



Assessment of the environmental health issues affecting residential areas along river till Katsina metropolitan, Katsina State, Nigeria

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Abstract

Environmental health as a branch of public health focuses on the interrelationships between people and their environment, promotes human health and wellbeing and fosters healthy and safe communities. This branch of public health was well established during the British colonial administration and the subsequent administrations that came to power in Nigeria. However, recent developments have shown that environmental health have not been given the emphasis it deserves as a form of preventive health mechanism in Nigeria. This paper assesses the environmental health issues affecting residential areas around River Ginzo in Katsina metropolitan, Katsina State. Data for the study was generated through field visit to the residential areas to observe firsthand environmental health issues affecting the area and to collect pictorial evidences of the issues that were incorporated in the study. Semi-structured questionnaires were administered on fifty (50) respondents from five residential areas that were purposively sampled for the study. Descriptive analysis was used to analyze the data using graphs, percentages and tabulations. The results have shown that the environmental health issues affecting the residential area are incidences of flooding, improper waste disposal, air pollution, risk of spread of diseases and open defecation. The government has responded in a number of ways to address the issues while the committee of residents have also made efforts. There is therefore the need for a holistic and concerted approach towards addressing the environmental health issues for improved health of the residents.

Keywords: Assessment, Environmental health, residential areas, flooding, River Ginzo

Introduction

Environmental health is a branch of public health that focuses on the relationships between people and their environment, promotes human health and fosters healthy and safe communities (APHA, 2023) [3]. The World Health Organization (WHO) defined environmental health as aspects of human health and diseases that are determined by environmental factors (Morand and Lajaunie, 2018) [16]. Indeed environmental factors play an important role in health and diseases among the population particularly young children and other high-risk population groups such as the aged (Mohammed, 2012) [15]. The World Health Report indicated that globally 23 percent of death occurrences and 26 percent of children death ranging up to 4 million children under five every year result due to environmental factors (Ponah *et al*, 2021) [20]. Also 85 out of 102 categories of diseases and injuries are influenced by environmental factors (Ponah *et al*, 2021) [20].

The importance of environmental health cannot be overemphasized in ensuring healthy communities. It is based on this that the United Nations Organization designated September 16th of every year as World Environmental Health Day to raise awareness of the crucial work of environmental health professionals worldwide (Josh, 2022) [9]. In 2022, the World Environmental Health Day celebration was under the theme "Strengthening Environmental Health Systems for the Implementation of Sustainable Development Goals (SDGs)." (Josh, 2022) [9].

The global environmental health conditions differ from high, middle and low income countries. In high income countries, environmental health issues have been focused on

the contribution of environmental factors to the risk of cancer, cardiovascular and other non-communicable diseases (UOB, 2023) [28]. In low and middle income countries, the challenging environmental health issues include ambient and indoor air pollution, inadequate and poor quality of water, poor sanitation and hygiene and toxic substances which remain leading causes of diseases, death and disability (UOB, 2023) [28].

In highly populated countries like India, urbanization, industrialization and intensification of agriculture has led to widespread water pollution by industrial effluents, toxic metals, industrial and agricultural chemicals as well as sewage have negative impacts on human health (Ramya, 2014) [22]. In many African countries, also, population growth, urbanization and rural urban migration has resulted to the development of slums or squatter settlements. The slums are noted for poor environmental health conditions due to lack of portable water supply, inadequate toilets, wastes and sewage disposal facilities including inadequate storm water drainages among others (Aliyu, and Amadu, 2017) [2].

In Nigeria, the World Health Organization (WHO) (2022) report on health and environment scorecard showed that 69% of the population is without safe sanitation. The health impacts were that 67% of death from diarrhea are caused by unsafe drinking water, sanitation and inadequate personal hygiene (WHO, 2022). Another report by an organization "Clean Up Nigeria" in 2021 titled The State of Nigerian Environment Report found that over 172.7 million people live in an unclean environment (Nnawabuife, 2021). The report further showed that only four States namely Abuja,

Bauchi, Lagos and Oyo have sanitary landfills for proper waste management, the remaining 34 practice open dumping. It is to reverse this seemingly ugly situation that the Federal Government is set to commence the enforcement of sanitary laws with the constitution of mobile environmental health courts to try offenders, besides efforts to provide water and sanitation facilities in the States and the Federal Capital Territory (FCT) (The Nation, 2023)^[27]. In Katsina State, environmental health is placed under the Katsina State Environmental Protection Agency (KATSEPA) who have a total number of thirty three (33) environmental health officers comprising males and females that periodically carry out residential area and house -to-house inspection. The officers are striving to educate members of the public on environmental health issues particular as they relate to solid waste and sewage management, environmental pollution, proper location of residential houses and other issues such as appropriate location of pit latrines and wells in local traditional houses. KATSEPA also continue to carry out fumigation of drainages and sewerages especially in densely settled areas of the metropolitan to reduce the breeding ground of mosquitoes and other disease vectors (Ladan, 2014)^[11]. Some studies have been conducted on environmental health issues in Katsina metropolitan and Katsina State. Ladan (2014)^[11] assesses the sewage disposal methods and environmental health impacts in Katsina metropolis, northern Nigeria. The results showed that the-among the five methods used all except one have negative impacts on environmental health conditions of the inhabitants. Olajide (2014)^[19] focuses on household environmental sanitation practices in Katsina metropolis. Findings of the study revealed that households disposed their solid wastes in vacant or used plots, back of homes, along the roads and drains among others. The study recommends the need to improve the environmental sanitation practices in the metropolis. Saidu (2021)^[24] assessed the knowledge, attitudes and practices of solid waste management among households in Katsina State. Findings of the study revealed that the knowledge, attitudes and practices of solid waste management among households is relatively adequate. And therefore the study recommended more education of the household on solid waste management by environmental health officers. Suleiman *et al* (2022)^[25] described the epidemiology of cholera outbreak in Katsina State. The results revealed that thirty three LGAs were affected in 2021 with Funtua having the highest rate of 460.4 and case fatality rate of 10.3%. The study recommends that Katsina State Government should prioritize provision of clean drinking water sewage drainage system in the affected areas to control the outbreak. Ladan and Mayaki (2023)^[12] studied flood incidences as public health challenge in Katsina State, Northern Nigeria. The results showed that flood incidences have become a public health challenge as it leads to loss of lives, injuries to flood victims, destruction of houses and creation of displaced persons among others. From the studies reviewed, it can be observed that only Ladan (2014)^[11] and Olajide (2014)^[19] focused their studies on Katsina metropolitan addressing environmental health issues such as sewage and solid waste disposal. Other studies focused on different environmental health issues in Katsina state as a whole. The present study is focusing on a

range of environmental health issues that are affecting people living along a river in Katsina metropolitan. The objectives of the study are to identify river Ginzo and the residential areas along it, explain the environmental health issues affecting the residential areas, highlight the efforts of the residents towards addressing the issues, highlight the efforts of local and State Governments in addressing the issues and recommend measures to address the issues for healthy communities.

Materials and methods

One of the materials used for the study is map of Katsina metropolitan which show the study locations or the residential areas sampled for the study which are marked A-E. The map was sourced at the National Aeronautics and Space Administration (NASA) Spot Image (2021) and drawn at the Cartography Unit of the department of Geography Umaru Musa Yar'adua University Katsina, Katsina State. Another material used in the study is an Infinix Hot 8 cellphone which was used to snap some of the environmental health issues affecting the residential areas. The pictures were incorporated in the study to provide pictorial evidences of the issues under investigation. One of the methods of data collection for the study was through field visit to the residential areas along the river on May 28th 2023 with two research assistants. The objectives of the field visit were to identify the residential areas along the river, to administer the research questionnaires, collect pictorial evidences of the environmental health issues and assess firsthand environmental health issues affecting the residential areas. The residential areas identified are Kofar Kaura, Kwalan Kwalan, Layin Zana, Kofar Marusa/Lambun Sarki, Katsira, Kofar Durbi, Bayan Daji and Kofar Sauri. The residential areas are eight in number out of which five areas representing 61.00% of the residential areas were sampled for the study. The area not sampled or included are at Kofar Marusa/ Lambun Sarki, Kofar Durbi and Kofar Sauri which are areas along the river where there are no much houses but gardens, farmlands and Fadamas that are not suitable for the construction of houses. Ruma and Sheikh (2010)^[23] refer to these areas as environmental sensitive such as wetlands flood plains areas liable to flood and waste dumps. During the field visit, the questionnaire were administered on the residents of the five sampled residential areas to ensure geographical spread along the river. A total of ten questionnaires were administered on each of the five residential areas which equals to fifty (50) questionnaires. Those who were sampled to complete the questionnaires were purposively sampled. They are residents of the areas who are adults and quite aware of the environmental health issues affecting the areas. The questionnaires were limited to fifty as some of the residents did not cooperate in completing the questionnaires. This limitation of the study was compensated with the collection of the pictorial evidence of the issues under investigation. The questions administered are divided into two sections. Section A consists of questions meant to collect the demographic characteristics of the respondents. Section B consists of the main questions that form the basis of the research. The questions are what are the environmental health issues affecting your residents areas ?, what are the efforts made by committee of residents in addressing the issues?, What are the Local and State Governments doing in addressing

the issues and what measures would you recommend towards addressing the issues for a healthy living ?

Key Informant interview was held with the Director Waste Management and Environmental Pollution Control at KATSEPA on the number of environmental health officers, their duties and schedules towards ensuring a healthy environment in the metropolitan. The Director also explained the occurrence and persistence of some environmental health issues affecting the people which for a long time has continue to affect the residential areas despite the knowledge of the agency and efforts of the Agency.

Secondary Sources of data were collected through desk research from conference papers, journal articles, book chapters, environmental reports and internet sourced materials. Data collected from the primary and secondary sources were analyzed using descriptive qualitative analysis that involved the use of percentages, tabulations, graphical representations and incorporation of pictorial evidences of the environmental health issues.

Results and discussions

Demographic characteristics of the respondents

The demographic characteristics of the respondents can be seen on table 1 below:

Table 1: Demographic Characteristics of the Respondents

S/No	Characteristics	Frequency	Percentage %
1.	Gender		
	Males	30	60.00
	Females	20	40.00
2.	Age range		
	20-29 years	25	50.00
	30-39 years	15	30.00
	60 years and above	10	20.00
3.	Marital status		
	Single	15	20.00
	Married	25	50.00
	Widowed	10	30.00
4.	Educational status		
	Adult literacy	10	20.00
	Secondary school Education	25	50.00
	Tertiary level education	15	30.00
5.	Occupational status		
	Artisans and craftsmen	20	40.00
	Trading activities	20	40.00
	Farming activities	10	10.00
6.	Residential area status		
	Kofar Kaura	10	20.00
	Kwalan Kwalan	10	20.00
	Layin Zana	10	20.00
	Katsira	10	20.00
	Bayan Daji	10	20.00

Source: Data analysis (2023).

Source: Field work (2023)

From table 1 above it can be observed that majority of the respondents (60.00%) are males while minority (40.00%) are females. This is because males were found mostly outdoors during the questionnaire distribution. The males also responded readily in completing the questionnaire during the data collection. In terms of age range of the respondents, majority of the respondents (50.00%) are found within the age range of 20-29 years. This is followed by those found within the age range of 30-39 years of age who constitute 30.00% and those 60 years constituting 20.00% of

the respondents. This distribution showed the youthful segments of the population are the majority that completed the questionnaire.

The marital status of the respondents indicated that majority (50.00%) are married and therefore responsible to their families and quite concerned about the environmental health issues. Among those that are married (50.00%), the majority (53.33%) are married to two wives and with the majority (46.66%) having 5-9 children which makes them more concerned about the environmental health issues affecting the residential areas.

The educational status of the respondents indicated that majority (50.00%) had secondary school education which is enough to complete the questionnaires and become aware about environmental health issues. The occupational status of the respondents indicated that majority (40.00% each) are artisans and craftsmen and those engaging in trading activities. This happens as the residential areas are informal settlements that are not fully regulated by the state government. The residential area status or identity of the respondents showed that each of the five residential areas had 20.00% of the respondents who completed the questionnaire. This means that the six residential areas have equal number of ten respondents to the questionnaires each.

Results and discussion

Katsina Metropolitan, River Ginzo and the Residential Area along It

The study area is Katsina metropolitan, the capital of Katsina State created on September 27th 1987 from the defunct Kaduna State. It is also the headquarters of Katsina Local Government Area (LGA) one of the thirty four (34) LGAs in Katsina State. It has an estimated population of 524,000 with a growth rate of 3.76% in the year 2023 from 2022 (Macrotrends, 2023) [14]. The metropolitan is located on latitude 12° 30’ north of the equator and longitude 7° 36’ east of Greenwich lying 173.42km along the highway from Kano to Maradi in Niger Republic (Encyclopedia Britannica, 2023) [7]. The climatic type is tropical wet and dry with short wet season and long dry season. Rainfall is concentrated in July, August to September with figures generally from 700 to 800 mm annually (Ahmed and Mohammed, 2015) [1].

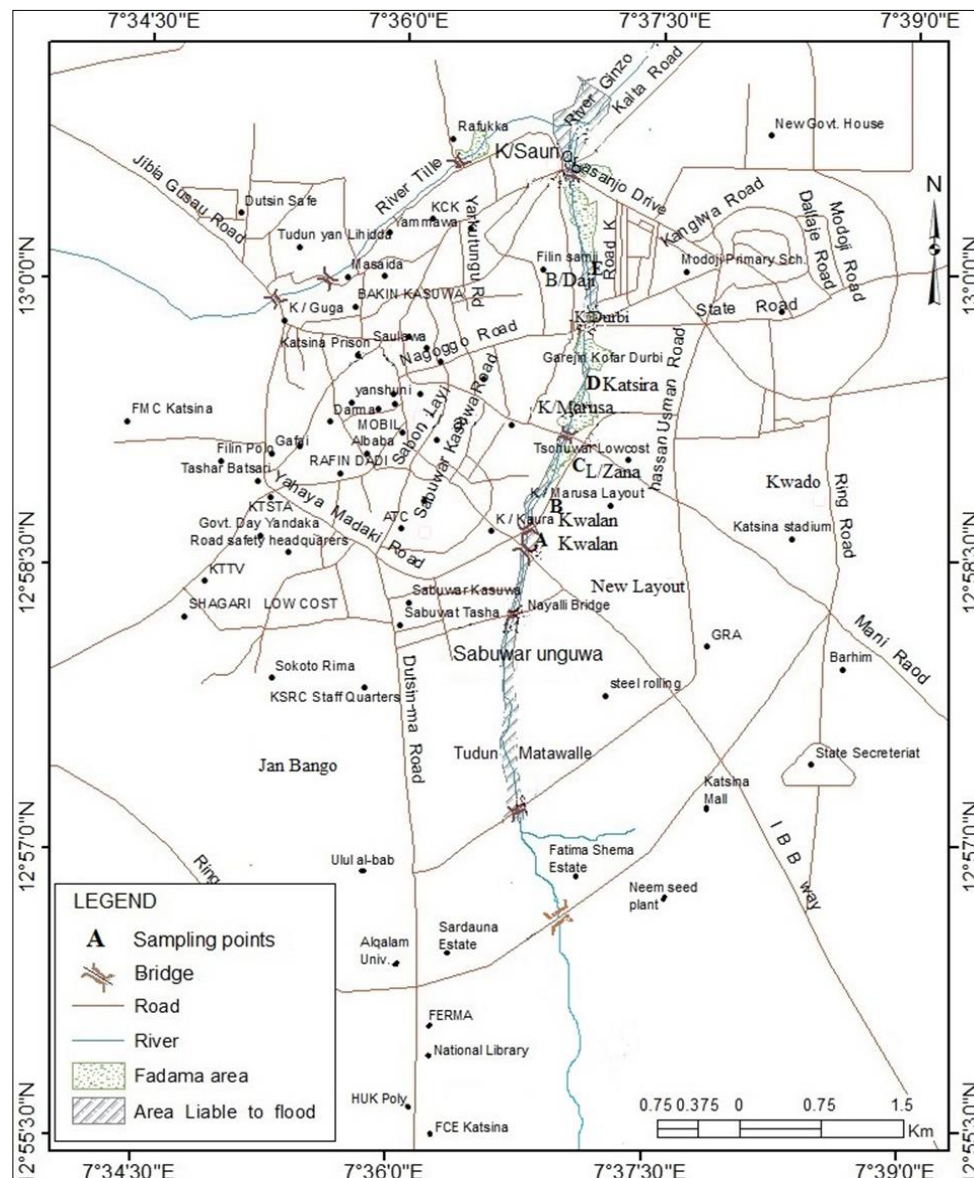
River Ginzo is one of the two gigantic rivers that drain the entire Katsina city and its surrounding areas forming two distinct watersheds which are named after the rivers (Ibrahim 2015) [8]. In fact, Katsina city was built on a spur of land between the two water courses of the rivers that flows in a north easterly direction and it is at the narrow neck of watershed between the Gada and the Tagwai river basins (Danjuma, 2017a) [4]. Over time, River Ginzo has undergone many changes as a result of hydrologic, geomorphic and urbanization process operating within and outside the catchments (Ibrahim, 2015) [8]. The changes have resulted in the shrinking of the rivers channel to resemble more or less that of a stream. But occasionally, the large volume of rain water flowing on the rivers during annual or sporadic floods depicts its river status. For example in August 2014, after few hours of heavy rainfall large volume of flood water washed away the bridge linking Kofar Sauri with Kaita road and GRA road.

The River Ginzo is one of the two rivers that encircle large part of Katsina city wall (*Ganuwa* in Hausa language). The immediate source of the river rises from Kabakawa forest

reserve that was deforested in the year 2009 to make way for Afdin Textiles Limited (Ladan, 2013) [10]. But later as the textile mill failed to be established, Fatima Shema Housing Estate was built on the deforested land by the State Government in 2015. The distant source of the river is a high ground around Dutsinma area (Ahmed and Mohammed, 2015) [1]. From where the river rises it flows through where it is joined by two storm drainages like tributaries joining a major river. It then flows through Tudun Matawalle, Sabuwar Unguwa, Nayalli bridge, Kofar Kaura/Adeleke bridge up to Kofar Sauri. Outside kofar Sauri, the river joins river Tille to form one river and then flows towards Shinkafi and Yanhoho villages to flow into Abdallawa dam in Kaita LGA.

The residential areas along the river that were covered by the study include Kofar kaura (from Adeleke bridge) to

Kwalan kwalan to Layin Zana to Kofar Marusa, Katsira, Kofar Durbi to Bayan Daji to Kofar Sauri. The length of the river covered is approximately 4kms based on figure 2. The study locations where the questionnaires were administered are marked on figure 2 as A, B, C and D. A to stand for Kofar Kaura, B to stand for Kwalan kwalan, C to stand for Layin Zana, D to stand for Katsira and E for Bayan Daji residential area. A study by Danjuma (2017b) [5] referred to these residential areas as slums that develop around cheap and environmentally vulnerable areas of the city. These areas were observed to accommodate the low income and poverty-ridden members of the society (Danjuma, 2017b) [5]. Figure 1 below shows Katsina metropolitan with river Ginzo almost at the center of the map and the study locations marked A-E.



Source: National Aeronautic and Space Administration stop Image 2023

Fig 1: Map of Urban Katsina Showing Sample Locations

Environmental health issues affecting the residential areas

The respondent’s response to the research question which environmental health issue affect them most in their residential area has shown a varied response. A sizeable

percentage of the response indicated that it is incidences of flooding (36.00%). This is followed by improper waste disposal (24.00%), air pollution (16.00%), risk of disease infections (14.00%) and occurrence of open defecation (10.00%). These are shown on figure 3 below:

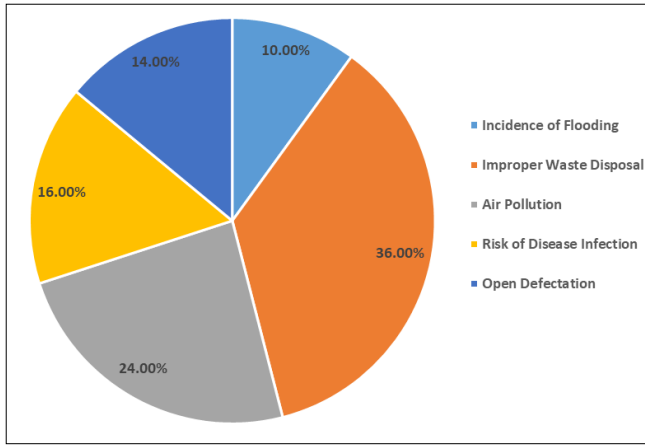


Fig 2: Respondents response on the environmental health issue affecting them.

1. Incidence of flooding

This environmental health issue has become a perennial challenge that occur every rainy season. The river channel has been constructed into a storm water drainage and in that process the width and depth of the channel has been reduced. This reduction means that during heavy rain that last for an hour, the rain water overflows out into its flood plains that has been built up with houses. This overflow brings damage to properties and the residents have to spend time and energy scooping water at most of the houses that are located few meters close to the storm water drainage. Also, the flood waters flow into open wells thereby contaminating the water especially in residential areas such as Katsira and Layin Zana. In certain instances, the flood leads to the collapse of outer wall of the houses. This collapse of one of the out walls can be seen on figure 4 below



Fig 3: One of the outer walls of a house that collapse close to the river ginzo channel.

2. Improper waste disposal: This is the second most prevalent environmental health issue affecting most of the residential areas. This issue was seen during field visit from Adeleke Printing Press bridge up to Bayan Daji residential area. The five residential areas located along the river which were sampled for the study had no any waste disposal facility, therefore the people dump waste materials close to the river channel on areas that can be termed as the flood plains. Other people dump waste materials directly into the river which contributed to the blocking of the flow of rain

water to cause flooding. Some of the materials dumped into the river channel include household wastes including old textile materials plastics, pit latrine excreta, dead animals that are concealed in sacks and pieces of plastic materials of different sizes. Improper waste disposal harbor flies, cockroaches and rodents that are vectors of diseases. Some of the waste materials such as plastics have accumulated in large quantities at a location close to Kofar Durbi can be seen on figure 5 below.



Fig 4: Improperly disposed plastic waste materials that have accumulated in the river Ginzo channel close to Kofar Durbi

3. Air Pollution

This is the third environmental health issue affecting residential areas along the river. One of the major cause of air pollution is the decomposition of waste materials due to improper waste disposal. The decomposition of materials in waste water or sewage also cause air pollution. The sewage is found on the river channel for most of the year during the dry season. The dropping of dead animals and pit latrine excreta further compound the level of air pollution. There is also the smell from human excreta that spread into the air due to the practice of open defecation prevalent in some of the residential areas. According to the World Health Organization (WHO) (2023) [29, 30], air pollution causes respiratory and other diseases which are important sources of morbidity and mortality. Figure 5 below shows some of the sources of air pollution in the residential areas which are sewage and waste materials decomposing to cause air pollution.



Fig 5: Waste materials and sewage on the river bed as sources of air pollution at Kwalan Kwalan residential area.

4. Risk of spread of diseases

This is the fourth environmental health issue affecting residential areas along the river. There are several circumstances that could lead to the spread of disease to the people. First is the stagnant sewage water that is found on the river becomes breeding grounds of mosquitoes. Children also play in the river channel which contain sewage that can potentially lead to infections and diseases. At Kofar Durbi residential area, some children were seen swimming in a pond of sewage within the river channel during field work. The swimming in sewage water could potentially lead to skin infections and contacting diseases such as bilharzias or *schistosomiasis*. There is also the risk of falling into the river channel due to its closeness to houses and some bridges across the river have no hand rails to prevent people from falling into the river. Figure 6 below shows stagnant sewage water in the river channel close to houses.



Fig 6: Stagnant sewage water at Layin Zana residential area

5. Open defecation

This is the fifth environmental health issue affecting residential areas along the river. Open defecation is the practice of depositing human excreta by people in an open space instead of a latrine or toilet. Most of those engaged in this ugly practice are children and beggars called *Almajirai* in Hausa language as also observed by the KATSEPA Director. There are also other people who have no decent toilet facilities that also engage in open defecation. Those who engage in this practice usually defecate inside the river channel where it is dry and at the back of houses where there is limited spaces. The open defecation is one of the factors contributing to air pollution in the residential areas and noted to be high in areas of high population among the residential areas. Even the Mechanic's Garage at Kofar Kaura near Alliance Bread have complained about the negative health impacts of the open defecation during the field visit. A study by Rabi (2023) ^[21] has revealed that open defecation is widespread in parts of Katsina State where there are inadequate provision of toilet facilities such as some of the residential areas under study. Open defecation besides being source of air pollution, also serves as a source of spread of diseases like cholera and diarrhea. In a study on Kano State Lambu (2011) ^[13] observed that open defecation harbors insects that transmits diseases such as cholera. If infected by cholera, individuals with lower immunity such as malnourished children are at greater risk of death. Figure 7 below shows one of the areas where open defecation is high at Kofar Kaura residential area.



Fig 7: Open defecation behind houses along the river at Kofar Kaura residential area

This research will also recognize some of the challenges facing the people in the residential areas which affect their environmental health conditions which were observed during the field visit.

One of the challenges is lack of portable water supply within their neighborhood. The result is that children and the youths are assigned to fetch water at a solar borehole near Mani house along Yahaya Madaki way, in order to fetch the water, they have to walk across and wade through the river which contains sewage that could transmit diseases. Also, there are reports that some of those fetching the water at the borehole site are involved in accidents as they attempt to cross the road. As a result of the accidents they sustain injuries and are rushed to the hospital or nearby clinics for medication.

Another challenge is inadequate bridges across the river to move from one side to another. Therefore, the people had to put stones or sacks of sand in the dry river channel which they step on to cross. This movement sometimes leads to stepping into sewage water when steps are missed which could be sources of infection. In one of the residential areas a bridge exists but there are no safety handles on the left and right hand sides to ensure the safety of the persons crossing on the bridge.

Efforts and responses of the committee of residents

The committee of residents has made efforts towards addressing some of the environmental health issues affecting them. The efforts to some extent are in response to the inadequate measures put in place or adopted by the local and state governments in addressing the environment health issues. The effort are:

1. The committee of residents periodically engage in the clearing of drainages that are choked with waste materials when it rains to permit the flow of rain water to avert flood incidences.
2. Some of the residents build wall in front of their houses or at edge of the river channel to stop the flow of flood water out of the river that could cause flooding.
3. Some residents have being talking to people who engage in improper waste disposal to desist from the practice due to its negative environmental health consequences in the areas.
4. Some of the residents who are farmers have been involved in reducing the amount of waste materials

generated by composting the organic waste into manure for their farm fertilization.

5. As a result of the perennial incidences of flooding that have been bedeviling some residential areas along the river, some heads of households have been planning to relocate out of the areas to areas that are not prone to flooding
6. In order to prevent open defecation, some of the residents whose businesses are located along the river have built toilets to reduce the practice. An example of this is Muazu mechanic garage located along the river at Kofar Kaura close to Alliance Bread Limited.
7. Children who practice open defecation were warned and sent away by the committee of resident in a move to discourage the practice thereby limiting its negative environmental health impacts.
8. Horticultural garden and irrigated farmland owners at Kofar Durbi area have adopted strict measures to stop children from swimming in sewage ponds on the river channel. One of the measures is corporal punishment to serve as a deterrent but they still swim in the ponds as witnessed during field visit to the area.

Response of the Local and State Governments

Katsina local government council and the State government have responded in a number of ways towards addressing the environmental health issues affecting the residential areas. This is through

1. The Local Government Health Department have during few occasions visited the residential areas to advise the people on the measures that need to be adopted to avert the spread of diseases due to improper waste disposal and presence of stagnant sewage waters.
2. The administration of Governor Aminu Bello Masari (2015-2023) has constructed a section of the river into a storm water drainage. This construction project from Sabuwar Unguwa to Adeleke Printing Press bridge and Alliance Bread Limited bridge was executed at the sum of 94 million Nigerian Naira (The Herald, 2017)^[26].
3. Katsina State Government has carried out another flood control project at Kofar Durbi bridge in the year 2020. This project led to the rehabilitation of the bridge which allows the flow of flood water thereby preventing flooding of nearby residential areas of Bayan Daji and Goriba road housing estate.
4. Katsina State Governor Masari himself visited one of the residential areas Katsira to assess the level and magnitude of the flood incidence on August 25 2021. This visit enabled the Governor to see firsthand the challenges posed by flooding to the residential area with a view to finding a lasting solution (DW, 2020)
5. Following the visit of the State Governor, KATSEPA carried out disinfection of wells with the chemical chlorine to decontaminate the water to make it safe for domestic purposes at the Katsira and Layin Zana residential areas.
6. On May 24th, 2023 the Katsina State Government has awarded a contract for the reconstruction of the Ginzo river storm water drainage with a view to further militating the impacts of flood incidences to residential areas along the river.
7. Katsina State Government have sent an assessment team of engineers to assess the possibility of relocating structures built along the ginzo river to avert flooding.

In line with this assessment houses very close to the river were numbered and marked for possible demolition. This was seen marked on the walls of some houses, one of which is written as ACS/06/KT2/SG/S-20.

Recommendations

The following recommendations are offered towards addressing the environmental health issues affecting residential areas located from Kofar Kaura to Kofar Sauri.

1. The State Government under the leadership of Governor Dikko Radda should speed up the Kofar Kaura- Kofar Sauri drainage reconstruction and rehabilitation project awarded by former Governor Aminu Bello Masari
As part of the project above, there should be the construction of link up drainage from residential areas that join the river/storm water drainage to permit the flow of rain water into the river
2. KATSEPA should provide waste collection containers at strategic positions in the residential areas. This is to allow for the dumping of waste materials inside the containers to prevent improper waste disposal.
3. Public enlightenment programs should be carried out by the Local Government Health Department and KATSEPA. The programs should enlighten the people on the need to dump waste materials into the containers and desist from the practice of dumping organic waste into the river channel to make manure.
4. KATSEPA should increase the number of environmental health officers from 33 to at least 50 so that they can adequately cover many residential areas especially those inhabited by low income earners that are facing environmental health issues such as those along the river Ginzo.
5. KATSEPA should regularly carry out fumigation exercises along the residential areas located along the Ginzo river channel with a view to ensure that disease vectors such as mosquitoes are eliminated and prevented from transmitting malaria fever to the residents.
6. Katsina Local Government council should build public convenience at strategic locations in a move to prevent open defecation. This is necessary to check the menace of open defecation in the areas affected even if it means buying houses to demolish them to create spaces for the public convenience.
7. Committee of residents of the various residential areas should periodically convene a meeting to discuss the environmental health issues affecting them with a view to increasing their contributions to address the issues.
8. Committee of residents should periodically carryout environmental sanitation exercises to evacuate waste materials and clear drainages that are choked with waste materials.

Conclusion

Environmental health is an important aspect of human health which if enhanced could assist in promoting good health and wellbeing of members of the society. However, in most developing countries there is inadequate emphasis on the environmental health condition of the people particularly in urban centers. In most of the urban centers of Nigeria, the government has failed to regulate the growth

and expansion of settlement into areas that are environmentally vulnerable. In Katsina metropolis, these areas are found along river Ginzo that flows at the edge of the city wall.

This study found out that the environmental health issues affecting the residential areas include perennial incidences of flooding, improper waste disposal, risk of disease infections and open defecation besides other challenges such as lack of portable water supply and inadequate bridges across the river. The committee of residents have made several efforts with the objectives of addressing the environmental health issues affecting them. However, the efforts have not succeeded in addressing the issues as the people have low income. The Government had also responded towards addressing the issues in the past and present but some of the responses are on-going. It is therefore recommended that the State Government should hasten the execution of the Ginzo River Reconstruction project to lessen the environmental health issues affecting residential areas.

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