



ABSTRACT

The paper examines the effects of solid waste on drainages and roads in Barama ward of Mubi North local government area. The study was based on the methods of waste disposal, the effects on the area and the steps to be taken in order to control hazards it may likely pose on Barama. Survey design was employed where secondary and primary sources of data collected were adopted. Structured questionnaire and personal observation were used. 80 questionnaires were designed and administered to residents that were selected through systematic random sampling method in the area to collect primary data, while information were

THE EFFECTS OF SOLID WASTE DISPOSAL ON BARAMA ENVIRONMENT OF LOKUWA WARD, MUBI, ADAMAWA STATE, NIGERIA

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Introduction

One of the challenges facing African countries in the face of unprecedented urbanization and physical development during the last few decades is the planning and managing of physical infrastructure and urban environment. Over the past few years, waste management has become a global concern. Commonly, waste is generated in households, factories, construction sites, refineries and nuclear power plants. As the population is increasing, consumption trends are changing. Along with improvement in lifestyle, the increase in population has posed alarming threats to the environment. Ethical Choice, (2021), Ogu (2010), Jiboye et al, (2011) stated that, there have been persistent drives for environmental sustainability in order to ensure physical development across the globe. But apparently, man in his multifaceted effort to exploit his environment for livelihoods, and or civilization works, has often ended up in destroying the same environment he wholesomely cherishes, due to over exploitation of the available environmental resources.

Urbanization, economic development and improved standard of living have led to increase in quality and complexity of waste generated in human environment. Waste is an unavoidable by products of human activities which has resulted due to rapid increase in population and industrialization in urban environment and has placed serious stress on the natural and general human resources. Improper management of solid waste is one of the causes of environmental pollution and degradation in most developing cities of the world. Asaduzzaman et al, (2009).



gathered from textbooks, downloaded websites, materials/ magazines for secondary data. The field data gathered was analyzed using frequency counts and simple percentage methods. The results of the findings were presented on tables. The study however revealed that reckless solid waste dumping in Barama is as a result of absence of official refuse dump in the neighborhood. This therefore makes people to dump refuse indiscriminately thereby blocking drainages and littering the surrounding which, give an ugly picture of the area. This situation can likely affect the air, the land, the ground water and other resources. In view of the above, recommendations and proposals were made: six (6) refuse dumps were suggested to be sited as shown on the map of the area. People should be educated on how to exhibit good attitudes towards the environment and new laws should be enacted and existing ones revisited and enforced strictly on the need to have a healthy environment,. Government and residents should join hands to improve the drainage conditions in the area.

Key Words: Solid waste, solid waste disposal, Road network, Environment, Degradation



According to Astrand (2006), waste generation increases with population expansion and economic development. This is true because as the number of people in an area increases, the waste generated in that area will also increase. So also increase in people earning increases their waste generation since they have enough money to buy more goods and pay for more services.

Bhuiyan(2002), also ascertained that greenhouse gas emission can be increased due to improper management of waste. It can also pose risk to human health and living environment. The conditions under which people live and work play a crucial role in determining their overall wellbeing. These conditions must be such that people's safety/security needs, physical, mental, spiritual, health, comfort and self-fulfillment are adequately taken care of NEST, (1990).

Ilesanmi (2013), stated that a drop in the oxygen level or an undue rise in the carbon monoxide (CO) level of our immediate environment will not only create a temporary inconvenience but death prolonged situation". These show reasons why we experience disease outbreak in different communities or part of some towns and cities in Nigeria. Microsoft Encarta, (2008)



reveals that the skin, lungs, liver, kidneys and nervous system are commonly affected by different agents in different settings.

Medugu et al (2017) posit that “as population increases and technology improved and expanded, more significant and widespread problems arose which is partially caused by the amount and types of waste being disposed into the environment. Waste can be classified into either inert or non-inert, depending on whether it has stable chemical properties or not (HKEPD), (2019). Inert waste includes predominantly organic materials such as packaging waste, bamboo, timber, vegetation. HKPD, (2015). Whatever the type or class waste is classified, the step taken to manage it is very necessary. According to Nagapan et al, (2012), nowadays, it is appropriate to take on concepts of sustainable material waste management to avert the probable harmful effects associated with such waste in terms of the economic, environmental and wellbeing dimensions.

STATEMENT OF PROBLEM

Economic development and population growth has caused so much increase in waste generation in many towns and cities in developing world. The problem of solid waste disposal and drainage blockage by waste has become a major issue of concern in Barama ward. Improper waste management and uncontrolled waste handling poses risk to human health and the environment. These problems include: water contamination, insects and rodent breeding place, flooding increase due to drainage blockages, increase in greenhouse gas emission and hazards from fire explosions and disease outbreak among other hazards.

AIM OF THE STUDY

This research work seeks to investigate the effects of solid waste disposal in Barama ward with the aim of improving the waste management system by making recommendations and proposals that will enhance the environmental condition of the inhabitants.

THE STUDY AREA

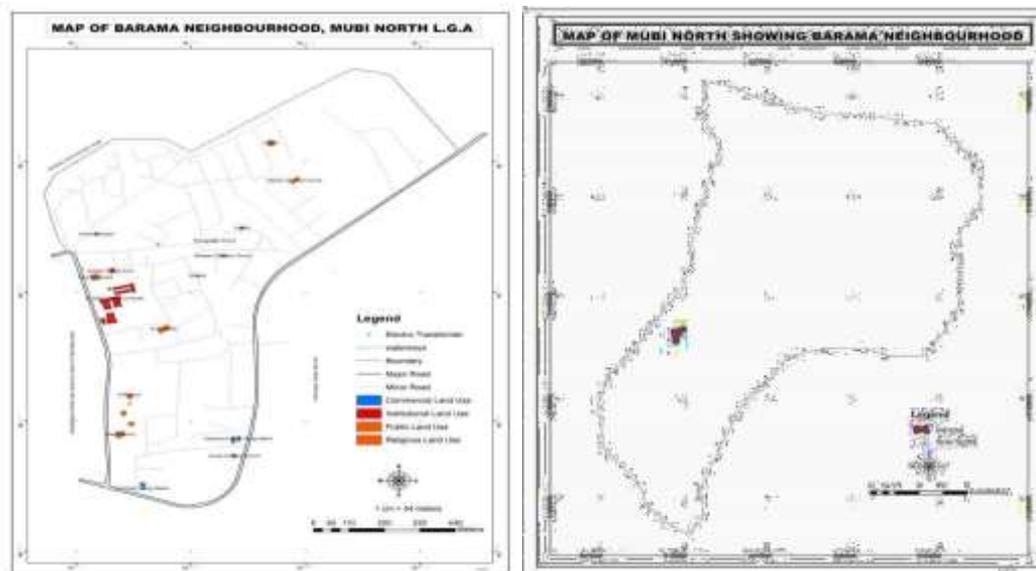
Barama is a ward under lokuwa ward of Mubi Township. This area is close to the Federal Polytechnic Mubi of Mubi North Local Government Area of Adamawa state, Nigeria. It has a distance of 180 kilometers from the state capital and is situated between latitude 9 degrees 03” N and 10degree 19” N of the equator, and between longitude 13 degree 02” E and 13 28” E of the Greenwich meridian. The relief pattern of Mubi generally is fairly flat in some parts with few hills and some mountains around the area. The highest peak of the hills and mountain are toward the North eastern part around vintim area with about 1500 meters and the lowest point is below 250 meters from northwest to the southern part. The major drainage in Mubi Township is river Yazeram situated at center of Mubi which meandered behind the Emir’s palace.

It has a Sudan Savanah type of vegetation, characterized by sparsely dense trees with grasses and shrubs of different species. The area consists mainly of alluvial soils referred to as vertisols, with high water holding capacity. (Adebayo, et al (1990)

The study area has a typical tropical climate with two marked seasons, which are the wet and dry seasons. The wet season starts in April and ends in October, while the dry season commences in November to March, every year. There are also variations in temperature at different times of the year in this area. The hottest months are mostly March and April with temperature of about 35.8% to 42.8% while the coldest months are mostly November to



January, having temperature of about 18°C to 22°C. The area has low relative humidity of about 20 to 30% from January to March, and high relative humidity of about 80% around the months of August and October (Adebayo and Tukur 1990).



Categories of Waste

1. Organic waste: Kitchen waste, waste from food preparation, vegetables, flowers, leaves, fruits, and market places.
 2. Combustibles: Paper, wood, dried leaves, packaging for relief items etc. that are highly organic and having low moisture content.
 3. Non-combustibles: Metal, Tins, Cans, bottles, stones, etc.
 4. Toxic waste: Old medicines, paints, chemicals, bulbs, spray cans, fertilizer and pesticide containers, batteries, shoe polish.
 5. Recyclables: Paper, glass, metals, plastics.
 6. Ashes or Dust: Residue from fires that are used for cooking.
 7. Construction waste: Rubble, roofing, broken concrete etc.
 8. Hazardous waste: Oil, battery acid, medical waste, industrial waste, hospital waste.
 9. Dead animals: Carcasses of dead livestock or other animals.
 10. Bulky waste: Tree branches, tires etc.
 11. Soiled waste: Hospital waste such as cloth soiled with blood and other body fluids.
- The types of litter and their approximate degeneration time

Various Sources of Solid Waste

Every day, tones of solid waste are disposed of at various landfill sites. This waste comes from homes, offices, industries and various other agricultural related activities. These landfill sites produce foul smell if waste is not stored and treated properly. It can pollute the surrounding air and can seriously affect the health of humans, wildlife and our environment. The following are major sources of solid waste: Residential, Industrial, Commercial, Institutional.



Unmanaged refuse dumps littered on the street in the study area in front of somebody's house.

EFFECTS OF SOLID WASTE DISPOSAL THE ENVIRONMENT

The effects of solid waste disposal on the community dwellers and other living things cannot be over emphasized. The refuse dump has effect on the health of the community members which includes poisoning through inhalation of carbon monoxide as a result of burning of the dump site. The waste can block and obstruct the waste storm water runoff, resulting to outbreak of diseases like cholera, Typhoid fever, diarrhea etc. solid waste has serious effect on animals and children due to disposal of harmful roasted metals, broken bottles and the likes that can cause injury. At times, people set fire on the dump sites which create potential adverse effects to the surrounding environment.

They usually cause air pollution, and this make people around such area to inhale smoke and have difficulty in breathing resulting to health effect including mental function, visual acuity, and alertness among other health effects. It can also result into leaching whereby solid waste enter the soil and ground water leading to contamination of ground water.

Effects of Poor Solid Waste Management

1. **Litter Surroundings:** Due to improper waste disposal systems, particularly by municipal waste management teams, wastes heap up and become a menace. While people clean their homes and places of work, they litter their surroundings, which affect the environment and the community. It also causes blockage of drainages.
2. **Impact on Human Health:** Improper waste disposal can affect the health of the population living nearby the polluted area or landfills. The health of waste disposal workers and other employees involved with these landfill facilities are also at a greater risk. Exposure to wastes that is handled improperly can cause skin irritations, respiratory problems, blood infections, growth problems, and even reproductive issues.
3. **Disease-causing Pests:** This type of dumping of waste materials forces biodegradable materials to rot and decompose under improper, unhygienic and uncontrolled conditions. After a few days of decomposition, a foul smell is produced, and it becomes a breeding ground for different types of disease-causing insects as well as infectious organisms. On top of that, it also spoils the aesthetic value of the area.



4. **Environmental Problems:** Solid wastes from industries are a source of toxic metals, hazardous wastes, and chemicals. When released to the environment, the solid wastes can cause biological and physicochemical problems to the environment that may affect or alter the productivity of the soils in that particular area.
5. **Soil and Groundwater Pollution:** Toxic materials and chemicals may seep into the soil and pollute the groundwater. During the process of collecting solid waste, hazardous wastes usually mix with ordinary garbage and other flammable wastes making the disposal process even harder and risky.
6. **Emission of Toxic Gases:** When hazardous wastes like pesticides, batteries containing lead, mercury or zinc, cleaning solvents, radioactive materials, e-waste and plastics mixed up with paper and other non-toxic scraps are burned they produce dioxins, furans, polychlorinated biphenyls, and other gases. These toxic gases have the potential of causing various diseases, including cancer.
7. **Impact on Land and Aquatic Animals:** Our carelessness with our waste and garbage also affects animals, and they suffer the effects of pollution caused by improperly disposed of wastes and rubbish. Consuming Styrofoam and cigarette butts have been known to cause deaths in marine animals. Animals are also at risk of poisoning while consuming grasses near contaminated areas or landfills as the toxins seep into the soil.



A Street without drainage and official dump site, water lodge eroded road and littered with refuse

METHODOLOGY AND MATERIALS USED

Maps of the study area include topographical map is displayed together with proposed apart from the existing base map. The population of the study area was estimated during the field survey, Average number of persons per household was assumed to be 8 and each compound had 6 households. The number of compounds in Barama is 146. The estimated sample size is 10% of the residents thereby give a total of 2 times 5 times 8= 80 as sample population. The total estimated population therefor is 12640. This shows that there is high rate of congestion in compounds.

The field survey involves the use of questionnaire, interview and physical observation where pictures/images were snapped to display the existing waste and refuse condition in the study area. The questionnaire was designed to reflect issues ranging from waste disposal sites, distance of the closes building to refuse site, drainage facilities and road condition among others information were collected from the residents. The information was gathered and analyzed and presented as displayed in the work.



RESULT AND DISCUSSION

Table: 1 Type of refuse disposal

METHODS	FREQUENCY	%
Open dump	60	75
Burning on site	15	18.75
Burying	5	6.25
Others		
Total	80	100.00

Source: field survey, 2022.

Research in the study area revealed that 75% of people in the area dump refuse in the open, 18.75% burn refuse, and 6.25% bury their refuse. This explained the reason why the area is littered since majority of the inhabitants used any available open space as their own disposal point.

Table: 2 Distance to closest House

DISTANCE	FREQUENCY	%
Less than 30m	40	50
31-50m	21	26.25
51m-100m	12	15.0
101m-150m	7	8.75
150m and above	0	
Total	80	100.00

Source: field survey, 2022.

Investigation in table 2 shows that 50% of people in the area disposed refuse less than 30 meters from their residence. 26.25% dump refuse between 31 to 50 meters, 15% dump refuse between 51 to 100 meters. Only 8.75% dump refuse between 101 to 150 meters from their houses. This shows that majority of the people in this area used unofficial dump sites.

Table: 3 Types of Drainage

TYPE	FREQUENCY	%
Close concrete	13	16.25
Open concrete	10	12.50
Earthen drain	20	25
No drainage	37	46.25
Total	80	100.00

Source: field survey 2022

46.25% of respondents acknowledged that there is no drainage in the area, 25% of respondents said there are earthen drainages, 12.5% said there are closed concrete drainage lines and 12.50% said there are open concrete drainages in the study area. Laterite drains are easily eroded since it is earthen in nature and erosion is prompt in such place.

Table: 4, Road Condition

CONDITION	FREQUENCY	%
Undulating earthen	18	22.5
Earthen/ laterite	12	15.0
Tarred	0	
Littered earthen road	50	62.5
Total	80	100.00

Source: field survey, 2022



Study revealed that road condition of the area is 62.5% littered, 37.5% are undulating earthen and lateritic. As seen in the images, it is only the road from tsamiya through Federal Polytechnic is tarred, all other roads within Barama are not tarred nor maintained hence all the roads are in bad condition.

Table: 5, Number of official waste disposal points.

Official refuse point	Frequency	%
Yes	2	2.5
No	78	97.5
Total	80	100.00

Source: field survey, 2022

97.5% of the respondents interviewed acknowledged that there is no official refuse point in the area. 2.5% only answered yes. This buttresses the reason why the area is littered with refuse.

Table 6: Agencies responsible for solid waste management

Agency	Frequency	%
None	80	100.00
Yes	00	00
Total	80	100.00

Source: field survey, 2022.

All respondent acknowledged absence of agency responsible for solid waste management, commonly used in the study area is open dump, with only 18.75% and 6.25% burn the refuse on site or burry it.

RESULT AND DISCUSSION



Rocky, undulating and Bad Street littered with refuse in people frontage and also water lodge based on the result presented, finding reveal that 75% of the methods of refuse disposal



This outcome agrees with the finding made by Sagir, Y.A. and Barka, M.A (2017), who identified solid waste as the major problem of the people of Tuji/Tura Kurmin sarki in Bauchi, where World Bank built a very big dump site in the locality which later became an eye-sore and restricted traffic into the community. The solid waste also finds its way into nearby drainages thereby blocking the drains, and just of recent lead to flood in the area. They stated that the dump site serves as breeding place for mosquitoes and other harmful insects and animals, some animals graze in the site many times eat harmful materials (like polythene etc.) that lead to their death. The case is not different from that of the study area.

Also study on distance of dump sites to houses in the area revealed that 50% of the houses in the area are not more than 30 meters many houses with only 8% that are between 101meters to 150meters distance from the dump site. This shows that most refuse dumps in the area are close to the houses. This can likely pose health and environmental challenges. Considering the results on the type of drainages commonly used in the area, 25% of the response says they have earthen drainages while 46.25% have no drainage at all. This shows why during rainy season usually heavy rain, water flood people houses and waste water flows aimlessly on the streets since there are no drainages to channel



A water lodge street without drainage and unofficial refuse dump around electricity transformer in Barama the runoff. The images in fig 1-4 also shows the littered streets and the blocked drainages by solid waste. The roads as can be seen in figures are all earthen laterite roads that are not maintained. Hence some of them are rocky, undulating or even eroded by rain water making it difficult for movement by both man and vehicles. Study on available refuse dumping points shows that 97.5% of the area have no official dump sites as presented on table 5. This indicate reasons why refuse is littered all over the study area since anywhere can be used as refuse dump. Table 6 also shows that there is no agency that manage refuse dump in Barama as stated by 80% respondents. Anything that has one to care for is nobody's responsibility and so is liable to spoil and or be misused and that is the case with solid waste



management in Barama ward. This outcome is in line with the findings of Asaduzaman and Rejwon, (2009) that says improper management of solid waste is one of the main causes of environmental pollution and degradation in most developing cities in the world. This can also easily lead to outbreak of disease. P. Rahamatullah and Neerada, (2004) stated that consumers can incorporate/waste control measures in to daily activities. The extraction and use of raw materials create waste and pollution and used energy. By changing the way we use products and resources, specific benefits of pollution prevention activities include: cleaner air and water, less solid waste, conservation of natural resources, reduced soil erosion, savings on electricity and water bills increase property value.

CONCLUSION RECOMMENDATION AND PROPOSAL

This paper examines the effects of solid waste disposal on drainages and roads in Barama ward in order to see how it is managed or not. The results reveal the methods of solid waste disposal, the distance of houses to refuse dumps, types of drainages found in the area, road condition, available official dumps and if there is any agency responsible for managing the waste and dump sites. The results obtained shows negative result to almost all the findings. The recommendation forwarded therefor should be given attention for implementation in order to arrest the situation before it run out of hand, seeing that this area (Barama) is mostly a student environment who are the future of the nation. Early action will avoid bad outcome.

RECOMMENDATIONS AND PROPOSAL

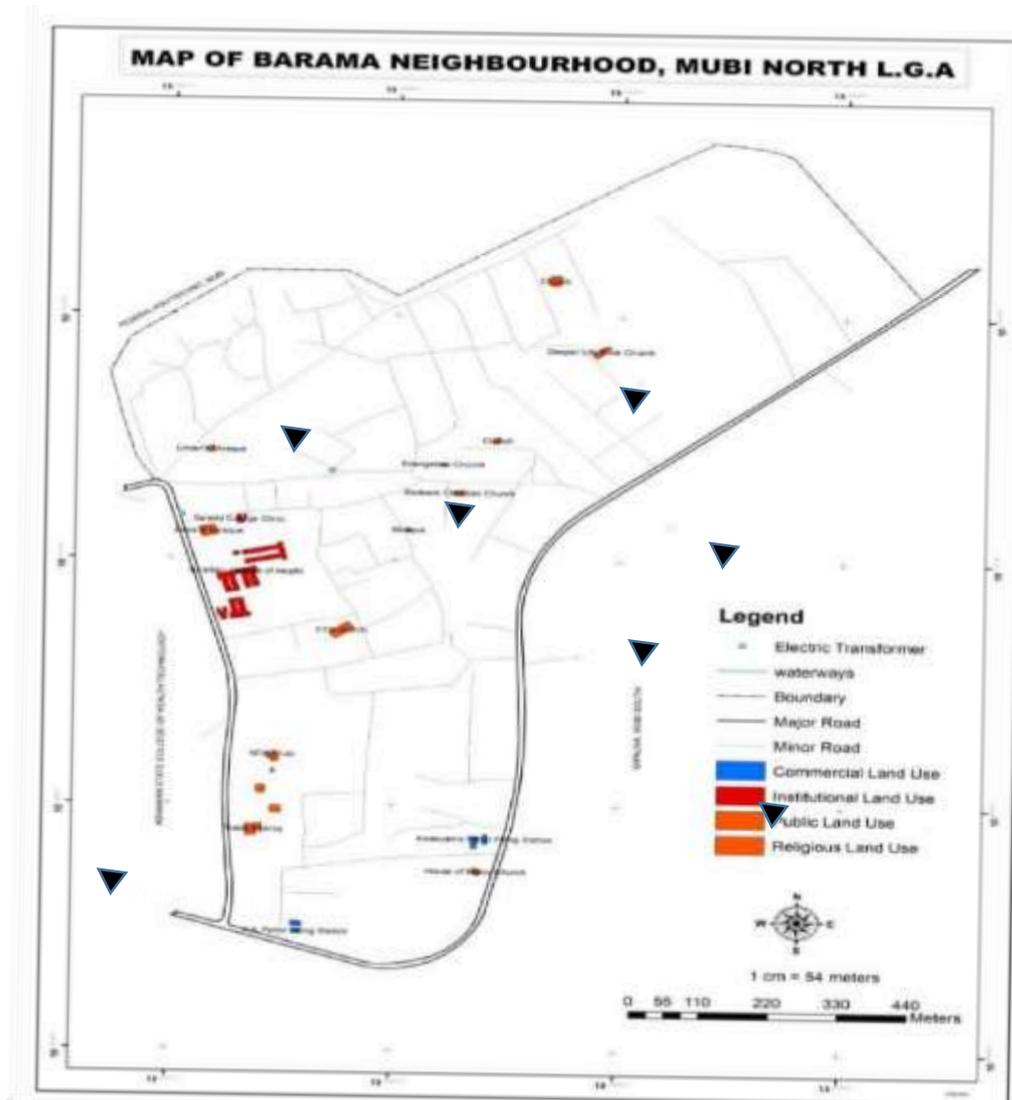
Considering the magnitude of the effect of refuse dumped indiscriminately on a place like Barama ward that host our future leaders, it is important to consider the following recommendations as stated:

1. The conversion of waste to wealth should be considered. The sorting of waste materials is common this day as a sort of business by people (e.g. Baban bola), there are other refuse materials that are still not usually sorted like polythenes, some certain types of rubber/ plastic materials, etc. especially around this environment.
2. 6 (six) sites for refuse dumps as indicated on the area map are proposed which if implemented will go a long way in alleviating the problems. Also strict monitoring and surveillance should be scheduled to ensure strict adherence to dumping of refuse on the official sites.
3. Laws on clean and healthy environment should be reviewed and enforced. People should be charged, even if it is a child that is caught, the parent are to pay.
4. Public participation and stake holders should be involved and encouraged. Until people are carried along in the matter that concerns them, the value of it may be abuse. This include educating them on the need to exhibit good attitude towards their environment the ills of waste disposal without proper management and the need to maintain good sanitation and hygiene for healthy living.
5. The drainages and roads that are in bad conditions too should be considered by government while the residents are encouraged to participate in kind or cast. This will go a long way in improving the condition of living for Barama dwellers.
6. Fano and Brewster, (1982) stated that unless the effort of environmental management rest on a solid legal foundation, they are certain to fall short of achieving their objectives. There exist international, National, Regional, state and



legislations are responsible of handling such issues well, right and better once law is allowed to take its course in such matter.

Proposed refuse disposal sites for Barama ward



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