A STUDY OF THE PROBLEMS OF ENVIRONMENTAL SANITATION OF KARU, NASARAWA STATE, NIGERIA

Saliman, Dauda

Department of Urban and Regional Planning, Baze University, Abuja.Nigeria.

ABSTRACT: *The study examined the socio-economic characteristics of residents of Karu; identified the socio-economic influence of Abuja on Karu; examined the existing environmental infrastructure and practices in the study area and assessed the influence of Abuja on the sanitation behaviour of Karu residents. This was with a view to identifying the dimension of environmental sanitation problems facing the residents of the town.The data for the study were from both primary and secondary sources. Primary data were collected through questionnaire administered on the residents, users of markets' and motor parks' in the major settlements into which the study area was stratified. Samples from residents were selected systematically at an interval of every tenth building. Similarly systematic random sampling was used to select one out of every five operators' (20%) permanent locations in motor parks and markets. A total of 230 households and 220 market and motor park users were sampled. Data obtained were analyzed using descriptive and inferential statistics. The results of the study revealed that 78.9% of the household heads were male. The educational status of the residents was on the decrease as distance of the settlement increased from the Federal Capital Territory (FCT) ($x^2 = 32.14$; p = 0.003). Income of residents followed the same pattern as that of educational status (F = 347: p 0.009). It was also established that 83.5% of the sampled population were workers in Abuja confirming the spill-over effects of Abuja on Karu. The study further confirmed that 10.4% of the residents had waste storage containers in their homes. Similarly, the mostsignificant waste disposalmethods (74.8%) were dumping on vacant plots and buildings under construction. While 67.4% of the residents had pit toilet, 32.6% had water closet in their homes and only one of the three markets surveyed had toilet facilities. Waste water pit was only available in 7.4% of the residences. The study confirmed further that there was no waste collection service either by the Local government or private companies. A weak but statistically significant correlation of 0.346, (p = 0.05); 0.518 (p = 0.01); 0.332 (p = 0.05) were established between income and kitchen space, availability of toilet facilities and soakaway pit respectively. On the other hand, monthly income had a strong and significant correlation of 0.622 (p = 001) and 0.519 (p = 0.01) with occupation status and water system latrine respectively. The study concluded that the spill-over effect of the Federal Capital Territory (FCT) influenced the demographic, environmental, socio-economic and physical conditions of Karu. Furthermore, the lack of adequate provisions for water supply, waste storage and disposal facilities by Karu Local Government actually contributed to the environmental sanitation problems in Karu.*

KEYWORDS: environmental sanitation, spill-over effect, impact analysis,   Karu, Abuja

INTRODUCTION

Available literature revealed that the impacts of urbanization all over the world wide ranged. These include impact on health and environmental sanitation, transportation, housing and population (Maurices et al, 1976). One of the most noticeable impact amongst others is the impact on health and environmental conditions (Gwatau et al, 2004, Maduegbuna 2004).

According to WHO (1985), population upsurge and inadequate environmental sanitation facilities are the major causes of poor environmental conditions. This implies that the rapid immigration of greater number of people to the urban centres in the Third World Countries without a corresponding improvement in infrastructure deve1opment contributed to the unhealthy nature of many urban centres (Berry 1973; Gwatau et al 2004). In the same vein UNICEF and Leitner (2005) revealed that unsafe water, poor environmental condition and hygiene are leading factor accounting for about 1 .7 million premature death in the developing world.

Scholars such as WHO (1985), UN (1993) and Varis et al (2006) hold the view that globally, the trends toward urbanization is one of the evil phenomenon of this century; cities exploiting border towns for their own interests. Also, Yeates et al (1976) observed that, urbanization in the developed countries had brought about efficient agricultural system, great scientific discoveries and mechanical inventions, and the development of efficient transportation system. Thus, in China it has brought about rapid industrialization of rural areas and jobs in the underemployed rural labour force and narrow the income disparity between urban and rural residents Guoping, 2006). Urbanization in developing countries however were discovered to have led to the influx of great numbers of peoples into areas that were generally unprepared in terms of housing, infrastructure facilities, water distribution, sewerage systems, roads and transport systems (WHO 1985, Umeh 1993). According to Vest et al (2005) urbanization is an unstoppable characteristic of global societal change, this attest to the fact that two billion people are already living in the cities of the developing world. In the same vein, Human Development Reports (2004) recorded that 45.9% of the Nigerian strong population resides in urban centres.

The most recent phenomenon of urbanization in Nigeria is being experienced in Abuja (Dawam 2000; Jinadu 2006). This is the nation's New Federal Capital Territory(FCT) created by Decree No. 6 of 1976 by the late General Muritala Muhammed led Federal Government (Dawam 2000). According to Frischmann 2000) the determination of the Federal Government of Nigeria to restore the Master Plan of Abuja had made living out of reach of both the rich and poor in Abuja. The poor are being hunted by the high standard of living while the rich are being frustrated by the unstable Development Control Regulations in the FCT. Thus, Fichmann (2000) observed that because Karu is the most important town in close proximity to Federal Capital city; about 5km to the city centre its population had been the increase. Obiechina (1985) had earlier revealed that the impact of the creation of Abuja on its neighbouring settlement over the years were being felt on the people, settlement structure and patterns, the activity system and the environment. Filaba (1994, 2005) and Frischmann (2000) also observed that Karu is

the most important town in close proximity to Abuja. Ironically, it takes a minimum of 3-4 hours to drive from the city centre to Karu during peak hours; 6.3Oam to 10.am in the morning and 4:00pm -9:30pm in the evening. This is due to influx of large number of people from Abuja to their residences. Rodd (2005) and Rufai (2006) observed that more than 60% of Abuja population actually resides in Karu. This view was corroborated by the ever increase in population figure. Dawam (2000) estimated the growth rate at 4.0% per annum. Thus the population which was estimated at 120,127 in 1997 (National Population Commission, 1997) had risen to 205,477 in 2007 (National Population Commission,2007) a rise of 69.63% in ten year period. WHO (1985) had earlier observed that one of the most important impact of rapid population upsurge is the excessive pressure on the available environment sanitation infrastructure that often led to poor sanitation practices. Karu is serving as the receiving end to the urbanization problem of Nigeria New Federal Capital Territory, Abuja. it is because of the importance of Karu to the proper functioning of the Nation's New Federal Capital Territory that this study is focused on the problems of its environmental sanitation.

LITERATURE REVIEW

The central theme of the literature review is the impact of urbanization on environmental sanitation. According to UN (1993 and Craig et al, 2001), the impacts are felt on water supply, waste water management, settlement pattern, and type and quality of housing. Attempt will be made in this chapter to highlight major impacts of urbanization on environmental sanitation conditions.

According to WHO (1985) One of the major social phenomenon of this century is the trend towards greater urbanization. Maurice et al (1976) revealed that before 1850, no society could be described as predominantly urbanized and by 1900 only Great Britain was so regarded.

Devries (2002) observed that today, the world's population is increasing by around 85 million every year, this figure is the equivalent of presentday Egypt or Mexico. In addition, the world's population was expected to grow from roughly six billion to more than nine billion by 2050, while, Attica's population was expected to almost triple. The projected growth rates were especially high in West Africa. Projected figures for 2020 indicated that 63% of the estimated population in West Africa will befound in urban centres. This implies that more people will live in towns and cities than in rural areas (Devries,2002). This trend is alarming in a region with limited resources for providing the necessary urban services. For instance, the population of Karu which was 120,127 in 1997 (National Population Commission, 1997) rose to 205,477 in 2007 (National Population Commission, 2007).

Maurice et al (1976) defines urbanization as a complex process of social economic change where a society is transformed from an essentially rural to a predominantly urban. To Tisdale (1942), urbanization is a process of population concentration, that proceeds from the multiplication of the points of concentration aid the increase in size of individual concentration; a movement from a state of less concentration to a state of more concentration. Wirth (1938),

23

however defines an urban area as a relatively large, dense and permanent settlement of socially heterogeneous individual. The existence of many definitions made Oduwaye (2002) to posit that the definition of an urban area is full of pitfalls and inadequacies due to lie failure to arrive at unanimous standard criteria for definitions.

According to WHO (1985), only one city in the developing countries had a population of four million in 1950s. This number increased to 16 in 1980 and by the year 2000 it was over 60. The consequences of this are severe. One of these is the over-loading of the existing infrastructure such as water distribution and sewerage systems, roads and transport systems and housing. The social consequences include the situation where-by people migrate to the cities in search of employment. The usual experience is that they can only obtain poorly paid employment and as a result, they live in makeshift shelters, or shared and over-crowded dwellings. The resultant high population densities causes serious environmental sanitation which in turn pose a number of threats to health (WHO 1985). It was also observed that public refuse collection systems were often able to serve only one quarter to one third of the urban population. Provision of adequate excretal disposal was observed to lag behind urban growth, consequently, large number of the "poor" lived in unhygienic squatter or slum areas with grossly inadequate water supply and sanitation facilities (WHO 1985).

Abuja is said to be growing at 4.0% per annum (Dawam 2000). However, most of these population reside in slums and illegal structures in FCT villages. The resultant public health problems are poor environmental sanitation concerned mainly with the adverse effects of biological pathogens, parasitic infections, physical and social stress and chemical contaminants (Dawam 2000). This led to massive demolition of illegal structures in FCT in 2004 by the Federal Government. The result was the influx of urban population into border towns leading to lack of unemployment, vulnerability to disaster and acute environmental sanitation problems.

As earlier stated by UN (1993) and Oduwaye (2002), other impacts of urbanization include lack of employment opportunities, spreading of homelessness and expansion of squatter settlements, increasing poverty and widening gap between the rich and poor growing insecurity and rising crime rates, inadequate and deteriorating building stocks services and infrastructure, uncoordinated development and vulnerability to disaster and acute environmental sanitation problems in the receiving border towns.

Thus, Nigeria like other developing countries, is experiencing rapid urbanization, which over one and a half decades ago was put at starling rate of 11% per annum and population was said to be at an explosive population growth rate of 3% annually (Sada and Oguntoyinbo 1981). Individual urban area was found to be growing at a higher rate than the national rate. For example, Lagos metropolis was said to have a growth rate of about 19%, Ilorin about 16% annually (Sada 1977) and Abuja 4,0% per annum (Dawam 2000). In 1975, the urban population was estimated at about 16.33 million or 21 % of total population. In 1980, it was estimated to have risen to 23.09 million or 24% of today population. Estimated figures for 1985 and 1990 based on the same growth trends were 29.87 million or 31% and 38.29 million or 34%

24

respectively (Taylor 1993). However, British Council (2009) opined that the Nigeria urban population is growing at 3.78% per year and that the proportion of urban dwellers as a percentage of the overall population rose from 28.6% in 1980 to 46.2% in 2005.

However, some scholars like Mabogunje (1975) and Ayèni (1978) had earlier categorized problems of urbanization in Nigeria under four classes, namely unemployment, serviceability, manageability and liveability. Unemployment was said to be consequent upon the influx of migrants from rural areas into urban areas. Many of them who were unemployable due to their lack of education or skills (Mabogunje 1975, Ayeni,1978). The result thus manifested in hawking, street trading and other informal sector activities. Serviceability problems stem from the failure of the cities to provide sufficient social facilities, services, amenities or infrastructure for their inhabitants such as good housing, environmental sanitation facilities, potable water, health, education, recreation facilities and energy (Mabogunje 1975, Ayeni,1978). The situation in Karu reflects this failure as the whole town was not supplied with pipe-borne water and sewerage system. Main sources of water were by wells, streams, rain harvesting, bore holes and public vending. Manageability problems related to issue of planning and unkempt of the city, maintenance of roads, markets, waste management systems and other system within the city. Mabogunje, 1975, Ayeni,1978). Presently, in Karuthere is little co-ordination and collaboration among the key development institution such as Karu area planning and development authority [KAPDA, Nasarawa state integrated rural development and Nasarawa State Ministry of Housing and Urban Development. These made it difficult to properly organize Karu to meet its urban demand. Also, reconnaissance survey by Author revealed that less than 20% of the staff of KAPDA were professionals. This impact negatively on its ability to effectively carryout its management functions. Liveability means creation and maintenance of a decent environment and good sanitation practices and ease of circulation within the urban system ((Mabogunje 1975, Ayeni,1978). Karu has no organized open space, all the open spaces are incidental in nature and there were no institutional structure for providing and managing open spaces. Also, in the same vein, Green (1976) and Jiriko (1999) observed that inadequate provision of urban facilities and infrastructure often lead to their over-utilization, waste generation and disposal problems, housing shortages, overcrowding, slum development, flooding and urban deterioration in the developing countries and above all environmental sanitation problems.

Environmental Sanitation services has been variously defined. To Mazubane et al (2002), it is any system that promotes sanitary or healthy living conditions. It includes systems to manage waste and storm water, solid waste and refuse. It also includes both the "software" of understanding why health problem exists and what steps people can take to address these problems and "hardware" such as toilets, sewers and hand washing facilities which together combine to break the cycle of disease that spread when human excreta and waste are not managed properly (Mazubane et al 2002). Sule (2004) on the other hand defined good sanitation services as proper management of solid waste. According to Swiss Federal Institute for Environmental Science and Technology (1999) environmental sanitation services could be defined as any system that create and maintain conditions where by people live healthy, productive live and the natural environment is protected and enhanced. Environmental

sanitation services is also defined as activities aimed at improving or maintaining the standard of basic environmental conditions affecting the well being of people. These items include clean and safe water supply, clean and safe ambient air, efficient and safe animal, human and industrial waste disposal, protection of food from biological and chemical contaminants and adequate housing in clean and safe surrounding. (htt.//www.business dictionary.com/ definition/environmental sanitation html). It was also defined as the hygienic disposal or recycling of waste, as well as the policy and practice of protecting health through hygienic measures. This involve the collection and treatment of waste water as well as the collection and disposal of municipal solid waste (http://www.answers.com/topic/sanitation?). To Lawuyi (2004), environmental sanitation services is a way of creating an orderly and clean space conducive to good living and health. It is also defined as a term that includes issues like safe excreta disposal, solid and bio-medical management, waste water management, drainage, personal hygiene facilities vector and pest control, food hygiene and behaviour of people. (User JCTP. ac. Uk /well /resources.com).

The word sanitation however was said to have entered the English Language in the nineteenth century and it was defined in relation to integrated water and sewer systems. And because the early Europeans lacked such technologies, three out of every ten babies born in Geneva between 1580 and 1739 was said to have died by their first birthday and the infant mortality rate in late seventeenth century London was over one in Four (http://www.answers.com/ topic/sanitation.). Experts like, Varies et al (2006) thus observed that sanitation methods depends on the type of water supply, management of wastes, receiving water quality, and environment. This is because, sanitation is no longer seen only as a health and technology issue but much more, sustainability, social, institutional and legislative in approach.

Study Area
Karu settlement derived its name from a hero called Karu. It has a population of about 48,000 by the beginning of nineteenth century. It is the headquarter of old Karu kingdom which is one of the three Gbagyi Kingdoms of Karu, Kudape and kurudu Kingdom. The old Karu kingdom covered the present day FCT to Zuma. The two most important rivers are river Kokona and Uke. Other important streams are Dako, Dagbadna and Rafin Kwara .The hills and streams influenced the original dispersed pattern of settlement (Byanyiko 1979; Filaba 1994, 2005).

Abuja settlement was founded in 1825 and named after the first ruler "Abuja" meaning "Abu the red". The settlement was initially a small camp of Hausa raiders near Zuma settlement and has historical influence with Zaria emirate (Filaba, 1994 and 2005).

The New Karu local government Area is located in the present day Nasarawa state. The state was formally part of old plateau state. Karu is one of the most important towns in close proximity to Abuja. It is about 5km to the city center. As a result of its closeness to Abuja and relatively low cost of housing, the population of Karu had been on the increase. Presently the local government which covers approximately 3328km2 is estimated to provide homes for 205,477 (National Population Commission, 2007). This figure has made the local Government to be the highest populated in the whole of Nasarawa State.
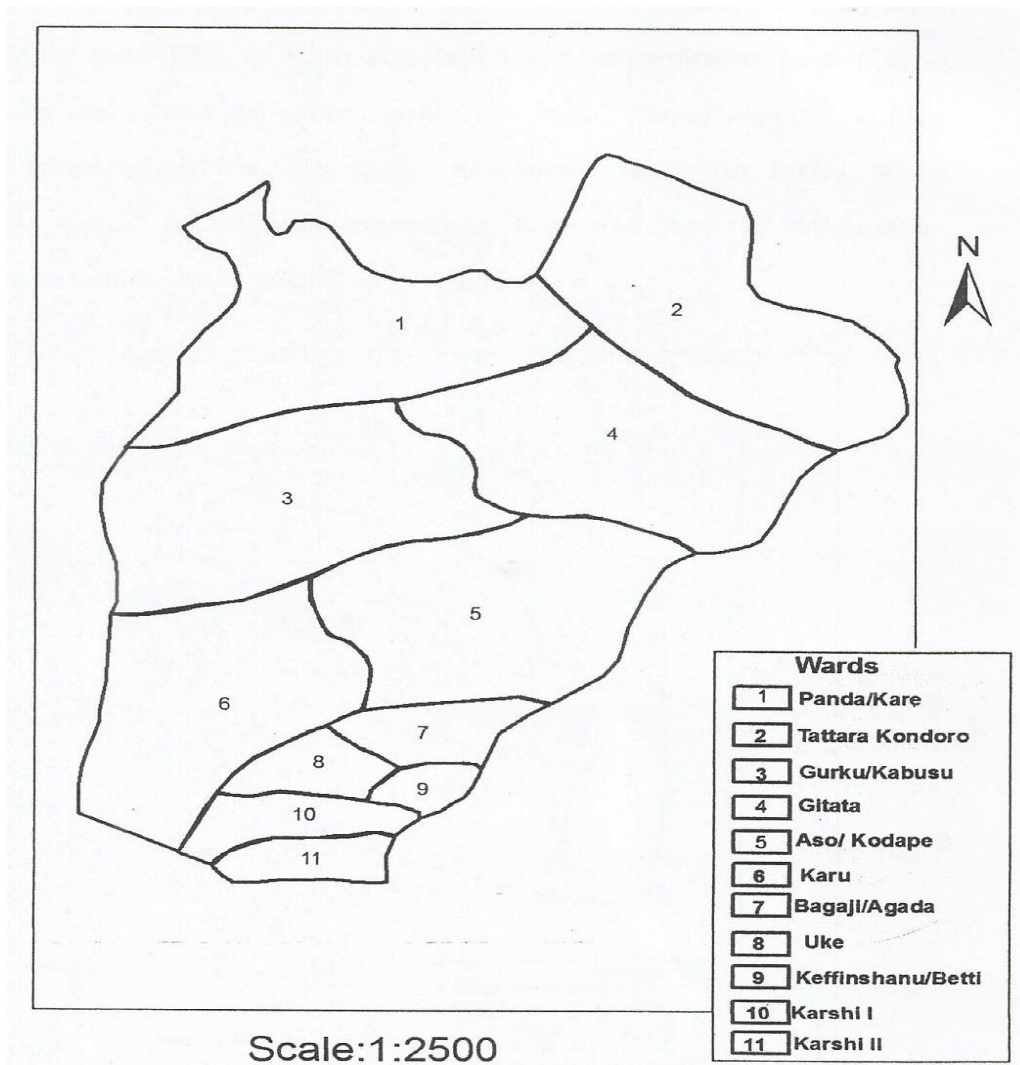
Figure 1: Map showing Eleven Political Wards in Karu
Source: Nasarawa State of Nigeria (2001)

The scope of this study is the major urban settlements of Karu Local governments namely Mararaba, One-Man Village, Ado (New Karu), New Nyanyan and Masaka. More than 75% of Karu population are concentrated here (Filaba, 2005). There are more than 30 ethnic groups in Karu. These include. Yoruba, Hausa, Fulani, lgbo, Kanuri; Tiv, Afo, Gade, Kro, Nyankpa, Jukun, Mada, Ninza, Nakere, Agatu, Alago, and Ebira (Nasarawa State Ministry of Information, 2001). This urban settlement is as shown on figure 2.
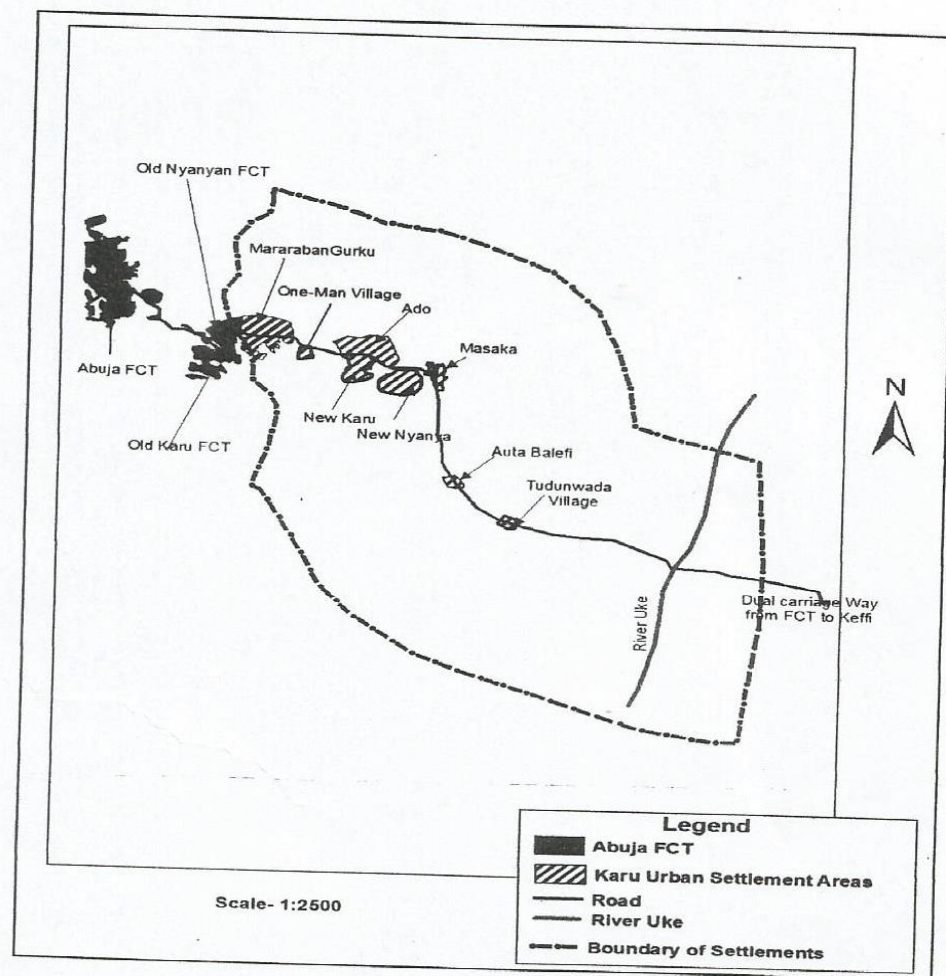
Figure 2: Karu Urban Settlement Area
Source: Frischmann (2000)

Presently, physical environment in Karu revealed a mixture of land-uses and communities of different economic status related to land prices.

Growth Centre a definition
Hansen (1967) defined a growth centre as "a complex consisting of one or more communities or places which taken together provide or are likely to provide a range of social, economic, trade and services functions for itself and its associated hinterlands either directly or indirectly". Furthermore, it has been viewed as "a set of expanding industries or a National Capital City located in an area and inducing further development of economic and (social) activities throughout its zone of influence (Bourdeville, 1961). The two definitions above assume that a centre should be able to exert influence (economic, social and demographic) on its immediate surrounding areas. Thus, Abuja being able to provide social, economic and employment

services function for itself and its hinterland and is able to exert such influence on its surrounding hinterlands is a growth centre.

The basic f**eatures of** Growth Centre are:
  i. **The Concept of Polarizatrion effect**(where by rapid expansion or growth of the centre induced the polarization or agglomeration of other social, economic and supportive activities into the centre of growth and/or growth area, this concept assumes that, once a centre has established itself, people and activities are attracted to it). Thus,all Federal Ministries, parastatals, all state governments' liason offices and the presidential villa, multi — National construction companies, head offices of Banks and Conglomerates, headquarters of all political parties are located in Abuja. These serves as polarizing factor and attracts people and activities to the nation's new federal capital territory;
  ii. **TheSpread Effect Concept (**dynamic propulsive qualities of the growth centre radiate outwards into the surrounding space(s) (Glasson 1978). i.e. growth area and hinterlands) the growth centre induces further development of economic (and social) activities into its zone of influence. (Olajuyin 1982). In other words, some of the effects of accelerated socio-economic improvements initiated at the growth centre will trickles out to their immediate hinterlands and/or growth area or zone of influence, (Olajuyin 1982). The Abuja spill-over population brought about increase in development activities in Karu- interms of construction of houses, Banks, industries and health centres, increased its population and contributed to its sanitation problems due to pressure on its environmental infrastructure;
  iii. **The Backwash Effect (**exactly the opposite of the spread effects, as **a** result of opportunities (economics demographic, political and social) existing in growth centers, the more enterprising and energetic people both skilled and unskilled labourer will be drawn from the hinterlands into the growths centres. Draining of the growth areas and hinterlands in terms of human and materials resources will occur. This implies migration.

Of all the immediate needs of urban inhabitants, environmental sanitation is the most important in the present day urbanization trends, this is because it is the bases of a healthy and productive nation.

RESEARCH METHODOLOGY

The sampling frame for the study are 2298 residential buildings and 2200 shops in the markets and motor parks in Karu (KAPDA Secretariat, 2009). The major markets in the study area are Mararaba, New Karu and Masaka while New Karu and Masaka are the two major motor parks. All these constituted the sampling frame.

However, due to absence of street names and house numbers in Karu, it was impossible to select the number of buildings for survey through the random table. To this end, 10% of the houses in the study area were selected. In other words, 230 houses formed the sample size. To achieve this, systematic random sampling techniques was adopted. The first house and shop

was chosen by simple random sampling while subsequent units of investigation was every tenth house and shop. A household head was surveyed on each floor of the selected residential building.

Different sampling techniques were used to select people for survey in markets and motor parks. For example, incidental sampling method was used for hawkers. One out of every ten (10%) hawkers identified were surveyed. Systematic sampling method was used for users with fixed locations. One out of every five operators (20%) of these permanent locations were sampled. Similarly, incidental sampling technique was used for selecting drivers and local government staff. One out of every five identified (20%) among these two sets of people were sampled. The artisan, mechanics that work on fixed locations were sampled through systematic sampling technique as done for similar people identified in motor parks. One out of every five locations (20%) were selected for survey; and only the head artisans and mechanics were sampled on each selected location.

ANALYSIS AND RESULTS

The scope of environmental sanitation includes types and quality of housing, water supply, waste water and solid waste management. These were identified to be influenced by the socio-economic attributes of residents. To this end, attributes like gender, age, educational status, occupation, income and household size of residents in the study area were examined.

Of the 320 household heads surveyed, 83 were females, this represents 36.1%. This was against the 147 (63.9%) of the respondents that were males. This showed that there were more male than female respondents in the settlement studied.

Another issue examined that is closely related to gender is age. For ease of analysis, respondents were categorized into three age groups. These are 18 to 30, 31 to 60 and above 60 years (Green,1998 and http://en.wikipedia.org/wiki/Teenage pregnancy). These groups were regarded as the youth, young adult and adult age respectively.
The youth constituted 22.1% of the inhabitants. It was also established that most of the residents were in the age bracket of 31-60 years. This age group represented 74.8%. In essence, the residents of Karu were mostly in their productive years. The adult constituted the lowest proportion (3.0%) of the residents. This is probably due to the high cost of living and the hectic nature of the city life.

Investigation on how these groups have been distributed in the different settlement of Karu was carried out. The study revealed that youths and young adults were concentrated in Mararaba. This is because 32.6% of the total sampled population of these age group were represented in the settlement. The results also indicated that, 57.1% of the adult population were concentrated in Ado (New Karu). This is probably due to its more relax and less chaotic atmosphere.
Further analysis revealed that, the minimum age of respondents was l8years while the maximum was 62 years. The mean age and standard deviation were 36.4 years and 7.9 years

respectively. The analysis of variance (ANOVA) confirmed that, there was no significant difference in the age distribution of the residents. (F = 1 .284, *p=0.278).*

It could be inferred from the above that despite the fact that there was no variation in the age distribution of residents, the productive youth and young adults were concentrated in Mararaba due to its close proximity to FCT while adult age group resided in the less hectic settlements.

Findings on the educational status of residents indicated that 51.7% of the residents were educated up to secondary school level. Those that had postsecondary education constituted 31.8% of the population. These findings are as presented in Table 4.4.
A critical observation of the table further documented that 22.1% of Mararaba residents were university degree holders. Similarly, 11.5% of Ado (New Karu) residents also had university education. The study further concluded that 10% of the total sampled population were educated to university level.

The Chi-square test computed revealed that there existed significant variation in educational status of residents in the different settlements surveyed. The results of chi-square value of 32.14 significant at 0.003 confirmed this. Further confirmation was also the fact that resident's with high educational status were found to be living in close proximity to the FCT. That the highly educated respondents chose to live very close to FCT could be attributed to the need for easy accessibility to their place of work, opportunities and information.

An investigation of the occupational distribution of residents indicated that 43.5% of the residents in Karu were civil servants and that 13.0% of them actually resided in Mararaba. In addition, of the 77 respondents in Mararaba settlements; 39.0% were civil servants. They were workers of Federal/State Ministries and Parastatals and Local Government Authority; while 29.9% represented those working in public servant namely: Armed forces, the Nigerian Police, Air force etc and organized private sectors (Banks, Construction Companies, Professional Firms/Organization). Also 30.9% of the sampled population that were engaged in public sector, organized private sector and civil service lived Mararaba and One-Man village. These are the closest settlements to FCT.

It was also established that 74.0% of the respondents in Mararaba were middle and low income earners. In Karu, these income groups shared the same socio-economic characteristics as well as standard of living (Karu City Alliance, 2002). Also, in one man village settlement, 53.6% of the sampled population were low and middle income earners. The same trend was experienced in Ado (75%), New Nyanyan (76.5%) while in Masaka, low and middle income earners constituted 77.3% of the sampled population.
The mean monthly income was N27, 674 with a standard deviation of 4.78. The one way analysis of variance (ANOVA) computed showed that a significant variation existed in the income level of residents (F = 3.47 p = 0.009).

Household size gives us a good idea of how congested the buildings were, the rate as well as the quantity of waste that may be generated. It is also an indicator of the sanitary amenities that

may be required for the settlements. It was observed that people generally maintained a medium household size in Karu. This accounted for 53.9% while small and large household sizes constituted 24.8% and2l .3% respectively.

Interms of composition by settlements; it could be deduced from Table 4.12 that 84.4% of Mararaba residents maintained small and medium households, 85.7% of one man village residents also maintained small and medium household size while Ado had 71 .2% of its residents with small and medium household family. In the same vein 74.5 % and 77.2% of the sampled population maintained small and medium household in New Nyanyan and Masaka respectively. The generally equal trend in family size could be as a result of high cost of living and high population in the face of inadequate infrastructure and high rent which all culminated into poor housing and environmental sanitation condition.

Investigation into the resident's housing types and environmental sanitation amenities indicated that 50.9% of the residents lived in a face-me-I-face-you house. The proportion that lived in traditional Gbagyi house was 19.6%. Those that lived in one bedroom flat was 23.0% of the residents, while 0.4% of the residents could afford duplex to live in. Also, 6.1% resided in 3 bedroom flats. It is also indicated from the table that Ado (New Karu) had the highest concentration of duplex and 3 bedroom that probably due its proximity to Karu Area Urban Plan and Development Authority (KAPDA) Secretariat.

In Maraba, the major housing type is traditional Gbagyi house. This is because 53.3% of this settlements' residents occupied.

It was established that 36.8% of the surveyed low income face-me-I-face-you houses were found in Mararaba settlements.

In order to examine the dependence of Karu on Abuja FCT, the respondents' places of work in relation to where they live was investigated. The study observed that 83.5% of the respondents worked in Abuja while residing in Karu. The study also established that 9.6% of the residents lived and earned their living in Karu. A negligible proportions of 3.9% and 3.0% respectively were working in Keffi and Lafia.

Furthermore, the highest proportion of those that worked in Abuja lived in Mararaba; the closest Karu settlement to FCT. This accounted for 32.8%.On the other hand, of the 22 respondents working in karu,12 representing 54.5% were residing in Ado and New Nyanyan. These findings confirmed the influence of FCT on the demographic, environmental, socio-economic and physical growth of Karu.

The survey established that there was no pipe borne water in Karu. This implied that residents had to look for other sources of water supply. Well and borehole water were two major sources of water supply in these settlement. It was established that these sources accounted for 12.2% and 9.6% of water supply respectively. All the residents had bath spaces and septic tanks in their houses. This was probably due to the type of toilet in use. The commonest type of toilet is the pit latrine. This accounted for 54.5% of the toilet types. Close to a third [32.6%] of the

residents had access to water closet, while 28.3% of the houses had urinary,25.2% provided their houses with drains.

An important determinant of environmental sanitation condition is the method of solid waste storage in practice. In Karu, the highest number of sampled residents did not have storage facility. This accounted for 74.8%. Similarly, 1.30% of the method was the metal drum, 8.7% and 3.5% was the use land pit and plastic containers respectively.

In Mararaba, 51.5% did not adopt any method of storage as against 59.7% in Ado (New Karu) who practiced same. The same practice accounted for 59.7 and 98.6% in New Nyanyan and One Man Village respectively. In Masaka, 77.3% did not adopt any method of waste storage

It was also established that 3.1% of the method used in Mararaba was the metal drum, while none of the respondents in other settlements used this method. Furthermore, a good proportions of the respondents in Mararaba were not aware of the need to store waste. In essence, quite a sizeable number of people do not store waste. Forty (40) residents were in this category in Mararaba representing 41.2% of method of storage in the settlement. It was also established that 29.2 and 31.3% of the methods was that people do not store waste in Ado (New Karu) and. New Nyanyan respectively.

The resultant effects could bring about diseases like Lassa fever, malaria, filariasis and yellow fever. This is because the waste provides food, water, habitats and breeding areas for diseases carrying agents.

The placement of waste so that it does not impact on the environment is **a** necessity for a good sanitary condition. Generally, 78.8% of the residents used building plot yet to be developed as their disposal sites. In Mararaba, 81.6% of the people disposed their waste on vacant land. In New Nyanyan and One Man Village this method accounted for 93.3% and 89.3% respectively. The same practices was engaged in Masaka where 59.1% of the method was the use of Building plot yet to be developed. What could only be called an environmental friendly means of waste disposal was practiced in Ado (New Karu). This was where 61.0% of the method used was the collection of solid waste generated by private waste vendor.

It was also established inferentially, that gender (vi) had a weak correlation (0.081 — 0.013) and not significant with any of the variables relating to sanitation practices such as v10 — 26. This implies that gender was not a significant factor for determining sanitation practices in the study area. In other words, the residents' sanitation practice was not determined by their gender. This corroborated the earlier findings which established more males (63.9%) than female (36.1%) respondents in the study area, since it has been established that females are more responsible for keeping. good environmental sanitation (UN Water (2006) and Grace et al (2010). However, educational status (v4) had a strong and significantly correlated with variables such as water system latrine (v10) (0.675**), bathroom, (vii) (0.580**), waste water pit (v12) (0.694**), septic tank (v13) (0.636**), kitchen space (v14) (0.691**) and drainage within the building (v22) (0.391 **). This suggests that residents' educational status has a

relationship with each of the above-mentioned sanitation variables. The findings indicated that only 10% of the respondents were educated to university level, hence the resultant sanitation problems.

In addition, monthly income (v5) was found to have a positive and significant correlation with occupational status (v7) (0.622**), occupation category (v9) (0.519**), water system latrine (vi0) (0.518**), kitchen space (v14) (0.588**), soakaway pit (v21) (0.332*), poor waste water collection (v23) (0.147*), poor waste water treatment (v24) (0.218*), poor solid waste collection (v25) (0.283*) and lack of good drainage system (v27) (0.323*). This implies that monthly income of a residents may have a relationship with his/her occupational status, occupation category and his ability to acquire good kitchen space and well constructedsoakaway pit. It may also have relationship on the ability to ensure good waste water collection and treatment, maintaining a good solid waste collection and provide good drainage system in the house. The above corroborated the results of the earlier findings which indicated a low mean monthly income of N27, 674 in the study area. Hence, the generally poor environmental sanitation condition.

It could also be deduced from the table that occupation status (v7) had strong and significantly correlated with bathroom (vii) (0.580**) waste water pit (v12) (0.694**), septic tank (v13) (0.636**) and kitchen space (v14) (O.696**). The major inference from the above is that occupational status may have a relationship with the provision of the above mentioned sanitation amenities in the residents' houses. Findings indicated that though 92.2% of the respondents were engaged in the organized private/public sector and the civil service, 72.6% were low and medium income earners; this adversely affected their financial ability to acquire sanitation amenities. The results thus manifested in the poor environmental sanitation condition. The table also indicated that year spent in the pursuit of formal education (v8) may be a significant factor in determining his/her occupation category (v9) (0.583**). It was established that 31 .8% of the respondents had post secondary education, as a result of which most(72.6%) could only be engaged as low and medium income earners. Therefore, only 7.5% could afford Duplex and Flats while 70.5% were crowded in environmentally poor face-me-i-face-you and traditional houses.

Furthermore, it was established that availability of water system latrine (v10) had strong and significantly correlated with availability of bathroom (vii) (0.745*), waste water pit (vi 2) (1 .00**), septic tank (vi 3) (1 .000**), soakaway pit (v21) (1 .00**) and drainage within the building (v22) (1 .000**). This implies that availability of water system latrine (v10) may necessarily implies the availability of each of the above sanitation variables. Findings indicated that 32.6% of the respondents had water system latrine in their houses, thus 67.4% of them may not have the correlated environmental sanitation amenities in their houses hence the environmental sanitation problems in the study area.

It was also established that availability of septic tank (v13) had positive and strong correlation with the availability of soakaway pit (v21) (1 .000**) and drainage within the building (v22) (1 .000**). This inferred that provision of septic tank has relationship with the availability of each of the above mentioned variables. In the same vein availability of waste water pit (v12)

34

was found to have strong correlation with availability of soakaway pit (v21) (1 .00**) and drainage within the building (v22) (1 .000**). In other words, availability of waste water pit in a home may implies the availability of the correlated variables (v22).

Poor waste water collection (v23) was observed to have significant correlation with poor waste water treatment (v24) (O.897**), poor solid waste collection (v25) (1 .000**), poor drinking water (v26) (0.307*), lack of good drainage system (v27) (0.575*) and poor housing condition (v28) (0.680*). The major deduction from this is that, where there is poor waste water collection, there might be poor solid waste water collection, drinking water, lack of drinking system and the housing condition may be adversely affected. The table also established that lack of good drainage system (v27) had strong correlation with poor housing condition (v28) (0.870*). This implies that poor drainage system have relationship with poor housing condition (v28). In other words a poorly drained environment might bring about poor housing conditions. In conclusion a summary of findings of this research work and suggested solution to identified problems will further explain the theme of this study. This is the focus of chapter six.

Table 1: Gender distribution of residents in different settlement

Settlement	Gender					
	Frequency	%	Frequency	%	Frequency	%
Mararaba	50	64.9	27	35.1	77	33.4
One-man village	19	67.9	9	32.1	28	12.2
Ado (New Karu)	31	59.6	21	40.4	52	22.6
New Nyanyan	33	64.7	18	35.3	51	22.2
Masaka	14	63.6	8	36.4	22	9.6
Total	**147**	**63.9**	**83**	**36.1**	**230**	**100**

Table 2: Age group of respondents

Age group in years	No of respondents	%
Youth (18-30)	51	22.2
Young Adult (31-60)	172	74.8
Adult (above 60)	7	3.0
Total	**230**	**100.0**

Table 3: Age distribution of respondents on the basis of settlements in Karu

Settlement	Age group							
	Youth	%	Young Adults	%	Adults	%	Total	%
Mararaba	17	22.1	58	75.3	2	2.6	77	33.4
One-man village	5	17.9	22	78.6	1	3.6	28	12.2
Ado (New Karu)	14	26.9	34	65.4	4	7.7	52	22.6
New Nyanyan	10	19.6	41	80.4	-	-	51	22.2
Masaka	5	22.7	17	77.3	-	-	22	9.61
Total	**51**	**22.2**	**172**	**74.8**	**7**	**3.0**	**230**	**100**

Table 4: The distribution of respondent into different educational status in Karu

Settlement Area	No formal Education		Primary six		Secondary		Grade II		NCE		ND/HND		University degree		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Mararaba	4	(5.1)	4	(5.1)	22	(28.6)	-	-	10	(13.0)	20	(26.0)	17	(22.1)	77	(33.4)
One-man village	2	(7.1)	2	(7.1)	18	(64.3)	3	(10.7)	1	(3.6)	2	(7.1)	-	-	28	(12.2)
Ado (NewKaru)	8	(15.4)	3	(5.7)	24	(46.2)	7	(13.5)	-	-	4	(7.7)	6	(11.5)	52	(22.6)
New Nyanyan	4	(7.8)	2	(3.9)	43	(84.3)	2	(3.9)	-	-	-		-	-	51	(22.2)
Masaka	8	(36.4)	1	(4.5)	12	(54.5)	1	(4.5)	-	-	-		-	-	22	(9.6)
Total	**26**	**(11.3)**	**12**	**(5.2)**	**119**	**(51.7)**	**13**	**(5.7)**	**11**	**(4.8)**	**26**	**(11.3)**	**23**	**(10.0)**	**230**	**(100)**

Table 6: Occupation distribution of residents

Residential area	Public sector		Organized private sector		Civil servants		Farming		Schooling		Artisan		Retirees		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Mararaba	7	(9.1)	16	(20.8)	30	(39.0)	4	(5.2)	5	(6.5)	10	(13.0)	5	(6.5)	77	(33.4)
One-man village	5	(17.9)	3	(10.7)	10	(35.7)	3	(10.7)	4	(14.3)	3	(10.7)	-	-	28	(12.2)
Ado (New Karu)	4	(7.7)	6	(11.5)	30	(57.7)	4	(7.7)	1	(1.9)	6	(11.5)	1	(1.9)	52	(22.6)
New Nyanyan	15	(29.4)	6	(11.8)	20	(39.2)	3	(5.9)	2	(3.9)	5	(9.8)	-	-	51	(22.2)
Masaka	2	(9.1)	2	(9.1)	10	(45.5)	4	(18.2)	2	(9.1)	2	(9.1)	-	-	22	(9.61)
Total	**33**	**(14.3)**	**100**	**(43.5)**	**18**	**(7.8)**	**14**	**(6.1)**	**26**	**(11.3)**	**6**	**(2.6)**	**-**	**-**	**230**	**(100)**

Table 8: Residents' income groups in the settlements studied

Settlements	Income group						Respondents in all settlements	
	Low (<N10,000)		Middle (N1 0,000-N25,000)		High (>N25,000)			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Mararaba	24	31.1	33	42.9	20	26.0	77	33.4
One-man village	7	25	8	28.6	13	46.4	28	12.2
Ado (New Karu)	16	30.8	23	44.2	13	25.0	52	22.6
New Nyanyan	23	45.1	16	31.4	12	23.5	51	22.2
Masaka	9	40.9	8	36.4	5	22.7	22	9.6
Total	**79**	**34.3**	**88**	**38.3**	**63**	**27.4**	**230**	**100**

Table 10:   Residents' income group in relation to the time they relocated to Karu

Location period	Income Group						Total no of Respondents	
	Low		Middle		High			
	Freq.	% —	Freq.	% —	Freq.	% —	Freq.	% —
Before 1976	7	63.6	3	27.3	1	9.1	11	4.8
Before 1990	15	34.9	13	30.2	15	34.9	43	18.7
1999	10	27.0	20	54.1	7	18.9	37	16.1
Between 2003 and 2009	47	33.8	52	37.4	40	28.8	139	60.4
Total	**79**	**34.3**	**88**	**38.3**	**63**	**27.4**	**230**	**100.0**

Table 11 Household size as distributed among the residents

Settlements	Household size'						Total	
	Small (1-6)		Medium (7-10)		Large (710)			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Mararaba	30	39.0	35	45.4	12	15.6	77	33.4
One-man village	10	35.7	14	50.0	4	14.3	28	12.2
Ado (New Karu)	4	7.7	33	63.5	15	28.8	52	22.6
New Nyanyan	11	21.6	27	52.9	13	25.5	51	22.2
Masaka	2	9.1	15	68.2	5	22.7	22	9.6
Total	**57**	**24.8**	**124**	**53.9**	**49**	**21.3**	**230**	**100**

Table 13: Resident's housing types in settlements of Karu

	Face-me-I-face-you		Traditional		One bedroom		Duplex		3 Bedroom		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Mararaba	43	36.6	24	53.3	20	37.7	-	-	5	35.7	77	33.4
One-man village	17	14.5	2	4.4	7	13.2	-	-	2	14.3	28	12.2
Ado (New Karu)	31	26.5	7	15.6	10	18.9	1	100	3	21.4	52	22.6
New Nyanyan	21	17.9	2	4.4	13	24.5	-	-	2	14.3	51	22.2
Masaka	5	4.3	10	22.2	3	5.7	-	-	2	14.3	22	9.6
Total	**117**	**50.9**	**45**	**19.6**	**53**	**23.0**	**1**	**0.4**	**14**	**6.1**	**230**	**100**

Table15: Places of work in relation to settlements where residents lived

	Settlement of residence										Total	
Work place	Mararaba		One-man village		Ado		New Nyanyan		Masaka			
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Karu, Nasarawa State	3	13.6	5	22.7	6	27.3	6	27.3	2	9.0	22	9.6
Keffi	-	-	6	66.7	3	33.3	-	-	-	-	9	3.9
Lafia	2	28.6	-	-	-	-	-	-	5	71.4	7	3.0
Total	**68**	**29.6**	**26**	**11.3**	**46**	**20.0**	**51**	**22.1**	**39**	**17.0**	**230**	**100**

Table 16: Existing environmental sanitation amenities in Karu

Environmental amenity	Mararaba		Ado (New Karu)		New Nyanyan		One Man Village		Masaka		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Kitchen space	77	100	52	100	51	100	28	100	22	100	230	100
Waste storage container	4	5.1	10	19.2	7	13.7	1	36	2	9.1	24	10.4
Tap water	-	-	-	-	-	-	-	-	-	-	-	-
Well water	3	3.9	10	192	8	15J	2	7.1	5	22.7	28	122
Bore hole water	1	1.3	20		-	-	1		.		22	96
Wash hand basin	14	18.2	27	51.9	17	333	17	60.7	8	36.4	83	36.1
Bath space	77	100	52	100	51	100	28	100	22	100	230	100
Waste water pit	14	182	-	-	3	59	-	-	-	-	17	7A
Septic tank	77	100	52	100	51	100	28	100	22	100	230	100
Pit latrine	44	57.1	6	11.5	36	70.6	19	67.8	21	95.5	126	54.5
Watercloset	14	182	17	32.7	19	37.3	17	60.7	8	36.4	75	32.6
Drainage within compound	14	18.2	17	32.7	19	37.3	5	179	3	13.6	58	25.2
Urinary	14	18.2	17	32.7	19	37.3	7	25.0	8	36.4	65	28.3

Table 17: Solid waste storage methods in the different settlements of Karu

Storage method	Mararaba		Ado (New Karu)		New Nyanyan		One Man Village		Masaka		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Metal drum	3	3.1	-	-	-		-	-	-	-	3	1.0
No storage facility	50	51.5	40	59.7	43	59.7	22	78.6	17	77.3	172	602
Plastic container	3	3.1	2	2.9	3	42	-	-	-	-	8	2.8
Land pit	1	1.0	4	6.0	5	6.9	6:	21.4	4	18.2	20	7.0
Don't store waste	40	41.2	21	31.3	21	29.2	-		1	4.5	83	29.0
Total	**97**	**33.9**	**67**	**23.4**	**72**	**25.2**	**28**	**9.8**	**22**	**7.7**	**** 286**	**100**

Note: ** The number of respondents were more than the number of questionnaire administered, because some respondents used more than a storage method.

Table 18: Solid waste disposal methods in the residences

Methods	Mararaba		Ado (New Karu)		New Nyanyan		One Man Village		Masaka		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Building plot yet to be developed	80	81.6	30	36.6	56	933	25	89.3	13	59.1	217	748
Private vendor collection	10	10.2	50	61.0	2	3.3	3	10.7	-	-	52	17.9
Land pit	5	5.1	-	-	2	33	-		6	273	13	4.5
River/stream banks	3	3.1	2	2.4	-	-	-	-	3	136	8	28
Total	**98**	**33.7**	**82**	**28.3**	**60**	**20.7**	**28**	**9.7**	**22**	**7.6**	**** 290**	**100**

Note: **The number of respondents were more than the number of questionnaire, because some respondent used more than a disposal method.

Table19: Degree of relationship in the socio-economic, environmental amenities and sanitation practices variables of residents in Karu

	V_1	V_2		V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}	V_{16}	V_{17}	V_{18}	V_{19}	V_{20}	V_{21}	V_{22}	V_{23}	V_{24}	V_{25}	V_{26}	V_{27}	V_{28}
V_1	1																												
V_2	.258**	1																											
V_3	.458**	.558**		1																									
V_4	.152*	.280**		.095	1																								
V_5	.272**	0.47		-213*	.246**	1																							
V_6	.142*	.605**		.552**	.366**	.118	1																						
V_7	.2334**	.103		.317**	.461**	.622**	.106	1																					
V_8	.046	.218**		.095	.802**	.160	.339**	.802**	1																				
V_9	.117	.204**		.023	.691**	.516**	.229**	.862**	.563**	1																			
V_{10}	.081	.299		.157	.675**	.518**	.423*	.675**	.414*	.790**	1																		
V_{11}	.036	.150		.087	.580**	.134	.326*	.580**	.660**	.616**	.745*	1																	
V_{12}	.120	.408		.051	.694**	.198	.280	.694**	.543	.877**	1.00**	1.00**	1																
V_{13}	.171	.206		.130	.636**	.403	.253	.636**	.461*	.295	1.000**	1.00**	-	1															
V_{14}	.017	.305**		.161	.691**	.346*	.588**	.696**	.706**	.708**	1.000**	.849**	-	1.000**	1														
V_{15}	.024	.114		.029	.177	.131	.013	.177	.110	.118	-333	.701**	.577	.488	-	1													
V_{16}	.088	.054		.123	.143	.085	-138	.143	.193*	.178	-	-	-	-	-	.560**	1												
V_{17}	.126	.143		.015	.192	.156	.067	.192*	0.57	.251*	.632	.000	.509	-	.417	.131	-	1											
V_{18}	.021	.112		.071	.112	.069	.032	.113	.120	.203*	.277	.494*	-	-	.239	.691**	.482**	.167	1										
V_{19}	.083	.181		.004	.152	.086	.021	.152	.213	.219*	-	1.000**	-	.333	.300	.058	-	.081	.803**	1									
V_{20}	.042	.281		.262	.100	.022	.034	.100	0.38	.054	-	1.000**	-	1.000**	.655*	.671*	-	478	-	.577	1								
V_{21}	.054	.309*		.274	.240	.332*	.035	.177	.145	.268	1.00**	.679**	1.000**	1.000**	.592*	.213	-	.083	.149	.218	.600	1							
V_{22}	.250	.279		.386	.391*	.115	.090	.313	.084	.378	1.000**	1.000**	1.000**	1.000**	.707	.272	-	.234	.293	.272	1.000**	1.000**	1						
V_{23}	.024	.056		.055	.113	.147*	.060	.032	.155	.017	.471*	.149	.250	.158	.285	.103	-	.135	.074	.103	.291	.200	.015	1					
V_{24}	.005	.002		.105	.007	.210*	.130	.107	.136	.080	.671*	.094	.167	.000	.025	.147	.123	.224*	.073	.043	.000	.019	.019	.897**	1				
V_{25}	.136	.052		.056	.021	.283*	.152	.016	.193	.050	.745*	.293	.000	.000	.000	.216	-	.247	.055	.120	.167	.030	.083	1.000**	.897**	1			
V_{26}	.013	.061		.029	.122	.106	.010	.097	.051	.097	.258	.120	.089	.122	.095	.092	-	.148	.106	.086	.176	-	.239	.307*	.366**	.307*	1		
V_{27}	.056	.011		.063	.053	.323*	.113	.141	.049	.061	.408	-	.408	.500	.000	.203	-	.000	.308	-	-	.149	.167	.575*	.564**	.478	.359*	1	
V_{28}	.083	.140		.187	.082	.236	.299*	.032	.051	.070	.577	.174	.577	.500	.067	.364	-	.136	.316	.293	.316	.055	.378	.936**	.680**	.936**	.306	.870**	1

Note:

V_1	-	Gender	V_7	-	Occupational status
V_2	-	Marital Status	V_8	-	Years spent in the pursuit of formal education
V_3	-	Age	V_9	-	Occupation category
V_4	-	Educational status	V_{10}	-	Water system latrine
V_5	-	Monthly income	V_{11}	-	Bathroom
V_6	-	Family size	V_{12}	-	Waste water pit

V_{13}	-	Septic tank		V_{21}	-	Soakaway pit
V_{14}	-	Kitchen space		V_{22}	-	Drainage within the building
V_{15}	-	Well water		V_{23}	-	Poor waste water collection
V_{16}	-	Lined pit latrine		V_{24}	-	Poor waste water treatment
V_{17}	-	Bucket latrine		V_{25}	-	Poor solid waste collection
V_{18}	-	Bore hole water		V_{26}	-	Poor drinking water
V_{19}	-	Wash hand basins		V_{27}	-	lack of good drainage system
V_{20}	-	Waste storage container		V_{28}	-	Poor housing condition

Source: Computer of Author's Survey December, 2008.

* Significant at 0.01

** Significant at 0.001

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATION

Based on the findings above, the major problems identified includes inadequate and not properly coordinated housing production, total absence of public piped water supply system in all the settlements and waste water and solid waste storage and disposal problems. Thus, major problems facing the ever increasing population in Karu is the inadequate and not well co-ordinated housing production. Nasarawa state government must encourage improvement in the quantity and quality of housing production for all income groups. Second, government should provide sites and services and ease land ownership policies to promote orderly urban development. Third, provision and improvement of infrastructural facilities in the existing residential areas. Fourth, government should employ more professionals in Karu area planning and development authority (KAPDA) as well as Nasarawa state investment and property development authority to affectively coordinate housing delivery. Fifth, government should encourage the creation of institutions and instruments for mobilizing resources which will facilitate the granting of long-term credit for housing development. Sixth, government should build a bigger and more organized building material market to make Karu self sufficient in the area of building, materials thereby reduce rent and cost of construction: Seventh, Nasarawa state government should actualize the designing and execution of her proposed Master Plan for the study area. This will regulate future pattern of physical development conscious effort should also be made to upgrade slums and squatter settlements especially in Mararaba settlement area with highest number of such cases. KAPDA should also constitute a unit saddled with responsibility .for street naming and house numbering, this will ease co-ordination of the area and bring about policies and institutional consistency. Eighth, government should revitalize her staff NIPDCO estate, and Masaka estate housing scheme to cover other settlements in Karu. This will reduce continuous and uncontrolled urban growth which contributed to the poor environmental sanitation condition being experienced in Karu. Nineth because Mararaba settlements that attracted most settlers need to be upgraded by way of demolition of structures that were on the right-of way of road people and drainage. Thereafter, government in collaboration with private developers need to - build more low income houses and provide more site and services scheme.

Furthermore,the absence of a public piped water supply system in all the settlements of Karu had made its provision a necessity. Karu is blessed with abundant underground water due to its geological formation that enable the development of rich aquifers in most parts of the region. In addition, Karu is blessed with abundant rain — well over 1000mm per annum from April — October which provides for effective recharge of the groundwater. Furthermore the dammed Uke river in Masaka settlement if improved, maintained and put into use could provide pipe borne water for the whole of Karu urban populace.

The above could be achieved by government going into partial private sector responsibility (where the responsibility is shared between the private and public sectors) with international private

24

companies to harness the available water potential in Karu. In the mean time, government could construct kiosk systems with metered private connections to the households and sink bore-hole at strategic locations. The kiosk systems in the short term would improve cost recovery, meet consumer's cash flow needs, less expensive more reliable and provide better quality water than the water vendors being widely practiced in Karu. An improvement in the availability of portable water would alleviate sanitation problems in Karu.

Waste water management need to be improve upon. As earlier stated the development in Karu did not follow any Master Plan, therefore haphazard growth, high density, narrow internal streets and the lack of water made it impossible to establish a central sewerage system. Government could construct VIP — latrines (on-site systems) in every streets of all the settlements, markets and motor parks in Karu. The maintenance/management of these latrines should be the concern of the private company. KAPDA officials should ensure that standard specification for its construction such as placing of the latrines downhill and at least 30m below wells or other water sources, ensuring that the roof are sloped towards the back of the latrine (Abuja Metropolitan Management Agency, 2006). Also, the ventilation pipe should be placed so as to give maximum exposure to the sun and painted black (Abuja Metropolitan Management Agency, 2006). The pipe should be ensured to have a diameter of at least 15cm and should project at least 50cm over the latrine roof (Abuja Metropolitan Management Agency, 2006). Properly constructed latrines will enable residents to ease themselves at will without impacting on the environment.

At the individual household level, urban renewal department of KAPDA should make it mandatory for every building to construct a standard septic tank under the supervision of KAPDA professionals as it is being done by the development control department of FCT. Each septic tank should have at least 2 chambers for proper decomposition of solid components (sludge) and liquid components thus aid anaerobic decomposition, reduce smells and consequently maintain a conducive sanitary environment.

At disposal level, government through many willing private companies like Julius Berger, RCC and Dantata and Sanwoe could construct waste water treatment plant so as to meet-up with waste water disposal demand of Karu urban growth. Furthermore, government should go into partnership with waste management companies that has standard simple pump and drum system Vehicles for the emptying transportation and disposal of waste water to the designated treatment plants. Residents could be made to pay for this services at affordable fee. This systems as against the traditional unhygienic manual emptying with buckets will reduce smells, more hygienic and ensures good environmental sanitation condition and health of the residents.

Solid waste management in Karu needs to be improve upon. KAPDA in conjunction with private waste management companies should set up metal waste (Franziska et al 2005) containers with lids at regular intervals in every streets. (pro-off systems) in the settlements, markets and motor

25

parks. The container should not be more than 50-lOOm (standards) to the dwelling units. In addition Lorries could be provided for the emptying and disposal of the waste into designated dump site. Residents could be made to pay for this services at affordable tees.

Therefore, government of Nasarawa State need to provide new dump site in Masaka and New Nyanyan settlement being far from the city centre and sparsely populated. This will encourage and aid the emptying and disposal of waste. While a Comprehensive Development Plan Preparation for Karu will generally improve Urban Growth and encourage good environmental sanitation practice in Karu.

REFERENCE

Abdul. A. and Moten, M.A (2000): Privatization of solid waste management in Pakistan. *Journal of Planning Commission:* Vol. 43; pp. 1-8.

Abuja Metropolitan Management Agency (AMMA) (2006): FCT Development Control Manual. Federal Capital Development Authority. Abuja.

Adriana, A, Julio, O. D and Pascale, H (eds.) (2006): The Pen-urban poor citizens or consumers? *Environment and Urbanization:* vol. 18 (2); pp. 333-350.

Adriana, A. (2003): Environmental Planning and Management of the Pen-urban interface: Perspective on an emerging field. *Environment and Urbanization: vol. 15.no. 1;* pp.135-i 48.

Afon, A. O. (1985): Impact analysis of University of Ife on Housing Development in lle-lfe. B.Sc. Dissertation submitted to the Department of Urban and Regional Planning. Obafemi Awolowo University, lle-lfe. Nigeria.

Ahamed, N and Sohail, M. (2003): Alternate water supply arrangements in peri-urban localities: Awami (people's) tanks in Orangi Township Karachi. *Environment and Urbanization:* vol. 15. no 2; pp. 33-40.

Ahianba, J. E., Dimuna, K. O. and Okogun, G. R. A. (2008): Built Environment Decay and Urban Health in Nigeria. *Journal of Human Ecology:* 23 (3) pp. 259-269.

Ayeni, M. O. (1978): *Patterns, process and problems of urbanization in Nigeria: Geography of National Developments.* Heinemann Education Books Limited Ibadan.

Balogun, O. (2001): *The Federal Capita! Territory of Nigeria: a geography of its development.* University of Ibadan Press, Ibadan.

Bartlet, S. (2003): Water, sanitation and urbanization: the need to go beyond improved provision. *Environment and Urbanization:* vol. 15; pp. 56-65.

Berry, B. J. L. (1973): *The Human Consequences of Urbanization.* Hazell Watson and Viney Ltd. Macmillian Press Ltd. Great Britain.

Bisai, S., Bose, K. and Chakraborty R. (2009): Relationship of family income and house type to body mass index and energy deficiency among urban Bengalee male slum dwellers of Kolkata, India. *Journal of Comparative Human Biology:* Vol. 60 (1); pp. 45-57.

Bongaarts. J. (2001): Household size and Composition in the Developing World. *http:/www.popcouncil.org/pdfs/wp/144.pdf.* Accessed 20th of November, 2010.

Bourdeville, J. (1961): *Problem of Regional Economic Planning.* Scottish Council Development and Industry Publisher, Edinburg.

Byanyiko, N.F. (1979): *Topics on Gbagyi History.* National Museum Press. Jos. Christaller, W (1933): *Central Places in Southern Germany.* Prentice Hall. New Jersey. U.S.A.

Craig, A. M, Patricia, C. B, Fernando, R. B. and Mauricio, L. B (2001): Evaluating sanitary quality and classifying urban sectors according to environmental conditions. *Environment and Urbanization:* Vol. 13; pp.12-35.

Dawam, P. D. (2000): *Geography of Abuja, Federal Capital Territory.* Famous/Asanlu Publishers Minna.

Devries, F. P, Quansah, C. and Drechsel, P. (2002): Rural-urban interactions stimulation of urban and pen-urban agriculture in West Africa: Characteristics, Challenges, and need for action. *Proceedings of a Planning Workshop; pp* 1-12.

Doxiadis Associates (1983): *Regional Development Plan for the Federal Capital Territory.* Vol. 1 book 1; pp. 639-739.

Eaton, D,andHihoerst, T. (2003): Opportunities for managing solid waste founds in the pen-urban interface of Ouagadougou. *Environmental and Urbanization:* Vol. 15 No. 1; pp. 53-63.

Feachem, R, Magarey. M, and Mara, D. (1983): *Water, Wastes and Health in Hot Climates.* John Willey and Sons Press .New York.

Federal Ministry of Water Resources (2000): Water Supply and Sanitation Interim Strategy Note. Abuja. Nigeria.

Filaba, M.A. (1994): A History of Karu, Kurape and Kurudu Kingdom. M.A. thesis submitted to History Department, Ahmadu Bello University Zaria, Nigeria.

Filaba, M.A. (2005): A History of Karu, Kurape and Kurudu Kingdom. Ph.D thesis submitted to History Department, Ahmadu Bello University Zaria, Nigeria.

Franziska, B. and Vest, H. (2005): Improvement of Sanitation and Solid Waste Management in Urban Poor Settlements. Eschborn Press Deutschland.

Fnischmann, P. (2000): *Preliminary Master Plan Report :Final Version of Greater Karu Urban Area.* Nasarawa State government press.

Glasson, J. (1978): An Introduction to Regional Planning: Concepts, Theory. UCL Press Limited. London.

Grace, A. and Funso, A.(2010):Resulting Gender Issues in accessibility and Operation of Sanitation Services provided by private sector in Nigeria. *Journal of Applied Sciences in Environmental Sanitation. VoL v. no. N.pp.386-392.*

Green, H (1998): *Reaching Young Men with Reproductive Health Programs. http:/www. fhhorq/en/youth/youthnet/t,ublications/focus/infocus/youngmen.htm.Accessed on the 20th of November,2010.*

Guoping, L (2006): The Analysis and Evaluation of Compatible Relationship between Industrialization and Urbanization in China. Peking University Press. China.

Gwatau, D. and Sati, Y.C. (2004): Effect of poor Sewage Disposal System on Environmental Quality of Nasarawa Gwong, Jos .*Journal of Environmental Sciences:* 8 (1); pp 74-83.

Hansen, N. M (1967): Development Pole Theory in a Regional Context. *Kyklos International Review for Social Sciences:* Vol. 20, (4); pp. 709-727. *htt:/www.businessdictionary. com/definition/environmentalsanitation.html/20 10.* Accessed *20th* of November, 2010. *htty://www. answers. com/topic/sanitation!/2010.* Accessed *201h* of November, 2010. http:llen.wikipedia.orcj/wikiITeenage pregnancy. Accesed 20th of November,201 0 Isard, W. (1960): *Methods of Regional Analysis,* MIT Press. New York.

Jaiyebo, o. (2003): Women and Household Sustenance: Changing Livelihoods and Survival Strategies in the Pen-Urban areas of Ibadan. *Environment and Urbanization.* Vol. 15, no. 1; pp 111-120.

Jess, S. and Laurence, U. (1970): *The Random House Dictionary of the English Language.* Oxford University Press. London .p.71 3.

Jiboye, A. (2004): The Socio-Cultural Responsiveness of Household Size on Housing Quality in Osogbo. *Journal of Geography and Planning Science.* Vol. 2(2); pp. 1-7

Jiboye, A.D and Ogunshakin .L.(2010):The place of the Family House in the Contemporary Oyo Town, Nigeria. - *Journal of Sustainable Development. Vol.3,no.2 .pp. 1-12.*

Jinadu, A. M. (2006): Patterns of Settlements Interaction in the Federal Capital Territory (FCT): Implications for Physical Development Planning. *Journal of the Nigerian Institute of Town Planner.* Vol. XIX, no. 1; pp. 67-82.

Jiriko, K. G. (1999): Effective Urban Management and Governance for Sustainable Cities in Nigeria in the 21st century. *Journal of the Nigeria Institute of Town Planners: Vol.* XII; pp. 41-53.

John, A. and Pechenino, A. (1994): An Overlapping Generations' Model of Growth and the Environment. The Economic Journal. Vol. 104. pp 1393— 1410.

Karu Area Planning and Development Authority (2007): Plan Position Paper on the Preliminary Master Plan of Karu.

Karu City Alliance Initiative (2002): A Technical Report on Karu Governance and Management institutions. *UN-Habitat press.* Karu.

Lawuyi, 0. B. (2004): Space and Sanitation: Identity, Power and the Management of refuse in Osogbo, Nigeria. *Journal of Environment and Culture:* Vol. 1 no. 1; pp 38-50.

Leitner, K. (2005): Health and Environment, a view from the perspective of WHO. *Environment Matters, pp.* 8-9.

Mabogunje, A. L. (1975): Prolegomenon to Urban Poverty in Nigeria. Proceedings of the Annual Conference of the Nigeria Economic Society. Ibadan. pp. 69-91.

Maduegbuna, A. N. (2004): The Emerging Challenges of Environmental Problems in the Face of Struggle for the Survival of Developing Countries. *International Journal of Environmental Issues:* Vol. 2. no 1 and 2; pp. 173-179.

Mansuri, M. G. and Shelat, R. N. (1983): *Problems of Village Sanitation in India in Water, Wastes and Health in hot Climates.* Johnwiley and Sons Press. New York.

Margaret A. (1974): *An Introduction to Town Planning Techniques.* Hutchinson Press. London.

Maurice, Y and Barry, G. (1976): *The North American City.* Harper and Row Press, New York.

Mazubane, C. and Brisley, M. (2002): White Paper on Basic Household Sanitation. Pretoria.pp.1 -16.

Morill, R. L. (1974): *Growth Centre — Hinterland Relations.* Helleiner and Stohr. Nasarawa State of Nigeria (2001): Publication of the state ministry of Information, Youth and Sports.

National Population Commission (1997): Federal Republic of Nigeria Official Gazette. Federal Government Printer. Lagos.

National Population Commission (2007): Federal Republic of Nigeria Official Gazette. Federal Government Printer, Lagos.

Obiechina, RN (1985): Impact of Abuja on Settlements in the Federal Capital Territory. MSc. Thesis submitted to Urban and Regional Planning Department. Ahmadu Bello University, Zaria, Kaduna State.

Oduwaye, A. 0. (2002): Residential Land Use and Land Values in Metropolitan Lagos. Ph.D. Thesis Submitted to Urban and Regional Planning Department, Obafemi Awolowo University, Ile-Ife, Nigeria.

Okunmadewa, F.Y, Yusuf, S.A and Omonona, B.T(2005):Social Capital and Poverty reduction in Nigeria. Report submitted to African Economy Research Consortium(AERC) Nairobi Kenya.

Olajuyin, L.O. (1982): On Trickle down Effects and Regional Developments: An Empirical Study of Spatial Movements. *Journal of N1TP:* Volume II Nos. 1 and 2; pp. 12-24.

Olayemi, J. K. (1995): A Survey of approaches to Poverty Alleviation. A paper presented at the NCEMA National Workshop on integration of Poverty Alleviation Strategies into Plans and programmes in Nigeria, Ibadan. pp. 4 — 15.

Olomola, F. (2009): Future of Town Planning practice in Nigeria. Paper presented at the monthly meeting of the Lagos chapter of the Nigerian Institute of Town Planner.

Perroux, F. (1964): *Economic Policy for Development.* Baltimore. Penguin.

Perroux, F. (1964): Theory of Growth Pole and Development Pole. *A Radical Journal of Geography:* Vol.6(2); pp. 106-113.

Pfouts, R. W. (1960): *The Techniques of Urban Economic Analysis.* Chandler Davis Publishing Company. USA.

Roberts, M. (1974): *An introduction to Town Planning Techniques.* Wm Brendon and Son Ltd. Essex. Great Britain.

Rodd, F, Kidd, J, Cohen, W. and Noda, T. (2005): *Around and about Abuja.* Spectrum Books Limited. lbadan. Abuja.

Rufai, N. A. (2006): The Implementation of Abuja Master Plan: Position Paper Series. Federal Capital Development Authority, Abuja.

Sada, P. 0. (1977): Environmental Sanitation in the Urban Areas of Nigeria. *Nigerian Geographical Journal:* Vol. 20 no. 1; pp. 13-25.

Sada, P. O. and Oguntoyinbo, J. S. (1981): Urbanization Processes and Problems in Nigeria. Proceedings of the 17th Annual Conferences Nigerian Geographical association. Lagos. p. 202.

Sancho, A. (1996): Policies and Programmes for Social Human Development. Proceedings of the United Nation's World Summit for social Development. Sanfrancisco.

Sarcar, S., (2010): Town Planning the growing difficult in civil service India. *Indian administrative journal: Vol.* 23; pp. 1-2.

Sule, O. R. A. (2004): The Deterioration of the Nigerian Environment: Problems of Solid Wastes Disposal in the Metropolitan Lagos. *Geo Journal:* Vol. 3; pp. 571-577.

Supriyadi, S. Kriowoken, L. K. and Birley, I. (eds) (2000): Solid Waste Management Solutions for Semarang, Indonesia. *Waste Management and Research:* Vol. 18 issues 6; pp. 557-565.

Swiss Federal Institute of Environmental Science and Technology (1999): Technical Report on Environmental Sanitation in the 2l' century.

Tacoli, C. C. (2003): The links between Urban and Rural Development. *Environment and Urbanization.* Vol. 15, no. 1; p.5

Taylor, A. W. (1993): *Urban Development in Nigeria.* Ashgate Publishing Company. U.S. A. The British Council (2009): Nigeria — The Next Generation. Final Reports, Nigeria.

Tisdale, H. (1942): *The Process of Urbanization, Social forces.* University of North Carolina Press. USA.

Umeakuka, J. M. and Mba, H. C. (1999): Solid Waste Management Practices: A Case Study of Anambra State. *Journal of the Nigeria Institute of Town Planners.* Vol. XII pp. 12-45.

Umeh, C. C. (1993): *rban Development in Nigeria.* Ashgate Publishing Company. Booksfield U.S.A.

UNICEF (2005): Water Sanitation and Hygiene Interventions for Health what works? Technical, Policy and Advocacy document.

United Nations (1993): *World Urbanization Prospects. The 1992 Revision.* United Nations. New York.

United Nations Development Programme (2004): Human Development Report *www.hdr.undp.org/reports/global/2OO4.* Accessed 20th of November,, 2010.

UN Water (2006):Gender, Water and Sanitation. A policy brief by the Inter-Agency Task Force on Gender and Water(GWTF).International Decade for Action. *http:www.unwater.org/down loads/un.* Accessed of November, 2010.

UserJCTP.ac./uk/well/resources.com/2010. Accessed 2O' of November, 2010.

VanBenkering, P. V., Gerlagh, R. and Pandey, P. (1999): Integrated Modelling of Solid Waste in India. Proceeding of Collaborative Research in the Economics of Environment and Development (CREED). London.

Varies, O. and Somlyody, L. (2006): Freshwater under pressure. *International Review for Environmental strategies:* vol.6 No2; pp. 181-204.

Vest, H. and Bosch, F. (2005): *Improvement of Sanitation and Solid Waste Management in Urban Poor Settlements.* Eschborn Press. Deutshland.

White, A. N, Water, G. F and Bradley, D. J. (1972): *Drawers of Water: Domestic Water Use in East Africa.* University of Chicago Press. Chicago.

Wirth. L. (1938): Urbanism as a way of life. *American journal of sociology: Vol.* XLIV; pp. 1-24. –

Wook, L. J. (2004): Water, Sanitation and Hygiene Links to Health, Facts and Figures. World Health Organization Document. Geneva. Switzerland.

World Health Organization (1985): WHO Expert Committee Technical Report Series 718. Geneva.

World Bank (2008]: *World Development indicators 2008,* Washington D. C.

World Habitat Day (2009): A Safe City is a Just City. Proceedings of the World Habitat Day Celebration.

Yeates, M and Peter E. L. (1970): *Impact of industrial Incentives.* The Queen's Printer. Ottawa.