

EXAMINING THE RELATIONSHIP BETWEEN ECONOMIC ACTIVITIES AND WATER POLLUTION IN URBAN STREAMS IN MINNA, NIGERIA

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ABSTRACT

This work is directed at an assessment of human socioeconomic activities in and around urban streams and rivers. It highlighted the multiple sources of environmental pollution particularly water pollution that can and has been known to threaten life and livelihood in human environments. Through physical and socioeconomic surveys, data were obtained and analysed with the main finding showing that unguided use of this fragile land is on a serious increase. In many instances those directly using, misusing and or consequently at the receiving end of these abuses are quite unaware of the multidimensional implications of water pollution and or the misuse of aquatic habitat for that matter. Main suggestions drawn from the collected socioeconomic data analyzed using simple descriptive statistics, are hinged on proper land management and control of land uses, and of particular regard is the setting up of urban stream agency to provide adequate care for this vastly intruded ecosystem that is still the main source of both domestic and industrial water even at its present heavily polluted state.

Keywords environment management pollution river urban

INTRODUCTION

Water is a colourless, odourless and tasteless liquid. On a global scale, total water abundance is not the problem. The problem is its availability in the right place at the right form. More than 99% of the earth's water is in its natural state which is either unavailable or unsuitable for immediate human use. The amount of water for which all the people, plant, and animals on earth totally depend on is much less than 1% of the total (Formas, 2005). Pollution of surface water occurs when too much of undesirable or harmful substances flow into a body of water, exceeding natural ability of the water body to remove the undesirable material, dilute it to a harmless concentration or convert it to harmless liquid for human use. To understand water as a necessity, as resource and as a factor in the pollution problem we need to understand its role in the biosphere, and its role in living things. Water is a critical, limited, renewable resource. It is a unique liquid. Without it, life as we know it would become impossible. Compared with other liquids, water has high capacity to absorb heat and is a good conductor of heat and is a good liquid solvent (Tyler, 1993; Formas, 2005).

Water pollution refers to the degradation of water quality, while a pollutant is any biological, physical, or chemical substance that in identifiable excess is known to be harmful to other desirable living organisms. Hence, water pollutants include excess amount of heavy metal, certain radioactive isotopes, faecal coliform bacteria and viruses; and are categorised as emitted from point or non point sources. That is, those with distinct and confined sources such as pipes from industry or municipal waste sites that empty into streams or rivers. Non-point sources include those triggered by runoff through; land uses, climate, hydrology, topography and geology, agriculture and mining activities like the one in rural Zamfara state, north-western Nigeria recently (Tyler, 1993; Abdulkadir and Sadiq, 2010).

Environmental problems like water pollution cause irreplaceable depletion of essential resources and can set in serious damage that can affect public health, safety and capacity of natural system to sustain development. Water pollution is known to be caused by a number of human activities particularly in rural settings; however, human economic activities in urban areas particularly those around cities' traditional sources of water supply like streams and rivers are usually less emphasized by different assessors. The identification of these activities is of immense importance to mapping and the appropriate management of safe water sources for a growing urban centre. It is also needed for interventions to address the continuous misuse of major water sources for growing urban populations of developing countries.

Pollution is simply the contamination of the earth's environment with materials that interfere with human health, the quality of life, or the natural functioning of the ecosystem (living organisms and their physical surroundings). We can also look at pollution as a human problem because it is a relatively recent development in the planet's history, before the 19th century Industrial Revolution people lived more in harmony with their immediate environment. According, Salman (2002) water pollution has emerged as a major public health concern as a result of man-made and environmental changes at local and global scales. These developments are a multi-layered process, questioning the existence of a linear relationship between pollutants and their human impacts. Water pollution is intricately linked with a number of sub-systems of urbanisation, agricultural activities, food security, and human health, making it a complex system responding to stimuli in various sub-systems (McMichael, 2001).

AIM AND OBJECTIVES

This study is aimed at the assessment of human economic activities and water pollution in Minna. This was done for the identification, planning and management of sustainable urban water supply and safety for a developing urban centre. This exercise was achieved through a set of objectives that involved a review of the causes and effects of water pollution particularly in urban centres; then identification of the various human economic activities and their effects on water sources in the study area; and finally a provision of approaches for effective exploitation of safe water sources for Minna and its environs by giving physical planning recommendations about limiting the effects of water pollution in urban centres of developing countries generally.

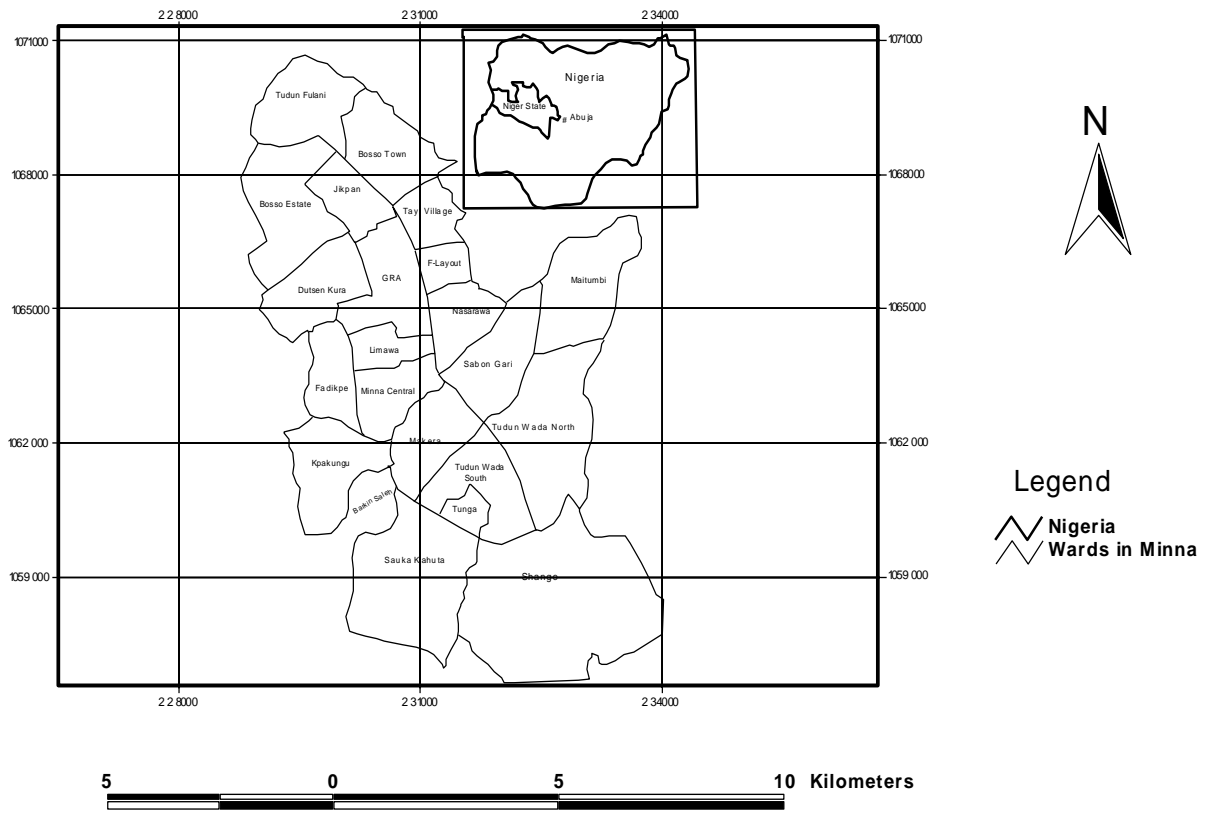
THE STUDY AREA

Minna is the administrative seat of Niger state, central Nigeria and also the headquarters of Chanchaga local government area. The city is known for her local farming activities and has high level traditional institutions to guide and maintain peaceful coexistence. Located on latitudes $9^{\circ}33'$ and $9^{\circ}42'$ to the north and longitudes $6^{\circ}27'$ and $6^{\circ}35'$ to the east (Googleearth, 2011), is on a geological base of undifferentiated basement complex of mainly gneiss and migmatite to the North-East of the town where a more or less continuous steep outcrop of granite occurs (Lock, 1980). These physical features coupled with adequate annual rainfall and good soil has placed the town in a position of great advantage for farming and farm related activities. The evolution of the town to a regional administrative capital with the creation of Niger state in 1976 has made it centre for population agglomeration ever since. The final movement of the seat of the federal government of Nigeria to Abuja (which is just 150km away), and the mass empowerment of civil servants with the coming of full-fledged democratic rule across the country, have further made Minna a relatively quite hilly settlement prior to the coming of colonial rule and the sitting of a regional rail interchange in 1912, a hub of urban growth and expansion. The settlement has grown to a large metropolis housing over 317, 465 people in a land of about 6,784 square kilometre encompassing up to 15 neighbourhoods or political wards (Lock, 1980; Olayide, 1992 (cited in Umar, 2011); Awoseyin, 2002; NPC, 2007; Dukiya, 2008).

There is increasing proliferation of farming, various cleaning works and sand mining activities along the length and breadth of the streams and rivers across Minna metropolis.

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River Sauke (one of the two case studies) passed through the study area for this work (Sauka Kahuta) and particularly coming through Tunga and Tunga Low-Cost neighbourhoods of the metropolis. River Suka is studied at Barikin Sale neighbourhood and it passed through Soje A and Soje B neighbourhoods where it daily witnesses intrusions and abuses (see plates I, II and III).



(Source: Modified after Min. of Housing & Environment, Minna, 1992)

Fig. 1: Map of Minna and its Neighbourhoods



Source: Googleearth (2010)

Plate I: Satellite Image of Barikin Sale and Sauka Kahuta Neighbourhoods ((River Suka at the western end, and River Sauka at the eastern part).

CAUSES AND EFFECTS OF WATER POLLUTION

Water is a fundamental element in sustainable development. Better access to safe drinking water, adequate sanitation and increased water for food production and industry contribute to health, livelihood and broader economic development. It is also essential for the environment providing wetlands and other aquatic ecosystems and resources. Although we as humans recognize this fact, we disregard it by polluting our main sources of domestic and industrial water like rivers, lakes, and oceans. Subsequently, we are slowly but surely harming our planet to the point where organisms are dying at a very alarming rate. As Earth's population continues to grow, people are putting ever-increasing pressure on the planet's water resources. In a sense, our oceans, rivers, and other inland waters are being "squeezed" by human activities not so they take up less room, but so their quality is reduced. In a sense poorer water quality means water pollution (Terry, 1996).

Virtually any human activity can have an effect on the quality of our water environment. When farmers fertilise the fields, the chemicals they use are gradually washed by rain into the groundwater or surface waters nearby. Chemicals released by smokestacks (chimneys) can enter the atmosphere and then fall back to earth as rain, entering seas, rivers, and lakes and causing water pollution (Richend, 1992; cited in Umar, 2011). Water pollution

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has many different causes ranging from areas of low population and human activities to major cities and towns with large factories, high population and millions of automobiles.

Major sources and entry points of water pollution can be through farming. For example, many animals are kept in intensive rearing sheds and are routinely fed drugs such as antibiotics. As around 75% of such drugs may be excreted, the resultant manure becomes a potential source of water pollution. Other sources of pollution through this economic activity include; Fertilizers use (Fishes and other water organisms often find it hard to survive in these polluted water; use of Pesticides (Pesticides, including herbicides and fungicides used to kill weeds and microbes which can end up in water supplies).

Water pollution can also be through the environment processes and environmental resources taken for granted. These include Sediment and Organic Debris (sediments build up over time in rivers and lakes as rain water washes soil, silt and organic debris from the land); Sewage (Sewage is used water and waste substance that are produced by human body that are carried away from houses and factories. With over six (6) billion people on the planet, disposing of sewage waste is a major problem). Others are, Chemical Wastes (this include lead, cadmium, mercury and tributyltin (TBT) that was used in paints to protect boats); Radioactive Wastes (People view radioactive waste with great alarm. At high enough concentrations it can kill; in lower concentrations it can cause cancers and other illnesses); Oil Pollution (oil pollution at sea comes from routine shipping and from the oil people pour down drains on land. However, what makes tanker spills so destructive is the sheer quantity of oil they release at once); and Plastics which are by far and away the most common substance that washes up with the waves. They are most common materials, used for making virtually every kind of manufactured object. Plastic is light and floats easily so it can travel enormous distances. Most plastics are not biodegradable (they do not break down naturally in the environment).

Effects of water pollution are enormous and can be from; oil spill which has a serious economic impacts on the residents. They lose income from fishing and tourist activities. Recently, BP oil giant had to pay over 10 billion US Dollars as damages to people affected by the unfortunate oil spill from one of her offshore sites (CNN, 2010). Chemicals like detergents insecticide and pesticides threaten human health and also other aquatic life in rivers and seas. Insoluble particles of soil and other solids that become suspended in water clouds water and reduce photosynthesis and water quality. Bacteria, viruses, and other

parasites that enter into water from animal wastes or domestic sewage causes sickness and death to millions of people annually. Compound of toxic metals like lead, mercury at higher levels makes water unfit to drink, harms man, fish and all other forms of aquatic life.

Water Pollution in the Developing World

Whenever the issue of global pollution is on assessment, developing or poor countries are easily seen as still contending with aspects of rudimentary aspects of the menace. This is because, it is in developing countries that many people still lack clean water and basic sanitation (hygienic toilet facilities). Sewage disposal affects people's immediate environments and leads to water related illnesses such as diarrhoea that kills 3 - 4 million children each year, and could claim 13 million lives by 2020 (Chris, 2009). Developing countries are the most affected by water pollution problems. Water resource issues in these nations always present special management challenges. These issues and related problems have been addressed by many works (United Nations, 1992 (cited in Umar, 2011); Word Bank, 1993). However the major barriers to addressing water problems in developing nations include poverty, illiteracy, rapid population growth, and ineffective institutions and policies for developing, distributing, pricing, and conserving water resources.

Allaoui (1998) views Pollution as a vexing problem in countries where the population is growing rapidly, where all industrial waste are discharged into surface waters without any treatment whatsoever. While writing about Nigeria, Spon (1997; cited in Umar, 2011) highlighted that widespread flooding occurs in the southern parts of the country, while the northern parts experience chronic water springs, streams and boreholes dry up, a situation that continually expose the region's vast population to water shortage and uses of unsafe avenues for domestic water source.

Water pollution in Nigeria occurs in both rural and urban areas. In rural areas, water from natural sources such as rivers and streams is usually polluted mainly by organic substances from upstream. Due to low population and virtual absence of heavy industrial activities in rural areas this particular pollution is less harmful than what is usually witnessed in urban areas across the world. Human socioeconomic activities are often highlighted as they affect living environment in different dimensions. However, while addressing urban pollution; attention is rarely placed on how people living at the various places where pollution of land or water has occurred are coping with the situation; if they are aware of the

different consequences their life or livelihood are exposed to; or if there are peculiar intervention modalities in terms of assistance.

MATERIALS AND METHODS

Sample Areas: Barikin Sale and Sauka Kahuta are two neighbourhoods in Minna. Due to their location on the lower courses of rivers Sauka and Suka at south-western axis of the metropolis; they are daily witnessing increase in human activities at and around these two rivers (see figure 1 and plate I).

Population and Sample: According to the 2006 population census figures the sample areas Barikin Sale and Sauka Kahuta have a population of 5,664 and 4,130 respectively. The total of this is about 3.349 % of the population of Minna. Three hundred residents and workers in these neighbourhoods were sampled during the field exercise to solicit information on their environment, water resources and livelihood. Through this approach, virtually all those working at the streams were interviewed together with residents who live close to them.

Data Types and Analysis: Two major sources were used to collect data for this study. These are primary and secondary sources. Primary data were acquired through the use of questionnaires, oral interviews and personal observations recorded by taking of photographs using digital camera. Secondary data used for this study comprised of published and unpublished materials like, text books, journals, seminar papers, internet and other electronic media. Simple descriptive statistics tools were used to analyse acquired data and presented as tables, charts, percentages, and frequency tables.

DISCUSSION OF RESULTS

Ages and occupation of Respondents: Most of the residents in the area are of the active age group of about 20-40 years. This group form about 91% of the population living and working around rivers and streams in Minna urban area. These rivers also entail high economic activities particularly in the wet season during which human activities are at the peak here. Most of these people are however, self employed and also practice other professions beside farming or fishing as traders, or those in manual jobs.

Uses and Abuses of Urban Stream and Rivers: Over 80% of the respondents that comprise residents and those who usually come from elsewhere use urban streams for different kinds of

activities particularly washing; which include car and motorcycle cleaning, laundry and, washing of different household utensils. This shows that, despite the filthy nature of most of the water sources, the immediate residents also use them for both domestic and other human economic activities including direct sale and consumption. Although they are still used as refuse dumps by the residents of the area. This detestable act, as shown in plate II, is causing serious threat to the streams and people living in the area. For example, the land and rivers continue to witness erosion leading to the collapse of buildings and the inundation of stream water to form ponds for the breeding of mosquitoes and other disease vectors (see plate II).



Source: Field Survey, April 2010

Plate II: Intrusion and the Abuse of River Suka, Barikin Saleh Neighbourhood, Minna.

Assessment Of Activities Around Streams And Rivers In Minna: The major employment based economic activities around these streams include farming and sand mining, mainly encouraged by the growing building activities nearby creating and sustaining ventures like block making and sales (see plate III). From field surveys conducted, it was made clear that these activities exist mainly due to lack of functional water sources from taps and bore holes (accounting for over 48% of reasons giving), and not because it is the only water source preferred in the area (12%), or because it is free (7%). Overall, economic reasons of employment source at various levels accounted for over 71% of reasons why people use streams and rivers in Minna.

Although field surveys and the subsequent data analysis shows that over 15% of the population are not aware or do not believe that these activities have any negative effects on their environment, about 76% of them are pretty sure that activities like direct washing or dumping of refuse into streams, can affect water sources (that is, 15%), cause diseases like cholera (over 27%), create and retain dirty environment (about 28%) and can even destroy farmlands and make the entire environment unsafe for human habitation.



Source: Field Survey; Oct, 2010

Plate III: Block Making Activity around River Sauke in Sauka Kahuta neighbourhood.

Confronting Water Pollution in Minna: Worried about the scenario around their living environment, residents revealed that water pollution and related issues can be controlled through effective control of land uses, public awareness campaign, taxing people who farm around the streams, provision of alternative jobs to people carrying out these activities, disallowing people from using the place especially for refuse dumping, and providing better sources of water to the populace. Provision of effective and efficient urban waste management facilities was also mentioned.

Mass public awareness campaign and strict control of land uses with the highest response rate of over 34% and 22% respectively could be the most effective measures to control water pollution in Minna and similar areas of the developing world. Likewise it is

evident that people need adequate and safe water supply for domestic uses to avoid using polluted streams for direct consumption.

CONCLUSION

Water pollution is a global phenomenon which needs local action to address effectively. Interventions at all levels need good coordination that is locally based. However, public authorities responsible for public health, maintenance of law and order need to be properly empowered to check activities that can harm the environment. Working together like this can help make pollution less of a problem in all human settlements and make the world a better place to live.

Public awareness is an effective measure to control human induced water pollution especially when people do not know the effects of their activities around water bodies. Hence, making people aware of the problem is the first step towards solving it. Greater public awareness can therefore make a positive difference. This needs to be followed with planning and creation of job opportunities with particular attention to environment friendly activities like proper waste management, laundry and vehicle cleaning and maintenance; whose absence is creating these problems. Urban authorities should, however, strengthen efforts to provide adequate and hygienic water supply to the people. The fact that clean and potable water and sanitation facilities are lacking in the study area easily shows how vulnerable the people are to clearly preventable hazards (Mabogunje, 2005). The public health problems caused by lack of these facilities tend to limit economic and social progress of people and further constrain their ability to escape poverty traps.

Water pollution is an issue which needs good co-ordination based on intervention between authorities and the people concerned for effective and lasting solutions to be derived. Governments should carry along the various bodies in these areas needing interventions; play their part in providing services that these people need. The public can then be made aware of their own responsibilities to sustain the good gesture and also made aware of the negative effects of water pollution and environmental degradation. These measures can be sustained through the use of local law enforcement agencies known locally as 'The Vigilante Groups' or 'Yan Banga'. They have been known to be effective and can help by disallowing people from using these streams in negative ways. Continuous monitoring, insistence on good

practices especially by farmers, and at the extreme, taxing those who use the streams can also make it tougher for people to pollute and would require them to look for more appropriate alternatives. This can be through municipal water supply, water bore-holes, or even hand dug wells.

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