Socio-Economic Characteristics and Environmental Quality of Auchi Region, Edo State, Nigeria

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Abstract

The link between socio-economic variables and environment has not been clearly established in literature. The study examined the relationship between the socio-economic characteristics and environmental quality of residents of Auchi Region in Edo State. A survey was conducted that covered 886 respondents in 24 spatial sampling units of the study area. The questionnaire items had Likert-type response options. The data were analysed with the aid of percentage/frequency tables and Spearman correlation. The descriptive analyses revealed that the region has low quality environment. The result showed that income and environmental quality were positively correlated ($r = 0.64$) and the coefficient of determination ($r^2 = 0.41$); income and water consumption had correlation of 0.68 and coefficient of determination of 0.46; and distance to primary school and environment had correlation of 0.47 and coefficient of determination of 0.22. Based on the generally low performance of the socio-economic environmental indicators and their significant explained variances, there was the need for a synergy between the government and the residents of Auchi Region in order to address the basic needs of water, health care and education.

Keywords: environment, facilities, quality, socio-economic, synergy.

Introduction

One of the major determinants of the physical environmental quality of settlements is socio-economic characteristics of the residents. These characteristics influence to a considerable extent how the physical environment is impacted upon. There are conflicting reports on the direction in which socio-economic characteristics of residents in urban environment relate with environmental quality in both the developed and less developed countries. There is a general consensus that economic growth as measured by per capita income affects environmental quality (Constatini & Martini, 2010). Income is often regarded as a bearer of options of economic activities and surrogate of activities. A model that has been used mostly in modern times in linking environmental quality with economic growth is the Environmental Kuznets Curve (EKC). According to the variant by Papanyotou

(1994), as the economy expands, environmental damage increases up to a threshold, above which the society demands environmental remediation and natural resource protection. However, situations into which the EKC operates are conflicting

The scenario presented in the environmental Kuznets hypothesis is hardly applicable in the less developed countries that have less emission as a result of their low level of industrialization (Sowmayananda, 2004). Despite this result, income still plays a vital role in analyses linking socio-economic variables with environment(National Planning Commission,2005).Even in the developed countries the result of the link between income and environment does not wholly conform to the Environmental Kuznets Curve.(Bozdaglioglu, 2013; Omay, 2013). Their results show that a U-shaped not an inverted U-shaped curve exists. In fact Peskin (1981) had earlier pointed out that income may not explain everything about human well-being and environment, they do indicate to a large degree of what the society care about and correlate with for measuring quality. The relationship between socio-economic characteristics and environmental quality of human communities can also be found in inequality of income. Environmental degradation appears to be another side effect of economic inequality and analyses show that there is negative correlation between income inequality and environmental sustainability (Andrich et al. 2010; Dorling, 2010).

Fobil et al. (2010) assessed the relationship between "socio-economic conditions and urban environmental quality in Accra, Ghana" and portrayed that there are wide variations in levels of association between five socio-economic classes and the variables of environmental quality in the neighbourhoods of Accra. They recommended that socio-economic conditions are important drivers of change in environmental quality of urban neighbourhoods in freeing them of infectious diseases. The physical quality of

urban settlements in less developed countries seems to hinge more on socio-economic characteristics, which are the major attributes of poverty (Expert Group on the Urban Environment, 1996; Nigerian Environmental Study/Action Team, 1991; Raban, 2010). Nigeria is a low-income country with a level of poverty as high as 92 per cent according to the World Bank's index of measuring poverty of the number in the population of a country living on less than $2.00 per day (World Bank, 2006 cited in US Population Reference Bureau, 2006). If one contests the World Bank's figures, the Nigerian National Planning Commission (2005) in its document "National Economic Empowerment and Development Strategy (NEEDS)" also established that 70.2 per cent of the Nigerian population live below $1.00 per day. These figures corroborate the claim of the high incidence of poverty in Nigeria. Many studies have established that there is a strong link between poverty and environmental quality (Cunningham, 2001; National Planning Commission, 2005; United Nations Conference on Environment and Development, 1992). The theme that runs through these studies is that the resources of the poor are not sufficient for them to keep and maintain their environments. Some studies even assert that the activities of the poor degrade the environment (Cunningham, 2001).

The study is based on a survey of 886 respondents in Auchi Region. The aim is to determine the link between the socio-economic characteristics and environmental quality of Auchi Region, Edo State, Nigeria. There is the need to link the environment with key socio-economic variables that many urban residents value in Nigeria. The socio-economic variables that many urban dwellers place premium have been fairly established by many studies (Nigerian Environmental/ActionTeam, 1991; UNDP /UNCHS/WorldBank,1994).The performance of these variables and their links with the environment will be explored in this study.

Conceptual Framework

The concentric circles or oval circles model has been used by many scholars to model environmental quality and sustainability, and the links between economic, social characteristics and environment (see Figure1). The overlaps of the three circles and each circle representing economy, environment and society (social institutions), show that the three are mutually reinforcing and represents sustainability (Thwink.org, 2014).

Economic and social characteristics are the major links with the environment. The economy determines how viable is the environment; the social institution indicates how equitable is the environment; and the environment shows how bearable are the living conditions of settlements.

This model will be explored in providing the link between the environmental quality and socio-economic characteristics of the settlements in the Auchi Region, Edo State, Nigeria
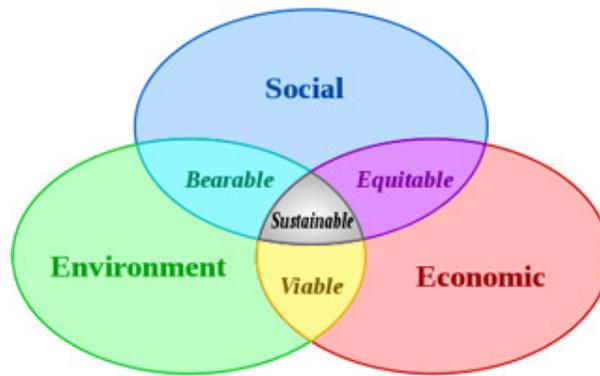

Figure 1.Model of the links between environment, economic, and social characteristics. Source: Adapted from Sustainable Seattle and Thwink.Org.

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The Study Area

Auchi Region is defined by an area circumscribed by a radius of 10.5 km at a point in Warrake Road in Auchi Town. The area covers 346.361 sq. kilometres. It is bounded in the West by Owan East and Akoko-Edo local government areas; on the east by Etsako Central; on the south by Esan West, Esan Central and Esan North-east local government areas. The Region has Auchi Town as the primate urban settlement, and Jattu and Iyakpias contiguous urban nodes to Auchi. The residents of the region engaged mainly in farming, trading, small-scale industries, and civil service. Auchi Polytechnic is the only public tertiary institution in the Region and

forms the main centre of attraction of business and commercial activities.

Methodology

The population of the study area is 216, 468 persons (NPC, 2006). A sampling fraction of 0.005 was used to determine the sample size for the study, which are 1082 respondents. A sample size calculator, however, gives the precise sample size for population size of 216, 468 to be 384 at an accuracy of level margin of 5 per cent and 95 per cent confidence level (Van Ambury cited in Mitchell & Jolley, 2007; http://www.surveysyste.com/samplesize). This was not used because it would have left some of the smaller sampling units to yield samples not adequate for the study. Twenty-

four settlements were sampled out of 38 settlements in the region. The region was further stratified into three zones: the core, the intermediate, and the periphery. The field survey was based on respondents of 1082 and only 886 answered the questions that were posed which amounted to 81.89 per cent response rate. Table 1 indicates how the total sample size was distributed based on the population sizes of the spatial sampling units.

Table 1. Spatial Sampling Units

| Zone	Settlement/Quarters	Population Size	Sample Size	
			Initial	Administered
Auchi – A	1. Igbei	9,240	46.2	39
Urban core	2. Aibotse	12,320	61.5	57
	3. Usogun	21,560	107	81
	4. Akpekpe	18,480	92	81
	5. Iyekhe	15,400	77	61
	6. GRA	6,161	30	25
		83,161		
Intermediate – B	7. Jattu (1-Old)	16,725	83	65
	8. Jattu (11 – New)	11,151	56	42
	9. Afashio/Afowa	8,384	42	34
	10. Ikabigbo/Idato	4,602	23	20
	11. Ibienafe/ugieda	5,184	26	31
	12. Ayua/Elele	6,735	34	29
	13. Ugioli	5,791	29	25
	14. Iyakpi (1 – Old)	5,984	30	26
	15. Iyakpi (11 – New)	7,978	40	28
		72,534		
Periphery – C	16. Iyuku	7,568	38.8	42
	17. Iyerekhu/Ughiekhai	3,978	20	19
	18. Buneka/Ebese(Ivbiaro)	7,994	40	31
	19. Warrake	11,784	59	41
	20. Ihievbe	8,636	43	27
	21. Uluoke/Ogbido	3,597	18	15
	22. Ayogwiri	7,366	37	29
	23. Irhekpai	3,320	18	14
	24. Ikpeshi	6,530	33	24
		60,773		
Total		**216,468**	**1082**	**886**
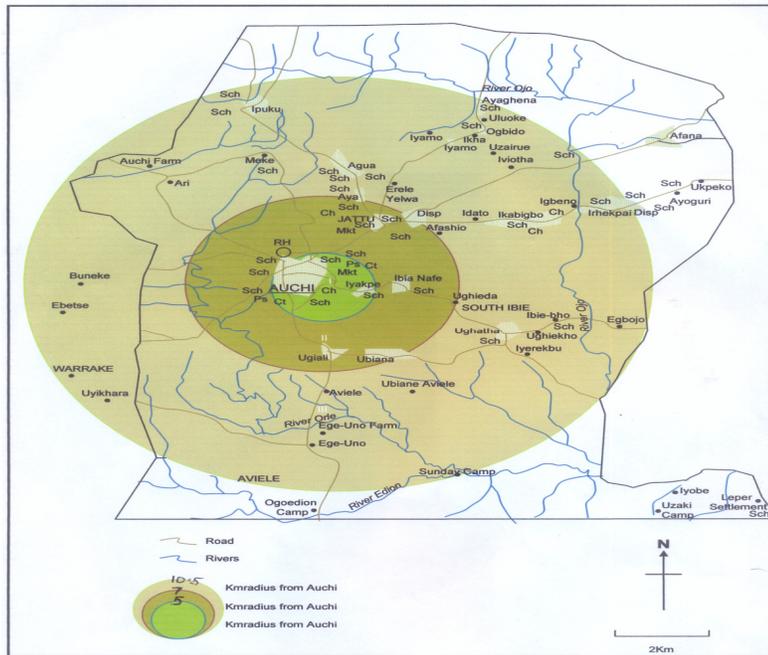
Figure 1. Study Area
Source : Onaiwu (2013)

The respondents were the heads of households which were selected based on a systematic random sampling. A respondent was selected at every 5th house in large spatial units and on every 2nd house in small units. The questionnaires were administered by twenty-four HND students of the Department of Urban and Regional Planning, Auchi Polytechnic. The socio-economic and environmental quality variables were structured into questions and the responses were in Likert-type format used for the survey.

The data on socio-economic and environmental quality were descriptively analysed using frequency tables and the hypothesis of the relationship between the environmental quality and income (a surrogate of socio-economic variables) was tested with Spearman correlation. The analysis of data was done with the aid of SPSS Version 16.

Results

The results of the survey of the socio-economic characteristics of the environmental quality of Auchi Region are as follows:

Income distribution

The income earned by residents of a settlement determines to some extent how they live and influence their socio-economic status. The National Economic Empowerment and Development Strategy argued that about 70.0 per cent of Nigerians are living with less than $1.00 per person a day (National Planning Commission, 2005). The 2006 National Population Census also depicts the low levels of income in the study area (Population and Housing Tables, Edo State, NPC, 2009). Table 2shows the distribution of income in the study area.

Table 2. Income Distribution in Auchi Region

No	Type	Core	Intermediate	Periphery	Total
1.	₦1,000.00-₦50,000.00	260(29.4)	203(22.9 %)	182(20.6%)	645 (72.9%)
2.	₦51,000.00-₦100,000.00	49(5.5)	71(8.0%)	48(5.5%)	168 (19.0%)
3.	₦101,000.00- ₦150,000.00	14(1.6)	17(1.9%)	9(1.0%)	40 (4.5%)
4.	₦151,000.00- ₦200,000.00	7(0.8)	3(0.3%)	2(0.2%)	12 (1.3%)
5.	₦201,000.00 and above	14(1.5)	6(0.7%)	1(0.1%)	21 (2.3%)
	Total	344	300	242	886 (100.0%)

Source: Field survey November, 2013.

The lowest category of income in the survey, which is the range of income between₦1, 000.00 to ₦50, 000.00 per month, forms the highest proportion of 72.9 per cent.   If this amount is converted into its dollar equivalence in terms of the existing parity ratio, and the average number of persons per household that will spend this amount, the picture of poverty is glaring. The disaggregation of monthly income earned by the respondents, especially in terms of the lowest category of income show minor variability among the strata of Auchi Region (see Table 2).

Some studies have established the link between poverty and low quality environment (Cunningham et al., 2001). Such studies have shown that the poor are living in 'subsistence' level and that the need for them to improve the quality of their environment may be tangential to their sensibility. The environment where people live is such an important aspect of their life that if it is ignored the essence of living is impaired.   Thus, whether people are in affluence or in poverty, the quality of environment they live in should be a major concern.   It is clear that poverty serious problem in improving the environmental quality emerging urban settlements in Nigeria. A balance has to be struck on how

to improve the environmental quality of emerging urban settlements and their low resource base. Not until this is reached the urbanization process in Nigeria will be of low quality.   This is the puzzle to be unravelled by the study.

Social Institutions and Environmental Quality

The presence of social institutions in settlements helps in determining their quality.   These institutions include: education, health-care, electricity, water, recreation and so forth.   In many studies these institutions form part of the indicators for assessing the quality of settlements. There is only one public tertiary institution in the urban region, which is Auchi Polytechnic, Auchi.   This institution is a major employer of labour. It also provides opportunities for the training of students in technical and vocational courses. It is an attractive pull of people and propels the wheel of economic and social activities in the region.   There are many secondary schools in the study area. Auchi alone has four government secondary schools and fifteen private secondary schools. Settlements like Warrake, Jattu, Iyakpi, Ihievbe, Ikabigbo have at least one government secondary school each. Some

settlements such as Ibienafe, Ayua that have small population share with their contiguous settlements in terms of secondary education. It is evident from Table 3 that about 27.4 per cent of the pupils trek for a distance of more than 500 metres to their schools. The desirable standard in the planning of a residential neighbourhood is a distance of less than 500 metres. In this regard, only 27.4 per cent of the children are not overstressed before they receive their education.

Apart from the presence of public primary schools in the region, there is the proliferation of private primary and nursery schools. The presence of private schools may bring these schools nearer to the pupils and perhaps help in bringing down the distances to be covered by pupils. The provision of health facilities in an environment is a major indicator of the quality of an environment. There is only one government general hospital in the area which is located at Auchi. Apart from the general hospital, there are few other government secondary health centres sited at Auchi, Jattu, Iyakpi, Ikabigbo, Warrake and so forth. However, there are many private hospitals and health facilities located in settlements such asAuchi, Jattu, Iyakpi and Afashio and these are mainly profit-oriented health ventures which the poor can ill-afford. The distances between the health facilities and where respondents of the survey live are shown in Table 4.

Table 3. Distance to the closest Primary School

S/No.	Distance (m)	Core	Intermediate	Periphery	Total
1.	Less than 500m	98(11.0%)	82(9.2%)	63(7.2%)	243 (27.4%)
2.	501m - 1000m	92(10.4%)	80(9.0%)	48(5.4%)	220 (24.8%)
3.	1,001m - 1500m	50(5.6%)	45(5.5%)	50(5.6%)	148 (16.7%)
4.	1501m - 2,000m	62(7.0%)	65(7.3%)	48(5.5%)	175 (19.8%)
5.	2,001m and above	42(4.7%)	25(2.8%)	33(3.7%)	100 (11.3%)
	Total	344	300	242	886 (100.0%)

Source: Field survey November, 2013.

Table 4.Distances between Public Health Institutions and where Respondents Live.

S/No.	Distance (m)	Core	Intermediate	Periphery	Total
1.	Less than 500m	78(8.8%)	50(5.6%)	35(4.0%)	163 (27.4%)
2.	501m - 1000m	122(13.8%)	72(8.1%)	49(5.5%)	243 (24.8%)
3.	1,001m - 1500m	42(4.7%)	76(8.6%)	62(7.0%)	180 (16.7%)
4.	1501m - 2,000m	50(.7%)	59(6.7%)	65(7.3%)	174 (19.8%)
5.	2,001m and above	52(5.9%)	43(4.8%)	31(3.5%)	126 (11.3%)
	Total	344	300	242	886 (100.0%)

Source: Field survey November, 2013.

If a distance of 1,000 metres is taken as a desirable standard to facilitate accessibility between users and a health facility, only 45.8 per cent of the respondents met this standard (Bauer & Groneberg, 2016). It seems the remaining 54.2 per cent of the sample respondents are not so favoured in

terms of location of health institutions. The field reconnaissance survey showed that most of the health institutions are located in the core area of Auchi Region. Table 4 corroborates the fact that the core has more of the health institutions meeting the distance of 1000 metres in terms of where respondents live.

Social Facilities and Environmental Quality

An important social facility that affects the quality of human settlements is water. Water is needed for both domestic and industrial uses. The quality and quantity of water supply plays a vital role in the functioning of any community. A sample survey of the water use of respondents is summarized in Table 5.

As evident from Table 5, about 35.8 per cent of the households in the survey consume less than 200 litres of water per week. If this 200 litres of water consumed is converted to per capital consumption in a week, using an average of five persons per household, this will translate into 40 litres per person a week and 5.71 litres per person a day. This amount is grossly inadequate if it is compared to the standard per capita consumption of a person of 100 L/head/day domestic consumption (Rao, 2004, p.48).

Following this standard, it seems nearly all the households in the survey operate less than the required minimum standard recommended by experts Rao(2004) and UNO(2010). The quantity of water consumed by households in Auchi Region could be related to the various sources of water supply. Table 6 shows the various sources of water supply in the region.

The itinerant sale of water by tanker drivers constitutes the commonest source of water supply (62.4%) in Auchi Region. The second commonest source is borehole water supply (16.4%), which is a recent growing phenomenon in the settlements of Auchi region. This is a costly source of water supply owing to the character of the bed rocks in the region that have low water yield. The rock type is crystalline, basement complex which have poor aquifers (Ayoade,1975; MacDonald et al., 2012).

Table 6 also reveals that even the growing borehole source of water supply is also sold. If we combined itinerant tanker sale and that of borehole water sale, about 74.6 per cent of water supply might be obtained through purchase. This may affect the income of residents living in the region; and subsequently affects the quality of the environment because of the part played by water maintaining quality environment.

The regularity of electricity supply to the various communities varies from place to place. Table 7 shows that 71.6 per cent of the respondents experience irregular supply of electricity. Some 16.4 per cent viewed the situation of the supply of electricity to be average, and only 9.5 per cent believed that the supply of electricity is regular. It is observed from Table 7 that settlements at periphery perform better than both the core and intermediate settlements of the region in terms of regularity in electricity supply. This may be because of low demand of electrical energy in those settlements.

Another aspect in the assessment of the performance of electricity supply in the study area is the issue of electricity voltage to the homes. The perception of the performance is displayed in Table 8.

Table 5.Weekly Consumption of Water by Households

No.	Litres (L)	Core	Intermediate	Periphery	Total
1.	Less than 200litres	109(12.3%)	106(11.9%)	102(11.9%)	317 (35.8%)
2.	201l – 300 litres	102(11.5%)	104(11.7%)	185(9.6%)	291 (32.8%)
3.	301l – 400 litres	65(7.3%)	52(5.9%)	36(4.1%)	153 (17.3%)
4.	401l-500 litres	26(2.9%)	24(2.7%)	12(1.4%)	62 (7.0%)
5.	501 litres and above	42(4.7%)	14(1.6%)	7(0.8%)	63 (7.1%)
	Total	344	300	242	886 (100.0%)

Source: Field survey November, 2013.

Table 6. Sources of Water Supply in Auchi Region

S/No.	Sources	Core	Intermediate	Periphery	Total
1.	Itinerant tanker sale stream	205(23.1%)	198(22.3%)	150(17.0%)	553 (62.4%)
2.	Rain water	10(1.1%)	39(4.4%)	59(6.7%)	108 (12.2%)
3.	Bore hole (mostly	16(1.8%)	25(2.8%)	29(3.3%)	70 (7.9%)
4.	through sale) Public tap	104(11.7%)	38(4.3%)	4(0.4%)	146 (16.4%)
5.		9(1.0%)	-	-	9 (1.0%)
	Total	344	300	242	886 (100.0%)

Source: Field survey November, 2013.

Table 7.Regularity of Electricity Supply

S/No.	Regularity	Core	Intermediate	Periphery	Total
1.	Very irregular	130(14.6%)	90(10.1%)	50(5.7%)	270 (30.4%)
2.	Irregular	57(17.7%)	121(13.7%)	87(9.8%)	365 (41.2%)
3.	Average	35(4.0%)	49(5.5%)	61(6.9%)	145 (16.4%)
4.	Regular	15(1.7%)	30(3.4%)	39(4.4%)	84 (9.5%)
5.	Very regular	7(0.8%)	10(1.1%)	5(0.6%)	22 (2.5%)
	Total	344	300	242	886 (100.0%)

Source: Field survey November, 2013.

Table 8. Voltage of Electricity Supplied

S/No.	Voltage	Core	Intermediate	Periphery	Total
1.	Very low	82(9.2%)	55(6.2%)	23(2.6%)	160 (18.0%)
2.	Low	163(18.4%)	115(13.0%)	43(4.8%)	321 (36.2%)
3.	Average	58(6.5%)	92(10.4%)	116(13.1%)	266 (30.0%)
4.	High	30(3.4%)	35(3.9%)	45(5.1%)	110 (12.4%)
5.	Very high	11(1.3%)	3(0.3%)	15(1.7%)	29 (3.3%)
	Total	344	300	242	886 (100.0%)

Source: Field survey November, 2013.

Table 8 shows that the cumulative performance in electricity voltage in low categories is 54.2 per cent. The assessment of average performance is 30.0 per cent. The response of average performance is based on the low level of industrialization of the area and does not require much of high-voltage demanding equipment. The peripheral zone fared better than the core and intermediate zones in terms of average voltage performance. Only about 12.4 per cent respondents claimed that the voltage of the electricity supplied to their homes is high. The performance of the zones in the degree of voltage of electricity supply is shown in Table 8.

The analysis of the socio-economic characteristics of the respondents in the sample survey done so far has been merely descriptive. There is the need to relate some of these characteristics to the quality of the environment. In many studies income is a surrogate variable for socio-economic variables and it is also used in this study as a proxy for the socio-economic characteristics. Thus, the association between income and quality need to be statistically tested to find the kind of relationship that exists between them.

Association between Income and Environmental Quality

The association between environmental quality and social-economic characteristics is the thrust of the study. This is a complex relationship which may not be very clear because of the diverse nature of environment and many factors that have links with it. However, this study attempted bivariate links between certain attributes of socio-economic characteristics and environmental quality. The Spearman correlation (r) between income and water consumption is 0.68; and the co-efficient of determination (r^2) is 0.46(46%). Thus the income of respondents is linked with the amount of water they consume and water consumption invariably affects the environmental quality of residents of Auchi Region. The Spearman correlation between the distance to public primary school and the quality of environment is 0.47, which is positive, fairly low and coefficient of correlation is 0.22 (22%). This may be explained by the fact that most of the settlements that are contiguous to each other have to share the primary schools within their vicinity. The explained variances of the variables of socio-economic correlation with environment have large effect sizes ranging from 0.22 to 0.46(Cohen, 1988 in Gravetter & Wallnau 2009). Thus apart from the coefficient of determination of 0.22 which is of medium significance, the other values are high significance.

In order to have a general perception of the quality of the environment in terms of socio-economic characteristics of the residents, the assessment of the quality of environment by the residents was correlated with income, a surrogate of socio-economic characteristics. The result is 0.64, which is positive and quite high. In terms of the co-efficient of determination (r^2), it is 0.4096 (41%). This shows the extent that the environmental quality of the environment can be attributed to the socio-economic characteristics of the residents of Auchi Region.

Table 11. Relationship between Income and Environmental Quality.
Correlations

			Despondence Income
Spearman's rho	General Assessment of Street Environmental Quality	Correlation Coefficient	.640[**]
		Sig. (2-tailed)	.000
		N	886
	Despondence Income	Correlation Coefficient	1.000
		Sig. (2-tailed)	
		N	886

**. Correlation is significant at the 0.01 level (2-tailed).

The result shows a strong, positive correlation of 0.640 with a sample size, n = 886 and. P<.001. The coefficient of determination (r^2) is 0.41 (41%). This means that about 41 per cent overlap is the explained variance between income and environmental quality. The correlation between income and environmental quality is significant for 2-tailed test at P<.001. The implication of this is that income, a surrogate measure of socio-economic characteristics, has strong link with environmental quality. This confirms the role income plays in explaining the environmental quality of urban settlements in both developed and developing countries (Bozdaglioglu, 2013;Omay, 2013).

Conclusion and Recommendation

The socio-economic characteristics of residents of Auchi Region confirmed clearly that they are associated with environmental quality of settlements. The socio-economic variables as indicators for measuring physical environmental quality, especially through the perception of residents, generally scored high. The association between income (a major surrogate variable for socio-economic characteristics) and environmental quality has very high statistical significance.

The income distribution of residents of Auchi Region is very low and about 72.9 percent of the respondents earn less than N51,000.00 a month. If this is converted to dollar parity it will be less than $100 a month. With such low income many residents are struggling to meet the bare necessities of life. The picture is further complicated due to the number of persons that rely on this amount. Thus the finding corroborates the previous studies (National Planning Commission, 2005; World Bank, 2006 Cited in US Population Reference Bureau, 2006).

The social indicators of the environment such as distance to primary school, health care, access to water by users painted a bleak picture. These low quality indicators of the environment further supported the studies carried out in developing countries (Fobil & Kraemer, 2010; Raban, 2010).

The inadequate presence of the social infrastructure is already a problem; and this further disguises their quality and quantity which are even more worrisome. The minimum per capita need of 20 litres of water goes few beyond the actual consumption of the residents.

The study also confirmed the variables that featured prominently in many studies done in developing countries that socio-economic variables constitute the bulk of the environmental sensitivity in developing

countries (Raban, 2010).The environmental Kuznets curve, used in modelling the link between income and environment seems not to be applicable in Auchi Region. The variables of atmospheric pollutants and income that constitute the bedrock of the model are lacking in most developing countries. Thus the major components that influence the calibration of the model are not captured in the socio-economic environments of developing countries.

The low income levels which give rise to low quality and poor social institutions and infrastructure suggest that there is need for something to be done to raise the physical environmental quality status of settlements in Auchi Region. There is the need for synergy between the government and the residents in improving social facilities. The residents of the settlements can pull their collective energy in providing the needed infrastructure and to be supported by the government. This partnership is desirable in order to be able to provide the social institutions and infrastructure that will enhance the environmental quality of settlements in Auchi Region.

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