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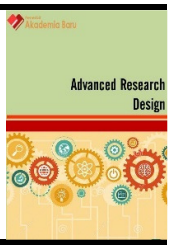

Analysing the Contribution of Attitudinal Factors to the Depleting Urban Green Vegetation in Akure, Nigeria

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ABSTRACT

The contribution of attitudinal factors to the morphology of urban vegetation in cities has received very scanty attention. Most researchers in the developing countries including Nigeria focus on urbanisation, without paying significant attention to attitudinal factors. However, a lot of socioeconomic adjustments take place in cities in these countries, which result in the depletion of urban vegetation. The necessity to determine the contribution of attitudinal factors to the reduction in Akure urban vegetation has called for this study. The study analysed the contribution of attitudinal factors to the reduction of urban vegetation in the city. Previous studies on the city's land use and land cover changes seemed to ascribe the city's falling greenery to urbanisation only, without considering the contribution of attitudinal factors to the process. The paper posits that the indicators of attitudinal factors need to be properly understood in order to design appropriate policies to curb the phenomenon. Data were sourced through self-administered questionnaire from 317 participants. The data were analysed with SPSS Version 20 for the descriptive analysis, and Structural Equation Modelling (SEM), for the determination of the dominant factors. The Kaiser-Meyer-Olkin measure of sampling adequacy showed that the research instrument was internally consistent. Confirmatory factor analysis also achieved satisfactory goodness of fit indices. It was revealed that eight dominant attitudinal factors contributed to the reduction of urban vegetation in the city. These include misuse of road setback (0.72), not enough enlightenment or publicity (0.72), and failure of town planning authorities to enforce urban tree planting (0.72.) This shows that attitudinal factors contributed significantly to the depletion of urban vegetation in the city. The necessity for mass education and enlightenment towards behaviour change and pro-environmental behaviour, is stressed.

Keywords:
Attitudinal factors, socioeconomic adjustments, behaviour change, pro-environmental behaviour

1. Introduction

Urban green vegetation serves as habitats for different animal species, as well as a store for genetic diversity [1]. According to Alvey [2], urban vegetation contributes to human wellbeing through the promotion of biodiversity. It is suggested that cities with large and mature ecosystems

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attract many birds, pollinating insects, and other animals. Polllination Partnership [3] argued that the services of bats, butterflies, moths, flies, birds, beetles, ants, and bees are indispensable, because they help pollinate over 80% of the world's flowering plants important for the survival of man and other terrestrial ecosystems. The presence of a large number of pollinators in a city is a good indicator of the city's strong and sound biotic health. Urban parks in particular, have been noted to also provide safe havens for migratory birds [4]. The diversity of plants and animals in a city provides great opportunity for urban residents to encounter nature on daily basis [5]. A large bird population and diversity in an urban environment is a good index of how peaceful, green, and sustainable the city is [6]. Availability of a large urban vegetation can also promote recreation. In some western European countries, bird watching has developed from a passive recreation into a lucrative tourism industry. [7].

Furthermore, the Conservation Reserve Enhancement Program [8] argued that continuous urban vegetation provides safe movement corridors for animals. However, fragmentation of the urban landscape disrupts habitat connectivity required for animal habitation and gene flow [9]. As an important element of urban green spaces, urban vegetation has been considered by Gairola [10], as a key ecological service provider that promotes sustainable development. Vegetation gives a city the good shape it requires, because of its natural form [11]. Vegetation also provides spiritual and cultural environments for tourism, recreation and education [12]. Trees and woodlands in urban areas promote human wellbeing and environmental health [13]. Trees regulate water by intercepting rain and run-off [13], also provide aesthetic benefits [14]. Urban trees improve air quality, filter and retain storm water, and contribute to healthier and more beautiful cities [13]. Trees are the backbone of forests and urban ecosystems. They play active roles in the release of oxygen for human breathing, and absorption of carbon-dioxide for photosynthesis.

However, these benefits represent part of the normative roles that urban vegetation plays in an ideal environment where vegetation is abundant and little or disturbed. The structure and composition of urban vegetation in most developing countries, Nigeria inclusive, have been adversely affected by urbanisation and human growths in them [15]. The impact of urbanisation in cities has led to series of fragmented urban forest landscapes [16]. These occur mainly along urban stream corridors, streets, roads, powerline setbacks, cemeteries, derelict lands, wetlands and incidental open spaces, and in the hilly areas of cities.

It is suggested that Nigeria has lost over 90% of her forest resources to illegal logging activities, road and residential developments, mineral exploration, and poor farming practices [17]. Similarly, the problem of invasive plant species, also reduced the quantity of urban vegetation [17]. The problem posed by invasive plant species to the ecological landscape of Nigeria was noted by Borokini and Babalola [18]. According to Geist [19], understanding the complexities and drivers of deforestation, and the nature of land use land cover that result, constitute future environmental research priorities for the developing countries. Observations from current trends in the developing countries' cities, indicate a rapid disappearance of urban vegetation, and the existence of poor urban policies for comprehensive replacement and regeneration of dead urban trees.

The problem posed to urban vegetation by unplanned urbanisation cannot be over-emphasised. Indeed, urban vegetation is under great pressure [20]. Urbanisation and land-use changes alter landscape structures and ecosystems [21]. It was observed that the world is becoming increasingly urban, and that the global urban population will hit an estimated 6.3 billion persons by 2050 [1]. This is about twice the 3.5 billion persons earlier projected to live in urban areas globally in 2010. In view of its faster rate of growth, the urban area is expected to triple between 2000 and 2030, by which time the global urban population would also have increased from 2.84 to 4.9 billion [1]. Regrettably, most of the growths are envisaged to occur in the low-income countries, where the resources and

human capacity to accommodate the growths are lacking [22]. Since the city appears to be where majority of the world's inhabitants will ultimately spend their lives, urban deforestation therefore represents a paradox that prevents the realisation of the Sustainable Development Goal 11.7 and the Cities 2030 New Urban Agenda intended for cites.

Akure is located on Latitude 7^0 12′ 18″ N and Longitude 5^0 11′ 15.6″ E. Akure became the capital city of Ondo State on the 3rd of February, 1976. The city was also made the headquarters of Akure South Local Government Area. Since it became a capital and headquarters, its population grew from as little as 38, 852 in 1952, to 71,106 in 1963 [23]. The population also increased to 239,124 in 1991, and 353,211 in 2006 [24]. At the estimated rate of 3% annual growth rate [24], the projected population of Akure could be in the neighbourhood of 503,594 in 2018. The rapid increase in the city's population resulted in the physical expansion of the city from approximately 16 square kilometres in 1980, to over 30 kilometre in size in 2000 [25]. The growth in the city's physical and numerical size caused a problem for the urban vegetation. Akure is currently experiencing an unprecedented decrease in its urban vegetation. This needs to be controlled. The city's vegetation comprises of natural and exotic species, such as urban forests, vegetation along river corridors, and road and powerline setbacks. Other components of Akure urban vegetation include urban street trees, vegetation on the incidental open space, and the botanical gardens, which ought to act as store-houses for dead plants, but are also threatened by urbanisation [26].

As a fast-growing city, its urban vegetation ought to increase in relation to its population, if its future liveability must be guaranteed. However, till date, Akure does not have an accurate inventory of its. The few studies on land use and land cover change, e.g. Oyinloye *et. al*; [27] and Owoeye *et al*; [28], did not include the attitudinal factors. The aim of the current study is to analyse the individual contributions of attitudinal factors to the reduction of vegetation in the city. The study believes that the declining trend in Akure's urban vegetation could be reversed, if attitudinal factors are properly understood within the context of the city's socioeconomic system.

2. Conceptual and Theoretical Framework

The conceptual and theoretical framework of the study are presented in 2.1 and 2.2.

2.1. The Concept of Ecosystem Services

The concept of ecosystem services and the theory of planned behaviour, represent two opposing ways of viewing the contributions of urban vegetation to ecosystem services, and Akure residents' attitude towards the reduction of the city's vegetation. Ecosystem services describes the contributions of green vegetation to human livelihood and the environment. The Environmental Protection Agency [29], Millennium Ecosystem Assessment [30], and Costanza *et al*., [31], defined ecosystem services as the benefits that human beings derive from the functioning of the ecosystem, which contribute to human well-being directly or indirectly. The Millennium Ecosystem Assessment [30], and Civantos *et al*., [32], categorise these services into: 1) provisioning, 2) regulating, 3) supporting, and 4) cultural services. Provisioning services are ecosystem services that combine with built human and social capital to produce food, timber and fibre. Regulating services regulate the different aspects of the natural environment, such as flood control, storm protection and climate control. Supporting services maintain or keep the basic ecosystem processes running, without which all the other ecosystem services will cease. Examples of these services, [30] and Constanza, *et al*., [31], include bee pollination services, nitrogen fixation and decomposition of decaying vegetal and other materials in the environment. Cultural ecosystem services represent the recreational,

aesthetic, religious or cultural services that the ecosystem provides to man in the environment [30-31].

Urban vegetation contributes to the production of these ecosystem services. For instance, it contributes to provisioning service by providing food and fruits for urban residents to eat. It contributes to regulating services through the provision of shade and shelter, and urban cooling. The growth of urban vegetation in cities helps to attract pollinating insects to fertilise flowering plants that produce the fruits that city residents consume. In the area of cultural ecosystem services, urban vegetation is important for aesthetics and recreation, and the promotion of health. Nonetheless, a lot of attitudinal factors contributed to the depletion of the city's urban vegetation and thereby reduced these service. Attitudinal factors in this context, represent the actions and behaviours urban residents put up that reduce the quantity of the city's urban vegetation. These include conversion of road and powerline setbacks to commercial uses, building illegally on river corridors and open spaces, illegal felling of urban trees, and wilful damage or destruction to urban trees, among others. These actions contributed to the depletion of the city's urban vegetation. The reduction in shade and shelter, increase in urban flooding, and loss of opportunities for open air recreation and relaxation, represent some of the benefits lost by the residents to the reduction in the city' vegetation. Until now, studies analysing the contribution of attitudinal factors to the depletion of Akure's vegetation is scarce. This study hopes to bridge this gap.

2.2. The Theory of Planned Behaviour

Many studies have been conducted on human attitudes with the purpose of arriving at some predictable patterns, among which is the theory of planned behaviour (TPB). Ajzen [33] explained that individual behaviour is driven by behavioural intentions, which are mainly determined by three principal factors. These include attitude towards behaviour, subjective norms, and perceived behavioural control. Conner & Armitage [34] viewed behavioural intention as a person's motivation or conscious decision to perform certain behaviour. Attitude towards behaviour defines the extent to which a person evaluates the positive or negative outcomes of an intended behaviour. Subjective norm refers to the perception of the social environment in which behaviour is to be conducted, that is, whether a lot of the people think the person will perform the intended behaviour or not. Perceived behavioural control refers to the individual's assessment or judgement of the extent to which performance of the behaviour is easy or difficult [33].

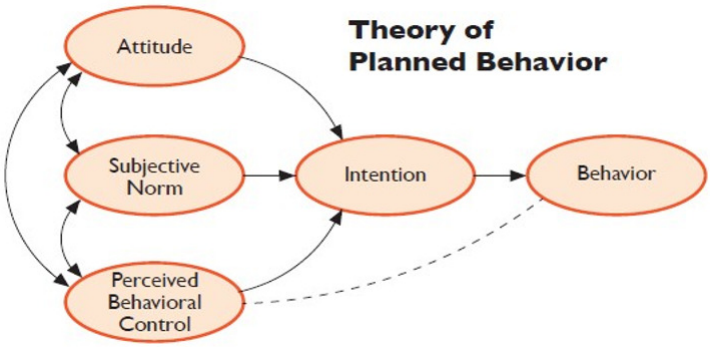

Fig. 1. Theory of Planned Behaviour, Adapted from Health Communication Capacity Collaborative

According to Ajzen [35], the tendency to execute a behaviour increases as individual's confidence and resources to do so also increase. In Akure, Ondo State, a lot of changes to the configuration of

urban vegetation are traceable to individual behaviours and actions. Many of these attitudes generate positive benefits to their executors, but negative repercussions on Akure urban vegetation. For instance, the conversion of road and powerline setbacks to trading grounds, affords traders the opportunity to sell their wares. The compaction of the setbacks, makes it difficult for street trees to grow. Besides, the exposure of the soil to weather elements also encourages erosion. An understanding of planned behavioural intentions presents a good opportunity for urban planners, landscape architects, and policy makers to intervene to reduce the destruction of urban vegetation in the city. One of this is making urban environment unattractive for illegal conversion or development, through effective monitoring and, sanctions, where possible. According to Health Communication Capacity Collaborative [36], understanding human intentions can provide useful clues on how to impact behaviour change. It also shows the way to sustain the right attitudes to green neighbourhoods [37] among Akure residents. The conceptual representation of the theory (Figure 1) indicates four distinct levels of intervention within which programme designers and policy makers can intervene, before the negative environmental behavioural intentions are actualised.

3. Methodology

A total of 350 structured questionnaires were administered on street basis in each of the nine popular residential housing areas of Akure. 317 questionnaires were successfully retrieved and analysed, first, with SPSS version 20 and then, with the Structural Equation Modelling-Amos software, for confirmation of the factors and their weights. The selected housing areas comprised of old and new residential areas. Apart from Ijapo Estate, (which is a high-income residential area), and Shagari Village, which is a Federal Low-Cost Housing Area, all other housing areas form part of the high density residential neighbourhoods of the city. These are areas where majority of the low-income households live. They are also areas where urban green vegetation is also very scanty, except along the river corridors.

The choice of old and new housing areas was to allow the pattern of urban green vegetation to be easily compared between the old and new areas. A database of over 7,000 housing units in these residential areas, was created. The residential buildings were digitised from the 2017 Google satellite imagery. This enabled an estimation of the population of each of the six digitised residential areas closest to the river corridors to be made. Information on the socio-economic status of respondents such as age, income, education and gender was obtained. Respondents were requested to assess the adequacy of urban vegetation around their residences. Respondents were also asked to choose the factors responsible for falling urban vegetation from the questionnaire. They were also instructed to indicate the effects of reduced green vegetation on the city and the residents. The selected housing areas and the questionnaires allocated to each area are: Akure Central Area (40) Area Shagari Village (42); Ijapo Estate: (32); Gaga Area: (40); New Town Idanre Road: (55); Federal University of Technology, Akure Area (30); Ondo Road (48); NEPA Area: (31), and Oshinle Area: (32) questionnaires. Allocation was based on the estimated populations in the six digitised housing areas. Interviews, archival reports, as well as historical narratives from key witnesses, were also used to complement the questionnaire survey.

4. Results and Discussion

This section presents, discusses and interprets the results of the study, beginning with the results on Table 1.

4.1 Reduction in Urban Vegetation

Table 1 presents the factors causing reduction in urban vegetation in Akure and their scores before the application of confirmatory factor analysis (CFA). Figures 1 and 2 depict the ten indicators before the CFA and the eight dominant factors after the CFA. As earlier noted, attitudinal factors refer to those actions that city residents embark upon, which directly or indirectly reduce the status of urban green vegetation. All the factor scores from the SPSS were high. The scores range between 0.77 and 0.82. Due to the high scores, it was difficult to know which factors to retain or which to drop. Consequently, the factors were analysed in the (CFA) measurement model to determine the confirmatory factors. The AMOS/SEM analysis is a powerful tool for analysing the indicators of a construct in the measurement model, before further analysis in the structural model. In this case, the various RGVs (Reduction in Green Vegetation) now become the indicators to measure attitudinal factors. Consequently, the contributions of the factors are arranged in descending order as 0.82, 0.82, 0.81,0.80, 0.80, 0.79,0.79, 0.78 and 0.77, respectively. After running the measurement model, a new set of values (factor loadings), as seen in Table 2, emerged. These represent the contributions of the indicators to falling urban vegetation in the city. It was revealed that eight of the ten factors constituted the dominant factors. The remaining factors remaining were discarded on account of scoring lower than 0.5 (Figure 3). The ten indicators in Figure 2 represent the independent, latent or unobserved variables used to measure attitude (an endogenous or dependent variable), towards the reduction in urban green vegetation (RGV) in the study area.

Table 1
Factors causing reduction in Akure urban vegetation

Items	Factors Causing Reduction in Green Vegetation	Scores
RGV 01	Inadequate setback for urban tree planting	0.77
RGV 02	People do not re-plant trees as they are cut down	0.78
RGV 03	Misuse of road setback for commercial activities	0.79
RGV 04	Not enough enlightenment or publicity	0.80
RGV 05	Lack of political will to enforce tree planting	0.82
RGV 06	Failure of town planning authorities to enforce tree planting	0.81
RGV 07	Little or no sanction against felling of urban trees	0.80
RGV 08	Building or dumping illegally on river corridors	0.79
RGV 09	Conversion of incidental open spaces to residential or commercial uses	0.82
RGV 10	Conversion of urban agricultural gardens to residential/commercial uses	0.82

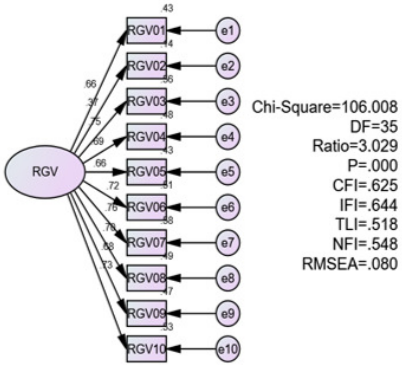

Fig. 2. Before CFA

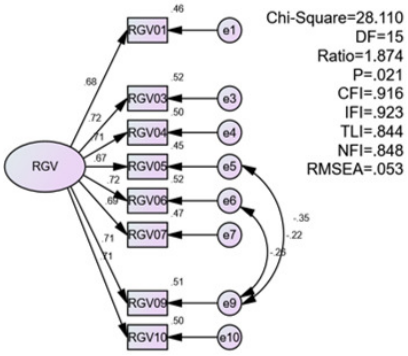

Fig. 3. After CFA

4. 2 Components/Indicators of Attitudinal Factors

Table 2 presents the AMOS/SEM output after the factors have been analysed in the measurement model. Eight of the ten indicators constitute the dominant factors The eight factors were significant at 0.5 and above. Two indicators asterisked, (RGV02) and (RGV08), measured less than 0.5. They were not statistically significant. A study by Tanko [35], utilised the SEM approach to establish confirmatory factors for value management in the construction industry in Nigeria. However, the study was a full structural model. The present study only utilised the (CFA) measurement model to reduce the number of factors, determine factor loadings, and isolate the dominant and weak factors. The slightly low TLI=.844, and NFI=.848 represent permissible fit indices, since all the remaining modification indices met the acceptable benchmark. As a self-validating tool, the SEM has the power to analyse and display factor weights, which may guide in the separation of the significant variables from the least important in a measurement model. This is what was done in Table 2. We can see the individual contributions of each factor to the reduction in urban vegetation in the city. For instance, inadequate setback for urban tree planting made a contribution of 0.68 to falling urban vegetation. On the other hand, misuse of road setback for commercial activities made 0.72 contributions. Similarly, not enough enlightenment, lack of political will to enforce tree planting, and failure of town planning authorities to enforce tree planting before property development scored 0.71 and 0.67 in that order. Furthermore, little or no sanction against felling of urban trees, conversion of incidental open spaces to residential or commercial uses, and conversion of urban agricultural gardens to residential/commercial uses contributed 0.69, 0.71 and 0.71, respectively. With this analysis, we can deduce the contributions of individual factors to the fall in urban green vegetation in the city very clearly.

Table 2
Indicators of attitudinal factors

Items	Indicators of attitudinal factors causing reduction in urban vegetation	Factor loading
RGV 01	Inadequate setback for urban tree planting	0.68
RGV 02	People do not re-plant trees as they are cut down	***
RGV 03	Misuse of road setback for commercial activities	0.72
RGV 04	Not enough enlightenment or publicity	0.71
RGV 05	Lack of political will to enforce tree planting	0.67
RGV 06	Failure of town planning authorities to enforce tree planting	0.72
RGV 07	Little or no sanction against felling of urban trees	0.69
RGV 08	Building or dumping illegally on river corridors	***
RGV 09	Conversion of incidental open spaces to residential or commercial uses	0.71
RGV 10	Conversion of urban agricultural gardens to residential/commercial uses	0.71

4.3 Adequacy of Urban Vegetation near Residential Areas

To further validate the reduction in urban vegetation, the opinions of the residents on the adequacy of urban vegetation was sought. The result is depicted on Table 3. The residents' assessments revealed that 17.7% of the residents observed that urban vegetation was grossly inadequate, while 45.4% indicated it was inadequate. On the other hand, 28% of the residents found the green spaces adequate, 4.7% quite adequate and 3.8% highly adequate. This confirms summarily that urban green vegetation is generally inadequate in Akure, as seen from the higher response rate

of 63.1% against 36.9%. The inadequacy of green spaces in the residential areas has great implications on residents' exercise levels, health, and environmental quality.

Table 3
Adequacy of urban vegetation near residential areas

Indicators	Frequency	Percentage
Grossly inadequate	56	17.7
Inadequate	144	45.4
Adequate	90	28.4
Quite adequate	15	4.7
Highly adequate	12	3.8
Total	317	100.0

5. Findings

The findings of the study are presented and discussed in 5.1 and 5.2, respectively, starting with the finding on falling urban green vegetation as depicted in 5.1.

5.1 Falling Urban Green Vegetation

Urban green vegetation has actually declined in Akure. About 63% of the residents were of the view that the urban vegetation has seriously reduced, while approximately 40% believed it was adequate. The increasing rate of urbanisation has been destroying the urban green vegetation. On the other hand, many attitudinal factors also cause the city's urban vegetation to reduce. The finding agrees with the work of Ames [34], who discovered that, sociological considerations were more important for the survival of urban trees.

5.2 *Dominant Indicators of Attitudinal Factors*

Table 4 reveals the indicators of attitudinal factors that exert strong or dominant contributions on the disappearance of urban vegetation in Akure. For instance, out of the ten indicators, eight are dominant while two are weak. Such factors like 'not enough enlightenment and publicity, 'conversion of incidental open spaces', and 'conversion of urban agricultural gardens to residential uses,' contributed 0.71, 0.71 and 0.71, respectively. 'Lack of political will to enforce tree-planting', and 'little or no sanctions against illegal felling of trees', made little contributions at 0.67 and 0.69. Similarly, inadequate setback for urban tree planting', and 'dumping illegally on urban stream corridor', were not statistically significant. The factors are arranged in descending order, indicating a fall in the level of contribution from the left to the right. The implication is that the factors are of different strengths, and therefore, require different solutions and resources to get them resolved. Furthermore, a knowledge of the factors' contribution to the disappearance of urban vegetation may guide policy makers to identify and select a range of policies to quickly address the problem. The choice of policies may be based on the strength of their weights.

Table 4
Factor weights/components of attitude

*RGV	06	03	09	10	04	07	01	05
Factor loadings	0.72	0.72	0.71	0.71	0.71	0.69	0.68	0.67

*RGV= Reduction in Green Vegetation

5. Policy Implication

Large quantities of urban vegetation provide tremendous benefits to urban residents. The benefits may become unavailable however, where the vegetation is scanty or patchy. The contribution of attitudinal factors to Akure urban vegetation cannot be over-emphasised. Taking urgent and appropriate measures represents the only way to solve the problem. Mass education and enlightenment towards behaviour-change will ensure the development of the right attitude to embrace pro-environmental behaviours in the city. Urgent measures should be taken to re-green the city, through a comprehensive city-greening policy. Involvement of residents in urban greening programmes will give residents a sense of belonging in the exercise. Government should effectively take over and develop all the city's green corridors to prevent abuse.

6. Conclusion

The depletion of urban vegetation has become a major characteristic of medium and large cities of the developing countries, particularly Nigeria. The causes of reduction in urban vegetation have often been traced to urbanisation, which includes the construction of roads, houses, industries, and establishment of educational institutions. Recently, however, attitudinal factors have continued to play active roles in the disappearance of vegetation in cities. This not only reduces ecosystem services, but increases urban heat, and promotes urban flooding. In Akure, Ondo State, the contribution of attitudinal factors has become so great that it reduced the vegetation in the river corridors, road and powerline setbacks, incidental open spaces, and the streets. Urgent measures are needed to ensure the promotion of pro-environmental behaviour among Akure residents. Effective acquisition and development of all the city's green corridors by government will go a long way to reduce the impact of attitudinal factors on the reduction of urban vegetation in the medium city.

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