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Assessment of the Present Location and Suitable Dumpsites for Solid Waste Disposal in Mubi Metropolis- GIS Approach

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A B S T R A C T

This study examined the present locations of solid waste dumpsites and also suggested the suitable solid waste dumpsites in the study area considering the settlement, road, water ways and soil type as the major criteria. Intensive fieldwork, Geographic Information System (GIS) and Remote Sensing (RS) were the major instruments used for the data collection and analysis. It was discovered that most of people dump solid waste either by the road side, in the water channel or on an open space. It was recommended that public awareness and mobilization should be embarked upon to improve public attitude to environmental planning and maintenance of environmental quality through evacuation of solid wastes in discriminately dumped in order to improve sanitary conditions in the study area. Government should also employ more sanitation officials, in order to improve effective and sanitary condition.

Keywords: GIS, Remote Sensing, Solid waste Disposal

1. Introduction

The high population growth and the resulting urbanization had led to high consumption of natural resources and generation of substantial wastes (Joseph, 2002). Uncontrolled disposal of waste is unhealthy and can degrade freshwater and cause pollution. Wastes, such as plastics cans do not break down quickly and traps stagnant water where mosquitoes can breed (World Bank, 2003). Open dumping of waste encourages flies and rats; hence diseases can spread as a result. Sharp litter is a common cause of injury. Open burning and uncontrolled burning of waste can also result in air pollution and respiratory ailments. Leachate from dumps can contaminate surface and underground waters used for drinking and other uses. These are just but a few examples of how waste and their poor disposal can cause environmental degradation. With the existence of appropriate technologies (such as for composting, polythene papers' recycling, scrap metals recovery, and waste papers recovery) for turning the waste materials into resources, solid waste disposal needs not be a problem. However, this is not the case. The reason for this lies mainly on the logistics of dealing with the waste materials from its source till they get to the processing site.

Management of solid waste has become a contemporary issue of increasing environmental concerns in our world (Rahman and Moten Ashraf, 2007). Historically, solid waste was collected in packer dump truck collection vehicles which delivered the waste directly to landfills. As landfills closed, haul distances became greater, giving rise to the use of transfer stations in which the waste is transferred to larger-capacity transfer trailers(Abul,2010). The current global trend of waste management problems stems from unsustainable methods of waste disposal, which is ultimately as a result of inadequate planning and implementation(Ahmad, et al, 2011). The practice of direct dumping of wastes into water bodies, open, abandoned lands and any other "appealing" sites without proper treatment have led to serious environmental pollution and health-related problems(AdeofunandNwagu, 2006). Solid wastes are waste generated through domestic, commercial, industrial, agricultural and other social activities including institutional waste, street sweepings and construction debris. Solid waste generated in many urban areas in Nigeria is composed of organic materials, plastics, polythene, cans, metals, bottles,

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glasses, clothes, shoes, and ceramics (Imoh and Udofia, 2005; Aliyu, 2010; Al-Jarrah, et al 2006). Household wastes have been found to also contain hazardous and toxic waste such as expired drugs, dried cells, broken glass, syringes, electronic waste which constitute serious environmental and health hazards (Delgado et al, 2007 andAsian Institute of Technology, 2004).

Municipal solid waste disposal is of enormous concern in developing countries across the world, as poverty, population growth, and high urbanization rates combine with ineffectual and under-funded governments to prevent efficient management of wastes (UNDP, 2004). Waste management issues should be confronted in a more generalized manner, which means that new strategies need to be designed for considering diverse and variable urban models. This fact demonstrates the necessity of developing integrated, computerized systems for obtaining more generalized, optimal solutions for the management of urban solid waste (Karadimas et al, 2004). Geographic Information System (GIS) and Remote Sensing are such computerized systems which can be integrated to get optimal solutions for efficient and effective solid waste management planning(Burrough, 1986 and Chang, et al, 2007).

This study emanated from the obvious problems faced by cities in managing the increase in solid waste generation as a consequence of overpopulation and the indiscriminate methods of disposing the solid waste at unwanted places.

Waste management is a persistence problem in most urban areas of the developing countries, particularly when dumped on an unwanted place. Mubi as a growing urban area is not an exception. There are heaps of wastes all over, making the places quite untidyDaneshvar, et al, 2005 and Ramachandra, et al 2003). Sometimes private small industries provide waste collection services for a fee, but not all parts are covered due to lack of proper planning and lack of willingness by some residents to pay for the service. Hence, this prompted thisstudy to identify the present locations of major refuse dumps and also determine the suitable dump sitesinMubi town.

2. The Study Area

The study area is geographically located between the Latitudes 10°05'N, and 10°30'N and the Longitudes 13°10'E and 13°30'E of the Greenwich Meridian (Fig. 1).

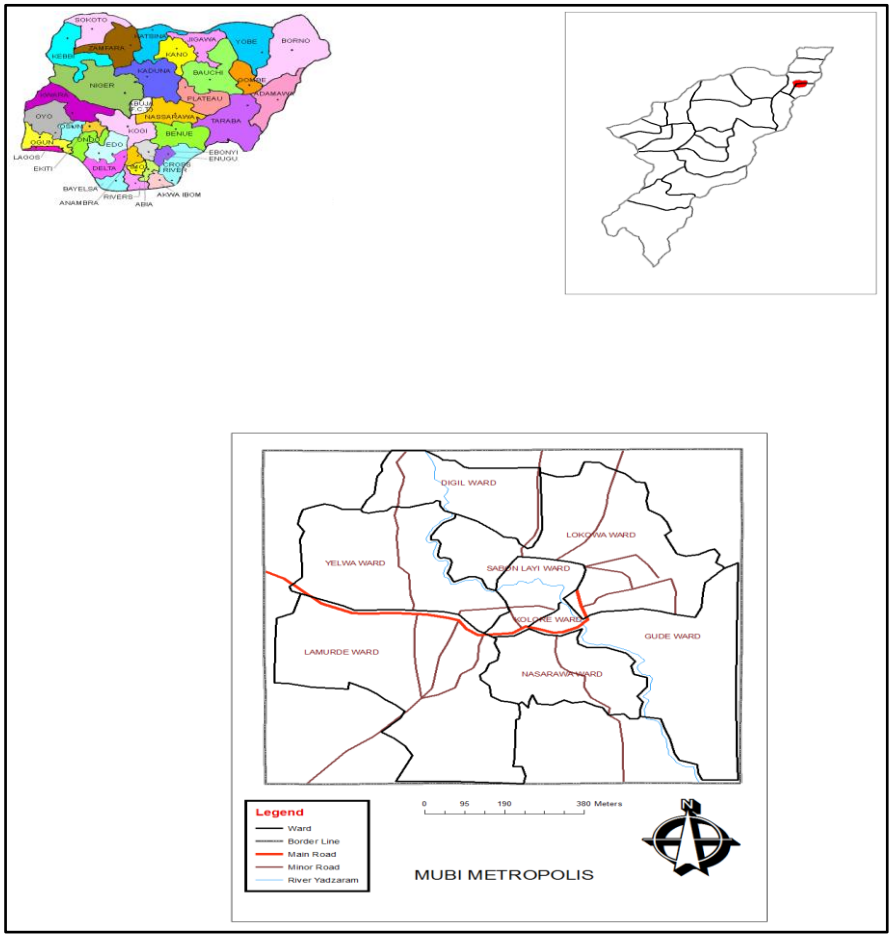

Figure 1: The study area. Source: field work 2021

It is mainly drain by the Yedzeram River; a stream that flows northward into the Lake Chad, and is situated on the western flanks of the Mandara Mountains which forms both their drainage system and relief. The area is bounded internationally by the Cameroon Republic on the east side and within

the state by Michika Local Government Area to the north, Hong Local Government Area to the West, and Maiha Local Government to the south. Also, it occupies an area of 903km2 and has a population of 151, 515 people (National Population Census, 2006).

Mubi exhibits both the dry and the wet tropical climate type which is also referred to asAw in koppen's classification of world climatic region. The dry season begins in November and ends in March, while the rainy season runs from April to October each year. Annual rainfall is about 900mm with the highest frequencies in July and August. Temperature ranges from warm to hot throughout the year but cold period is experienced between November and February with a gradual increase in January to March. The relative humidity of the area is low but begins to rise from April to August, (Adebayo, 2004).

3. Methodology

Material/Equipment

The main instruments used in this study were GIS software and GPS which produced coordinates that showed suitable dump sites in the study area. Other software such as Microsoft office excel and CorelDraw were used. Hardware such as computer and its accessories were used in this research work. The study area was stratified into wards, after which each ward was picked systematically. In each ward, the major indiscriminate dumpsites were identified and their coordinates were picked for mapping. FromGoogle map, the study area was captured, manipulated in ArcGIS 10.3, in which the suitable dumpsites were determined through the observation of criteria such as build up areas, road, water ways, and slope and soil type (Sener, et al 2011).

4. Results and Discussion

From the study findings in relation to the information obtained from the scheduled questionnaire administered, field investigation carried out in the study area, and the usepersonal interview,the research pinpointed the qualitative and quantitative results that provedthe evidence of poor methods of solid waste collection in Mubi town.

Present Locations of Major Refuse Dumps in Mubi Metropolis

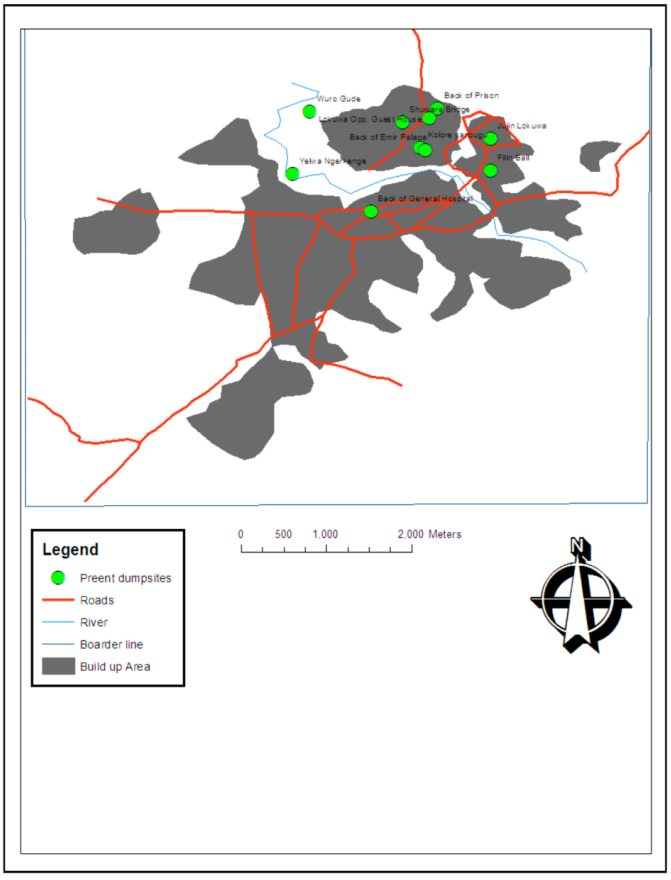

Figure 2: Present dumpsite in Mubi town

Table 1 is the summery of present solid waste material dump sites; it indicates locations, coordinates, and descriptions of solid waste materials.

Table 1: Present locations of major Solid dumpsite in Mubi town

Tag	Location	Latitudes	Longitudes	Description of solid waste
1	Kolere Yan-Bugu	10.272033N	13.278253E	Paper, empty sachets of pure water, detergents, rags, and plastic bottles.
2	YelwaNgerkege	10.268767N	13.2777E	Pure water sachets, waste papers, polythene, rags, and plastics bottles.
3	Lokuwa Opposite guesthouse	10.266458N	13.263597E	Polythene, plastics bottles, waste papers, and fruit peels.
4	Back of Prison	10.26983N	13.28485E	Polythene, vegetable rags, Pure water sachets, plastics containers and vegetable waste.
6	Back of General Hospital	10.273158N	13.265083E	Pure water sachets, polythene, mental tins, vegetables leave.
7	Shewuri Bridge	10.2725N	13.277303E	Polythene, mental tins, bottles, fruit peels and pure water sachets.
8	Wuro-Gude Bridge	10.266339N	13.284528E	Polythene, mental tins, bottles, fruit peels and pure water sachets.
9	Back of Emir palace	10.273558N	13.279278E	Vegetable wastes, fruit peels, mental tins, leaves, polythene, plastics bottles, waste papers, etc.
10	Filin Ball	10.271853N	13.275358E	Rags, plastics bottles, polythene, vegetable wastes, etc.

Source: fieldwork 2019

Suitable dump sites in Mubi town

Suitable solid waste dumpsites in Mubi town were selected based on the following criteria: - River Layer, Land use (build up area and road), soil type and slope. The listed criteria were overlaid on single map through the use of Boolean operation method. The soil map of Mubi North (figure) indicated that Mubi town fall on plenthicluvisol soil shown with green colour on figure 10. This implies that in terms soil, any part of Mubi town can be sited as solid waste dumpsite.

From figure 3, areas that are suitable for solid waste dumpsite are indicated considering the slope (152.836331-553.3950291 meters), river layer and land use area (build up area and road), these are :-

1. Buladega/Lamurde, located on latitude 10.259874N, Longitude 13.252108E. The site is suitable for dumping solid materials before treatment.
2. Jerin Fulani is another suitable site. It is located on latitude 10.274273N, longitude13.243804E.
3. Wuro- Palade is located on latitude 10.2826680N, longitude 13.272661E. This location is between digil and wuro-harde.
4. Along Madanya road, opposite stadium. The location is latitude 10.270022N, Longitude 13.296833E. Plate 3 is the picture of the site.

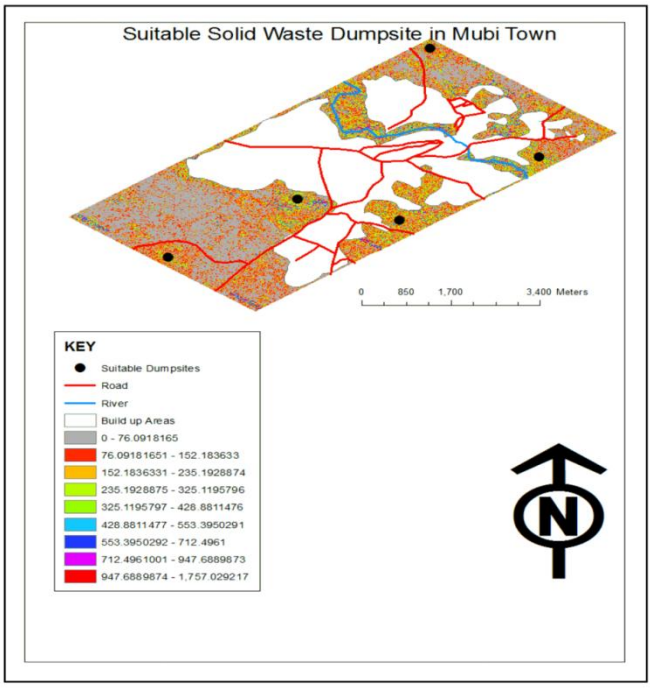

Figure 3: Suitable solid waste dumpsite in Mubi Town

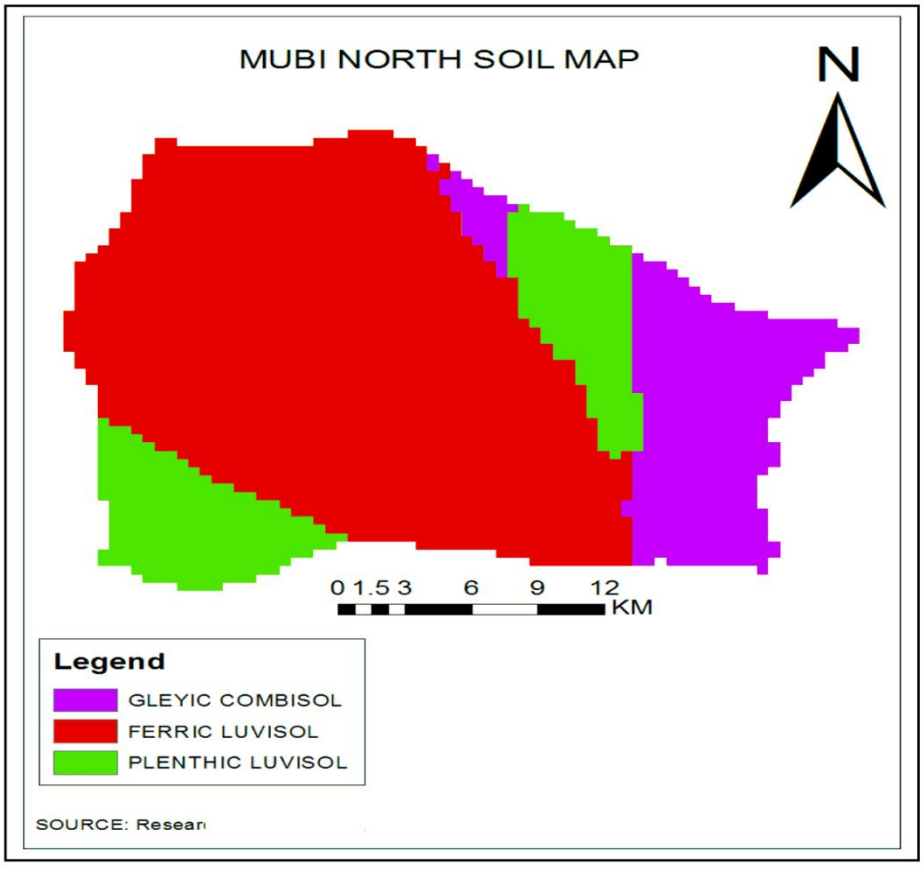

Figure 6: Soil map of Mubi North

5. Conclusion

Based on the above findings, solid wastes materials are not properly dumped in Mubitown, thereby constituting severe hazards on the people's live and the environment in general.

Recommendations

In order to improve the solid waste management situation in Yola tow, the following recommendations are put forward. Public awareness and mobilization should be embarked upon to improve public attitude to environmental planning and maintenance of environmental quality. This can be achieved based on the following:Adequate containers should be provided in every ward, solid wastes have to be evacuated at least twice a week in order to improve sanitary conditions in the study area, and government should employ more sanitation officials, in order to improve effective and sanitary condition.

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