the variables. Since all diagonal values exceed off-diagonal values, discriminant validity is implied. In conformity to the findings by Stern et al., (1993), the weakest association among the dimensions was found between egoistic and biospheric concern.

Table 5 Convergent Validity, Discriminant Validity, and Composite Reliability

	CR	AVE	MSV	ASV	Social-Altruistic	Biospheric	Egoistic
Social-Altruistic	0.70	0.53	0.45	0.23	0.73		
Biospheric	0.77	0.53	0.01	0.01	(0.11)	0.73	
Egoistic	0.84	0.63	0.45	0.23	(0.67)	(-0.06)	0.80

Note: Average variance was extracted from the squared multiple correlation estimates based on the formula given by (Fornell and Larcker, 1981)

The Nested Dual-Factor Measurement Model (M1)

Based on the result obtained in model M_0 above, a nested measurement model M_1 consistent with Thompson and Barton's (1994) dual-factor model was estimated. As shown in Figure 5, M_1 has acceptable fit to the data.

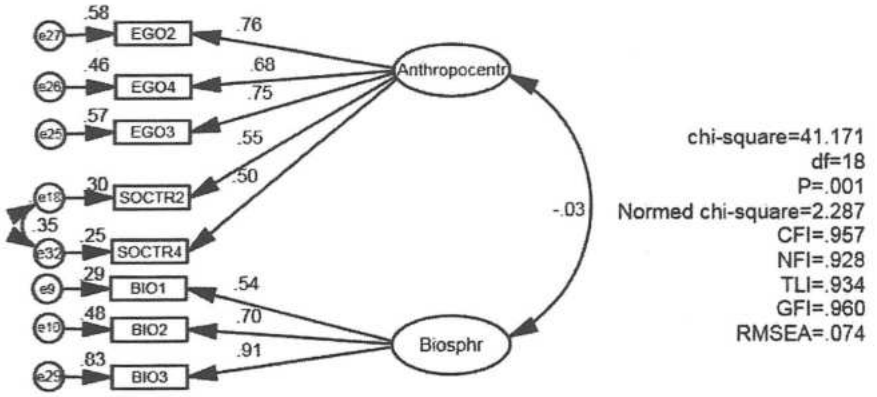


Figure 5: Nested CFA Result for standardized two-factor Structure Model of concern

The dual-factor measurement model depicted in Figure 5 has a RMSEA value of 0.074 and a p-value of 0.001. Since the sample size exceeds 200, the normed chi-square value is considered in place of probability as suggested by Kline (2011). The chi-square ($\chi 2$) = 41.171, df = 18, normed chi-square ($\chi 2/df$)= 2.247, CFI = 0.957, TLI = 0.934, and GFI=0.960. Since all diagnostics are acceptable, the normed chi-square ($\chi 2/df$) of 2.247shows that the null hypothesis of the true existence of a dual solid waste pollution concern model could not be rejected. This implies that the Anthropocentric - biospheric (eco-centric) dual-factor pollution concern dimensions are acceptable representation of concern structure for solid waste pollution. However, the tripartite model has better fit than the dual-factor model. Since, this comparison is descriptive; conclusion is suspended until hypothesis test confirms statistically significant difference between the two models' fitness.

The result obtained in this study conforms to the findings by Thompson and Barton (1994) who obtained an insignificant association between the two dimensions. As shown in Figure 5, the correlation between the two dimensions is not significant. Besides, a comparison between the two models shows that they are in fact, two alternative representation of the same thing. Both Stern and colleagues, as well and Thompson and Barton,

acknowledge the existence of the three dimensions of environmental concern. The difference lies in the way structures were presented, with the latter merging the two dimensions of egoism and social-altruism to form 'anthropocentrism'.

HYPOTHESIS TESTING AND DISCUSSION

After unveiling the dimensions of solid waste pollution concern, the respective fit indices of the models are presented to determine fitness across models. Chi-square difference test is used to test the hypothesis that the dual-factor and tripartite models (M_0 and M_1) are better than the null model (M_s), the parameters of which are fixed to zero (saturated model). The availability of chi-square value for M_0 and M_1 allows the determination of the best fitted model using chi-square difference test (Hsiao & Oxford, 2002). The fit indices as well as the results of the chi-square difference test for all models are respectively shown in Tables 5 and 6.

Table 6: Fit Indexes for three models of Concern for Solid Waste Pollution

Model Fit Indices	Null Model (Ms)	Dual-Factor Model (M1)	Tripartite Factor Model (M0)
Parameter #	36	18	20
Chi-Square	0	41.171	21.785
Degree of Freedom	0	18	16
P-Value	–	0.001	0.15
NFI	1	0.928	0.962
TLI/NNFI	–	0.934	0.981
CFI	1	0.957	0.989
GFI	1	0.960	0.978
CMIN/DF	–	2.247	1.362
RMSEA	–	0.074	0.039
AIC	72	77	61
BIC	196	139	130

All the fit indices reported in Table 6 show that both the tripartite and dual-factor models demonstrate improvements over the null model. Although the dual factor model has better fit relative to the null model, the tripartite model yields the best fit. However, this comparison might not be enough to justify relative fitness across models. The results shown in Table 7 provide a statistical test which constitutes one of the advantages of CFA over EFA.

Table 7: Chi-Square Difference Test among Competing Concern Models

	Dual-Factor Model (M1)	Tripartite-Factor Model (M0)
Null Model (Ms)	41.171*** (18)	21.785*** (16)
Tripartite-Factor Model (M0)	19.386*** (2)	

***denote significance level at 1%.

All the differences in chi-square across models shown in Table 7 are found to be statistically significant at 99% confidence interval. The significance of the difference between the two less constrained models (M_0 and M_1), signifies that both the dual and tripartite-factor models significantly explain the variation in households concern for solid waste pollution. This implies that the true pattern of such concern could be represented in either framework. Table 6 also shows that the difference between the least constrained model (M_0) and the less-constrained estimated model (M_1) is statistically significant. Since the tripartite-factor model (M_0) is shown to possess a better fit, the significance of the difference between M_0 and M_1 implies that M_0 offers the best representation of the pattern of solid waste pollution concern among the urban-poor households.

CONCLUSION

This study was motivated by the realization that most economic valuations studies contributed to explain the welfare effect of solid management related policy changes have consistently omitted "solid waste pollution concern" as non-economic determinant of welfare change. This is despite the acknowledgement of concern as an important non-economic determinant of economic value in economic valuation literature. Yet, the few economic valuation studies on solid waste management which included "solid waste pollution concern" as a determinant of economic value related to source-separation and service improvement are perceived to have mis-specified the variable. This is because such studies measure concern in a fashion that does not conform to theory by conceptualizing it as a uni-dimensional variable, measurable using binary-response anchors of "yes" and "no".

Alternatively, a continuous measurement level instrument adapted from existing generic environmental concern scales was customized to reflect the specificities of solid waste pollution concern. The instrument which was earlier published in Adam et al (2015) was only subjected to exploratory factor analysis (EFA). While the EFA result provided insight on the mixed dimentionality of the variable, conclusions could not be made about what variant specification best describes the variable. This is because EFA is a descriptive statistic technique and thus could not be used for theory testing. Since each of the variant theories which suggest different structure or specification for concern are considered relevant, this study furthers earlier findings by using the confirmatory factor analysis (CFA) technique to determine the most appropriate specification for the variable.

This was done by firstly, testing both the convergent and discriminant validity of the variant specifications of solid waste pollution concern. After both specifications were confirmed valid, the chi-square difference test was used to determine the most appropriate specification. The result obtained shows that both the dual and tripartite-factor model specifications significantly explain the variation in households concern for solid waste pollution. This implies that the true pattern of such concern could be represented in either framework. Nonetheless, the tripartite-factor model specification offers the best representation of the pattern of solid waste pollution concern among the urban-poor households.

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Appendix

Table 8: CFA Fit Indices and Recommended Threshold

Index Group	index	Description	Threshold	Author
Absolute fit indices				
	$\chi 2$	chi-square	Insignificant result; greater than or equal to 0.05	Barrett (2007), Hooper et al., (2008),Fornell (1983), Hoe(2008)
	$\chi 2/df$	Relative/Normed Chi-square	less than 2:1, 3:1, or less than 5:1	Wheaton et al (1977), Tabachnick and Fidell (2006), Kline (2005), Bryne (1989), Marsh and Hocevar (1985)
	RMSEA	Root mean square error of approximation	0-0.07 Considdered good fit; 0.08-0.1 considdered mediocre fit; 0-0.03 excellent fit	MacCallum et al (1996), Steiger (2007),Hooper et al., (2008), Hoe (2008)
	GFI	Goodness-of-fit statistic	Greater than or equal to 0.90	Tabachnick and Fidell (2006),Hooper et al., (2008).
	AGFI	Adjusted goodness-of-fit statistic	Greater than or equal to 0.90	Tabachnick and Fidell (2006),Hooper et al., (2008).
	RMR	Root mean square residual	Less than 0.05 for a good fit but values up to 0.08 are also acceptable	Hooper et al., (2008), Byrne, 1998; Diamantopoulos and Siguaw, 2000, Hu and Bentler,(1999).
	SRMR	Standardised root mean square residual	Less than 0.05 for a good fit but values up to 0.08 are also acceptable	Hooper et al., (2008), Byrne, 1998; Diamantopoulos and Siguaw, 2000, Hu and Bentler,(1999).
Incremental fit indices				
	NFI	Normed-fit index	Values greater than 0.90 is recommended but greater than 0.95 is preferred	Bentler and Bonnet (1980), Hu and Bentler, 1999
	NNFI/ TLI	Bentler-Bonett Non-Normed Fit Index or Tucker-Lewis index	A value as low as 0.08 is acceptable but greater than 0.95 preferred	Hu and Bentler, 1999, Hooper et al., (2008), Hoe,2008
	CFI	Comparative fit index	Values greater than 0.90 is acceptable but greater than	Hu and Bentler, 1999, Hooper et al., (2008),

i. http://www.unicef.org/infobycountry/nigeria_statistics.html

ii. This is based on the exchange rate of 1 USD = ₦ 160

iii. This estimate is provided by the National Bureau of statistics, Nigeria. It is available at: http://nigeria.prognoz.com/en/DataAnalysis