Tech-Sphere Journal of Environmental and Earth Sciences (TSJEES)
A Subsidiary of Tech-Sphere Multidisciplinary International Journal (TSMIJ)
Vol 1, Issue 1, 2024 Publication Edition

Overview of The Sanitary and Environmental Effects of Solid Waste Dump Sites at Emirin and Ilokuno in Ado-Ekiti, Nigeria

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ABSTRACT

Unabated increase in the population of urban areas directly leads to increase in the quantity of waste generated in those areas. Against this background this paper examines the effects of solid waste management practices of Emirin and Ilokuno dump sites on environmental sanitation of the areas. A case study method was used. Physical inspection and sanitary survey of the two sites were carried out. Interview guide and observation checklist were also used to extract reliable information from the communities within the areas of these dump sites. Key Informant and interview guide were used to elicit reliable data for the work. The study was carried out in the outskirt neighbourhood of Ado-Ekiti through a survey method. Simple random sampling was applied to select two hundred and fifty-two (252) sample size out of the one thousand, one hundred and sixty-five buildings (1,262) sample frame identified in the core areas. Therefore, 2.5% was selected as sample size according to Neuman (1991), larger populations permit smaller sampling ratio for equally good samples. Data were collected using the random sampling technique, and all 5th graders in the ten-district area were picked for the administration of the questionnaire. Also, secondary data were sourced from government ministries, agencies, and departments. A literature review was also conducted to obtain accurate criterion for siting dump site for sustainable solid waste management. Descriptive and contents analysis of the interview guide and questionnaires administration were used to analyze data collected from the study. The findings show that there is a high rate of environmental challenges emanated as a result of the dump sites. Such as air pollution, offensive odour and negative impact on the soil, domestic livestock among others. Regular spraying of chemical to the waste, provision of buffers zone to separate the dumping sites and residential areas were recommended for sustainability of waste management of the area.

Keywords: Environmental, Dump site, Sanitary, Solid waste, Sustainability.

1 Introduction

Ajayi, (2019) and Kapilan & Elangovan (2018) claim that in developing countries, the increasing trajectory of the human population and its attendant human caused activities have considerably boosted the process of waste generation to a more devastating level. Waste is any material ejected from human activities and which impairs human health and the environment. Solid Wastes consist of non-liquid and non-gaseous products that come from households, municipal, supermarkets, industries, construction, etc. The issue of the sanitation environment of dumping sites is much concerned with hygiene in the communities. Therefore, according to WHO 2005 in Ratha et al as cited by Assefa 2008 "sanitation" is a big idea that includes, safe collection, storage, treatment, and disposal/re-use/recycling of human excretal matter and management/reuse/recycling of solid wastes.

Environmental management of solid waste collection and disposal involves the removal of solid waste from human processes, transportation to disposal sites, and processing and disposal to prevent environmental nuisances. This entire process must protect public health, align with community preferences, and operate effectively and economically. It must also ensure better sustainability features in terms of quality of life.

Elmira, Behzad, Mazlin, Ibrahim, Halima& Saadiah (2010) and Hering (2012) referred to waste as a by-product of many human activities: waste causes significant problems in human habitats. Increasing population, rapid economic growth, and increasing living standards have promoted worldwide solid waste generation and further accelerated the process. The improper disposal of solid waste can generate soil and groundwater contamination through diffusing at the surface, air pollution, and methane emissions. Indiscriminate spreading of solid wastes in the human environment also leads to aesthetic issues and nuisance.

Investigations have revealed that many communities, large and small, do not adhere to sanitary solid waste practices. There are numerous reasons why these communities have not taken actions to protect their people's health and welfare from the risks associated with insufficient and unsanitary solid waste collection and disposal. The assumption that adequate service is too expensive, as well as a lack of knowledge on how to design and manage a decent system, are the most common factors. Developing suitable dumping sites requires establishing an affordable and effective solid waste management program that benefits the environment, especially in rapidly growing communities. Therefore, it's essential to create a comprehensive master plan for solid waste collection and disposal, which involves thorough planning, mapping, site analysis, and environmental engineering.

Mussa and Surya Bhagavan (2019) highlight the global struggle many countries face in establishing effective waste management systems amidst population growth and urbanization. A crucial component of urban solid waste management is the presence of sanitary landfills, necessitating the identification of suitable locations. Solid waste management presents significant environmental and health challenges worldwide, affecting both developing and developed nations (UNEP, 2005; United Nations, 2017). These challenges, coupled with social, economic, and land availability issues, underscore the importance of effective land management and evaluation techniques (Coban, Ertis, & Cavdaroglu, 2018).

The solid waste management challenge in Ado-Ekiti mirrors issues faced in other countries. The city's poor planning has led to extensive solid waste generation, exacerbated by its growing population and rapid urbanization since becoming the state capital. These factors contribute to improper disposal and inadequate management of solid waste, affecting various stages from collection and transportation to dumping and recycling.

In light of these concerns, this study examines solid waste dump sites' sanitary and environmental impacts in Emirin and Ilokuno, Ado-Ekiti, Nigeria. By analysing these sites, the study aims to assess their environmental effects on surrounding communities. Additionally, the study seeks to facilitate the proper selection of future dump sites, aiming to prevent environmental problems and propose suitable locations for landfill use in the area.

2 Literature Review

According to Wahab and Ogunmodede (2017), the word sanitation originated from the French and Latin word 'sanitaire' and 'sanitas' respectively. It was first used in 1838 and became popularized in 1939 (Wordreference.com, 2017). Toilet Paper History (2017) opined that the history of sanitation evolved from the widespread tradition of health promotion through prevention of human contact with waste waters, industrial, sewage and various types of other hazards threats to human metabolism and health. International Year of Sanitation (IYS, 2008), literally explained sanitation as any system that promotes proper disposal of human and animal wastes. The World Health Organization defines the term sanitation as "the provision of facilities and services for the safe disposal of human urine and feces and also refers to the maintenance of hygiene conditions through services such as garbage collection and waste water disposal (WHO,2017). Therefore, WHO (2005) asserts that 'sanitation' as a whole is a 'big idea' which covers inter alia; safe collection, storage, treatment and disposal/re-use/recycling of human excretal, management/ reused/

recycling of solid wastes (trash or rubbish); drainage and disposal/reuse/ recycling of household waste water, drainage of storm water; treatment and disposal/ reuse/ recycling of sewage effluents, collection and management of industrial waste products and management of hazardous waste (including hospital wastes, and chemical/ radioactive and other dangerous substances).

In the urban environment especially, sanitation also includes the management of solid waste, grey water and surface drainage. In the wider context, sanitation includes not only physical systems, but also the policies, legal and management frameworks and investments necessary to achieve sanitation for all. In nut shell, sanitation includes collection/containment, conveyance/transport, treatment, disposal or reuse (WHO/UNICEF,2010). The overall purposes of sanitation are to provide a healthy living environment for everyone, to protect the natural resources (such as surface water, ground water, soil) and to provide cover and privacy, safety, security and dignity for people. It is a process whereby people demand, effect, and sustain a hygienic and healthy environment for themselves. Such an approach is needed not only to prevent disease and promote health, but also to lay the foundation for sustainable development and healthy towns and cities.

Waste encompasses any material discharged from human activities, which adversely impacts human health and the environment. Solid waste, including items from households, municipalities, supermarkets, construction, and industries, poses a global environmental and health challenge (Ajay, 2019; Kapilan & Elangovan, 2018). The associated environmental, social, economic, and land availability issues raise concerns regarding land management and evaluation techniques (Coban, Ertis, & Cavdaroglu, 2018; Lein, 1990; Philippe & Culot, 2009).

In developing countries, the growing human population and associated anthropogenic activities have led to a significant increase in waste generation (UNEP, 2005; United Nations, 2017). In recent decades, many countries in Africa, Asia, America, and Europe have shifted from landfilling to incineration as a waste management process (Lino & Ismail, 2017; Rezaei et al., 2018). Consequently, identifying suitable waste management and disposal methods becomes crucial (Abedi-Varaki & Davtalab, 2016).

Uneven dumpsites often receive heterogeneous materials and are common in developing countries, serving as receptacles for unhygienic landfilling or open dumping (UNEP, 2015; Perteghella, Vaccari, 2017; Ojuri, Ayodele, & Oluwatuyi, 2018). Such practices pose a significant threat to groundwater and other environmental resources (Nwankwoala & Ngah, 2014; Ujile, 2017).

According to Mohammed, Majid, and Yamusa (2020), determining the ideal location for a sanitary landfill requires the identification of crucial criteria, which can be a challenging task. The authors have identified three main criteria that are divided into thirteen sub-criteria - environmental, social, and economic. These sub-criteria include water bodies, geology, soils, elevation, slope, residential areas, archaeological sites, airports, population, roads, railways, infrastructure, and land use/land cover. The authors used these criteria to create a map that highlights potential landfill sites.

The authors, along with Kapilan & Elangovan (2018), developed specific decision rules to select suitable sites for solid waste disposal based on research literature and study area criteria. A site is considered suitable if it meets all specified requirements, such as being at least 488 meters from streams, 794 meters from residences, and 499 meters away from road networks. Additionally, the soil type and topography must meet certain criteria. If a site does not meet these requirements, or if the slope exceeds 32%, it is deemed unsuitable.

Soil permeability and porosity are crucial factors in controlling contamination movement (Bear, 2012). The soil should have low permeability to slow the passage of leachate. Areas with slopes greater than 20 degrees

are unsuitable for dumpsites, while those with slopes between 0 and 10 degrees are considered suitable (Sam & Steven, 2017; Akbari, 2008). Furthermore, areas within a 700-meter radius are excluded to mitigate public health effects.

Inadequate management of urban garbage, especially in Nigeria, poses increasing nuisances, environmental burdens, and public health risks. Nearly 95% of municipal solid waste is disposed of in poorly managed dumpsites, where it decomposes and infiltrates land resources inadequately, posing threats to ground and surface water, the environment, and public health (Lino and Ismail, 2017; Rezaei et al., 2018). Hence, it's imperative to identify appropriate waste management and disposal solutions (Ebistu and Minale, 2013; Abedi-Varaki & Davtalab, 2016).

3 Research Methodology

This study examined the sanitary and environmental impacts of solid waste dump sites at Emirin and Ilokuno in Ado-Ekiti, Nigeria, utilizing a survey research design with a case study approach. Adebaking (2003) defines a case study design as an in-depth analysis of a single setting, providing a comprehensive exploration of an individual, group, or organization. Data were collected from both primary and secondary sources, including a physical visibility sanitary survey conducted at the two sites. The investigation employed a detailed questionnaire to record socio-economic profiles, assess the sanitary conditions of waste sites, and evaluate environmental and soil health. It also examined infrastructure, land use patterns, and key environmental concerns, including air and water quality, and their impacts on public health, agriculture, and the living conditions of residents. Utilizing simple random sampling, the study selected 252 residences from a total of 1,262 in the targeted areas, in line with Neuman's (1991) recommendation that a smaller sample can effectively represent a larger population. The data collection process was systematic, with every fifth house in each district chosen for the survey. Additional data were gathered from government sources, and key informants provided insights specific to the communities affected by the dumpsites. The study also conducted a literature review to determine sustainable criteria for waste site location. The analysis involved descriptive and thematic evaluation of the survey data (see Table 1).

Table 1: Sample Frame and Sample Size

S/N	Study areas	Sample Frame	Sample Size (2.5%)
1	Emirin	201	40
2	Aba-Ebira I	180	36
3	Aba-Ago	160	32
4	Aba-Ebira II	150	30
5	Aba-Osun	152	30
6	Ilokuno	145	29
7	Aba-Ebira I	86	17
8	Aba-Ebira II	80	16
9	Aba-Ebira III	62	12
10	Aba-Ebira IV	49	10
	Total	**1,265**	**252**

Source: Field Survey,2023

4 Study Area

The Emirin region is geographically positioned between latitudes 70°39'60" and 70°33'80", and longitudes 50°10'40.9" and 50°21'60.4". The topography near the dumpsite varies from 367.0m to 547.0m above sea

level, with a gentle incline from the northwest to the southeast. The dumpsite spans roughly 125,250 m² (12.5 hectares), as depicted in Figure 1. Climatically, the area experiences a bimodal pattern with a wet season from March to October, averaging 1600-1800mm of rainfall, and a dry season from November to March, with temperatures reaching an average high of around 30°C. These climatic details are consistent with regional patterns observed in similar latitudes (Akinyemi, 2013). Ilokuno is a community within Ado-Ekiti. It is situated at approximately 7063'16' latitude of 70 63 16' and longitude of 5021' 00" east of the prime meridian.

Ilokuno dumpsite stands as a key institution, addressing the escalating demands of waste disposal. However, Ilokuno is a critical area for socio-economic and environmental factors. It is not only a repository for discarded materials but a place where environmental sanitation for public health investigation needs to study. Hence, a thorough environmental impact assessment (EIA) is imperative to comprehensively evaluate the consequences of the dumpsite's operation on the environment of its location.

4.1 Data Presentation and Discussion of Findings

Table 2 in Appendix I details the study's findings. The gender distribution within the surveyed area revealed a higher number of females (131 or 51.8%) compared to males (122 or 48.2%), attributed to the migration of men to urban centres in pursuit of employment opportunities, such as the Okada motorcycle taxi business. The area, being on the outskirts of Ado-Ekiti's central region, showed varied educational attainment among residents: 95 individuals (37.5%) completed only primary education, and 60 (23.7%) had informal education. This educational gap has hindered many from moving to areas with better living standards. Most residents, 158 (60%), engaged in small-scale trading, with their income levels influencing their occupation type. Notably, only 80 residents (31.6%) earned over #5,000 monthly, falling short of the national minimum wage of #30,000, which reflects the struggle to afford quality housing and maintain a healthy living environment. Consequently, some reside in substandard, unsanitary, and rundown dwellings, as depicted in Appendix II (Plates 1, 2, and 3). Household size analysis showed a prevalence of 5-6 members per household in 116 cases (45.8%), leading to overcrowding and facility shortages, thus transforming these areas into slums. The poor state of building maintenance, including roofing, plastering, and painting, suggests that construction technology in the area lags far behind contemporary standards.

The assessment of the area revealed that the residents' disregard for environmental stewardship significantly contributes to the locality's ecological and health issues. Practices such as indiscriminate waste burning, open defecation, and neglect of drainage systems exacerbate the environmental degradation and pose risks to public health. The survey indicated that 59.1% of participants acknowledged pollution from local dumpsites.

The Emirin dumpsite, subject to this study, has been operational for two decades, accumulating a mix of refuse including paper, plastic, glass, and metal, most of which are non-biodegradable. Over time, this waste has compacted, allowing prolonged interaction with the soil and subterranean layers.

Located on government property, the site receives daily waste deposits managed by the Ekiti State Waste Management Board. Key informants, including a security officer residing nearby, reported the biweekly use of chemicals to mitigate foul odors. Additionally, there are measures in place to periodically test the quality of household water sources for potential contamination from the waste.

The investigation and data collection revealed significant environmental challenges stemming from the dumpsite, such as air pollution, unpleasant smells, water contamination affecting wells and streams, and adverse effects on the habitability for locals and their livestock, including goats and poultry. Recent observations noted an influx of houseflies troubling residents, attributed to the dumpsite's presence. (See Plate 5)

Apart from environmental problem constituted by the dump site in the area, the community also benefited from the dump site, although in small scale economic level. The dump site help in their farming activities as it aids their crops germination and produced a robust yield. The waste matter adds nutrients/manure to the soil for cultivation of crops especially the vegetables. It was also gathered from the key informant respondent that years ago (during governor Ayodele Fayose regime in Ekiti State), the dump site was used for fertilizer production. Presently, such small-scale enterprise is no more exists. Also, the residents (scavengers) generated little income in plastic and scape recycling from the dump site. See plate 2 &4.

Structured questionnaires were administered to Ilokuno community concerning the effects and the important of the Ilokuno dump site to the community and surrounding environment. Physical investigation was made together with interviewing the residents, staff of the dumpsite and the key informant who also a member of the community. The following findings parameters gave analysis and broader knowledge on the effect of the Ilokuo dump site in the community.

Findings has shown that there are some offensive odours perceived frequently especially during the raining season when the waste was unable to be burnt which might affect the health of the residents. Evidence from the research revealed that the nearby stream used by the community is contaminated by the washing away of some part of the waste by erosion during heavy rainfall to the body of the stream which are useful to the resident and the adjoining communities within the Ilokuno dump site. This have been greatly affected the health of the people and the natural state of the stream.

Apart from environmental challenges, the dump site has improved the livelihood of the community though a micro-economic benefit from the dumpsite. The Ilokuno dumpsite generated job opportunities to the host community and the adjoining residents. Many people from the community have been engaged as a driver of trucks vehicles carried waste to the dump site, recycler, gateman, security among others. Apart from individual benefits, it also serves as means of revenue to the local government as the waste generators paid fees for the disposal of the waste generate.

However, the study also shown that apart from positive economic gain from the dump sites, the Emirin and Ilokuno dumpsites location have been a challenge to land lords and estate developers in the area. Land lords of the areas as well as estate valuers' complaint about low patronage of potential land buyers within the environment of these dumpsites. Location of these dumpsites have a negative effect on the values of lands in the communities. Recently, from the respondent particularly the key informant, research shown that there was an outbreak of fire disaster. Ilokuno that almost burnt the entire community. Courses of the fire was traced to the indiscriminately burnt of refuse from the dumpsite during the dry seasons.

5 Conclusion

This research has revealed that both Emirin and Ilokuno dumpsites in Ado-Ekiti constitutes a very degree of hazards to the environment of their host communities. Ranging from air pollution, surface and underground water contamination, fire outbreak, pest infestation like housefly, domestic animals' infestation with diseases, devaluation of landed properties within the vicinities of these dumpsites among others. Although, there is a pocket of gains derived from the dumpsites by the residents of the areas such as driving jobs, security jobs, gate man collecting tolls from wastes vehicle drivers, scavengers and recycling of wastes like plastics, irons scraps among others. However, irrespective of the positive and negative effects of these dumpsites within the communities of Emirin and Ilokuno, government authority, policy and decision makers should integrate the efforts towards a sustainable solid waste management technique taking into consideration the results obtained in this research. Dumpsite is a necessity to development of any community, villages, towns, cities hence environmental sanitation of the area should be prioritized as well as sustainability of waste management in the area.

6 Recommendation

Government should partner with private investors to intensively Integrate waste management in the state capital through waste reduction, recycling, composting, and reuse in these dump sites. Ekiti state Waste Management, Ministry of Environment with the collaboration of state and federal Orientation Agency should create public awareness of the citizens on the needs to have good attitudes to effective waste management and willingness to pay for waste generated.

In Ekiti State, resource recovery and recycling, primarily managed by the informal sector, offer employment opportunities but often lack safety measures. It's crucial for environmental agencies to actively regulate these sectors to ensure a clean and safe living environment for citizens. Open dumping, while cost-effective, requires oversight to ensure hygienic waste transport and disposal by wheelbarrow operators and truck drivers.

Environmental professionals, including town planners, surveyors, builders, architects, estate valuers, and geologists, should collaborate with environmental agencies to select appropriate sites for dumpsites and landfills, mitigating potential adverse effects. Authorities and policymakers must consider the findings of this research to develop sustainable solid waste management strategies.

The enforcement of the Ekiti State Urban and Regional Planning Law from 2014 is necessary. Additionally, the government should expand the workforce in waste management, provide better vehicles, hire more sanitation officers, and regularly fumigate dumpsites to prevent disease outbreaks and promote a healthier environment for residents.

References

Adebakin, M.A. 2013. 'Research Designs' in Contemporary Social Science Research Methods. A practical Guide, Revised and Enlarged Edition. (eds) Agbola. T; Egunjobi.L; Olatubara,C.O; Ola Yusuf, D, and Alabi, MURLAB Search wisdom Educational Services, Lagos. M.pp119-128.

Ajay, S. (2019). Remote sensing and GIS applications for municipal waste management. Journal of Environmental Management, 243, 22−29.

Akbari, V. (2008). Landfill Site Selection by Combining GIS and Fuzzy Multi-criteria Decision Analysis a Case Study Bandar Abbas. Journal of Department of Surveying and Geomatics Engineering. University of Tehran, Iran.

Bear, J. (2012). Hydraulics of groundwater, Courier Corporation

Coban, A., Ertis, I. F., & Cavdaroglu, N. A. (2018). Municipal solid waste management via multi-criteria decision-making methods: A case study in Istanbul, Turkey. Journal of Cleaner Production, 180, 159–167

Elmira, S., Behzad, N., Mazlin, B. M., Ibrahim, K., Halima, T., & Saadiah, H. (2010). Urban solid waste management based on geo-informatics technology, University Putra Malaysia, Malaysia. Journal of Public Health and Epidemiology, 3, 5460

Hering, J. G. (2012). An end to waste? Science, 337(6095), 1623−1623.

International Year of Sanitation (IYS) 2008. Sanitation and Hygiene. Frequently Asked Questions. Https;//esa.un.org/iys/review 09/countries/Nigeria/pdfs/Nigeria-IYSFAQs sanitation.pdf.

Kapilan, S., & Elangovan, K. J. (2018). Potential landfill site selection for solid waste disposal using GIS and multicriteria decision analysis (MCDA). Journal of Central South University, 25, 570−585

Mangizvo, M. R. (2010). An Overview of the Management Practices at Solid Waste Disposal Sites in African Cities and Towns. Journal of Sustainable Development in Africa (Volume 12, No.7, 2010) ISSN: 1520-5509 Clarion University of Pennsylvania, Clarion, Pennsylvania.

Mohammed H.I; Majid,Z and Yamusa, B. 2020. Geospatial Method of siting sustainable Sanitary Landfill in Johor Malaysia. Science World Journal Vol. 17, No. 3 issn; 15976343. ISSN;2756.391X 9(PRINT).

Neuman.W.L. (1991), Social Research Method: Quantitative and Qualitative Approach, Second Edition, London. Allen's Bacon New York College Publishing.

Ngwabie N.M, Wirlen Y.L, Yinda G.S, VanderZaag A.C. 2019. Quantifying greenhouse gas emissions from municipal solid waste dumpsites in Cameroon. Waste Manage, 87:947–53.

Nwankwoala H.O, Ngah S.A. 2014. Groundwater resources of the Niger Delta: quality implications and management considerations. Int J Water Res Environ Eng. 6:155–63.

Ojuri O.O, Ayodele F.O, Oluwatuyi O.E.2018. Risk assessment and rehabilitation potential of a millennium city dumpsite in Sub-Saharan Africa. Waste Manage. ;76:621–8.

Okpara,D.A, Kharlamova, M and Grachev, V. 2021. Proliferation of Household Waste Irregular Dumpsites in Niger Delta Region (Nigeria): Unsustainable Public Health Monitoring and Future Restitution. Sustainable Environment Research. 31:4 https://doi.org/10.1186/s42834-020-00077-1

Perteghella A, Vaccari M. 2017. Organic waste valorization through composting process: a full-scale case study in Maxixe, Mozambique, Environ Eng Manag J. 16:1819–26.

Sam, Z., & Steven, J. (2017). Site Suitability Analysis for solid waste Landfill Site Location Using Geographic Information Systems and Remote Sensing: A case study of Banket Town Board, Zimbabwe. Review of Social Sciences, 2, 19−31.

Ujile AA. 2017. Groundwater contamination: performance, limitations and impacts in Niger Delta-Nigeria. In: Powell AL, editor. Groundwater contamination. Hauppauge: Nova Science Publishers; 2017. p. 65–102

UNEP. (2005). Selection, design and implementation of economic instruments in the solid waste management sector in Kenya. New York, USA.

UNEP. 2015. Global Waste Management Outlook. Nairobi: United Nations Environment Programme.

Visvanathan, C., & Glawe, U. (2006). Domestic solid waste management in South Asian countries. A Comparative Analysis. Synthesis report of the 3R South Asia Expert Work Shop, Kathmandu, Nepal. 1–14.

Wahab, B, and Ogunmodede, O.D. 2017. "Sanitation" in Contemporary Concepts in Physical Planning. (eds) Egunjobi, L. Department of Urban and Regional Planning, University of Ibadan. Vol. III.pp. 895-922.

Water Aid. 2011. Sanitation Framework. Available at www.wateraid.org/publications.

WHO. 2005. 10 Things you should know about sanitation. Available at www.unwater.org/downloads/media/Sanitation/10 Things.pdf.

WHO/UNICEF. 2010. Progress on Sanitation and Drinking Water. 2010 updated WHO/UNICEF Joint Monitoring Programme for water supply and Sanitation. http;//www.who.int/water sanitation health_/publications/

Wordreference.com 2017. Definition of sanitation. Available at http;//www.wordreference.com/definition/sanitation sanitary.

World Health Organization. WHO, 2017. Sanitation Health Topics. Available at http;//www. Who.int/topics/sanitation/en//

Appendix I

Table 2: Socio-Economic Survey

Variables	Frequency	Percentage

Sex		
Male	122	48.2
Female	131	51.8
Total	253	100
Education		
Non-Formal Education	60	23.7
Primary	95	37.5
Secondary	65	25.7
Tertiary	33	13.1
Total	253	100
Occupation		
Civil servant	14	5.5
Farming	22	8.7
Craftsmanship	31	12.2
Trading	158	62
Unemployed	16	6.3
Apprentices	12	4.7
Total	253	100
Income #		
No fixed income	96	37.9
Below 5000	80	31.6
5000-10000	34	13.4
10000-15OOO	18	7.1
Above 15000	25	9.9
Total	253	100
Household Size		
1-2	31	12.3
3-4	63	24.9
5-6	116	45.8
7-8	33	13.0
9-10	8	3.2
Above 10	2	0.8
Total	253	100
Building Materials		
Mud/mud blocks	198	78
Cement blocks	25	22
Stone	-	-
Others	-	-
Total	**253**	**100**

Sewage Disposal		
Pit latrine	188	74
Water closet	31	12

Bush/ dunghill	24	10
Bucket latrine	10	4
Total	253	100
Waste Disposal		
Road side	16	6.3
Open space	14	5.5
Controlled typing	204	87
Incinerating	19	8
Total	253	100
Road Condition		
Tarred	80	32
Un-tarred	75	30
Footpath	98	38
Total	253	100
Environmental Related Problems		
Flooding	30	12
Cholera	32	13
Typhoid	75	30
Malaria Fever	108	43
Diahorea	8	3.0
Total	253	100
Environmental Problems Caustic Factors		
Poor Drainage System	48	18
Dirty Environment	102	40
Overcrowding	38	15
Poor Water Supply	65	27
Total	253	100
Open Space and Setback to Building		
Yes	25	10
No	228	90
Total	253	100
Bathroom Facilities		
Indoor self-contained	52	21
Shared	162	63
Out-door	30	12
Not available	9	0.4
Total	253	100

Kitchen Facilities		
Indoor Self-contained	36	14

Shared	141	56
Outdoor	51	20
Not Available	25	10
Total	253	100
Water Supply		
Pipe borne water	57	23
Well water	190	75
Surface Stream	5	2
Rain Harvesting	1	0.3
Total	253	100

Source: Field Survey, 2023

Appendix II

Plate 1: Wastes on Emirin dumpsite

Plate 2: scavenger on Emirin dumpsite

Plate 3: Deplorable Road of Emirin dumpsite

Plate 4: Extracted plastic wastes on the Emirin dumpsite

Plate 5: Interview of the resident of Emirin dumpsite