

EMANCIPATION OF PERILOUS LEACHATE'S FORAY IN A CITY ENVIRONMENT: EXAMPLE FROM ILLEGAL WASTE DUMP SITES IN KUBWA-ABUJA, NIGERIA.

Yusuf Alapata Ahmed ^{1*}

Aminat Aderonke Mohammed²

Zakirat Oyeronke Oyewo³

^{1, 3} Department of Geography and Environmental Management, University of Ilorin, Nigeria.

² Department of Industrial Chemistry, University of Ilorin, Nigeria.

* Corresponding email: yusufahmed579@gmail.com

Citation: Ahmed, Y.A, Mohammed, A.A. & Oyewo, Z.O. (2022). Emancipation of perilous leachate's foray in a city environment: example from illegal waste dump sites in Kubwa-Abuja, Nigeria. *KIU Interdisciplinary Journal of Humanities and Social Sciences*, 3(2), 284 - 301.

ABSTRACT

Cities in Nigeria face with problems of solid waste on illegal dump-site that could encourage poor sanitary conditions and unhygienic standard. This study examines the perilous impact of leachate's foray in Kubwa-Abuja, with the purpose to enlightening city inhabitants from dumping refuse indiscriminately on unauthorized sites which may proactively have composite consequences around dump-sites. Kubwa-Abuja has three prominent illegal dumpsites which were designated into zones. the three zones are within residential houses of; 100-300 meters radials from the dumpsites. Data for the study were obtained from primary and secondary sources. The primary source employed the administration of 200 questionnaires each to selected household members in the three designated zones and oral interview were conducted to random selected public members and the refuse control agencies in as to obtain information about impacts incursion of the unauthorized dumpsites in the area. Other source reveals the related literature on the work. Correlation was used to analysis the hypotheses set. Results show significant differences as residents' susceptibility to health related diseases and effect of leachate from dumpsites to the nearby water. Policy measures are suggested on how best to curtail the impact of illegal dumpsites on the city environment.

KEY WORDS: Impact, collaborative, leadership, quality, assurance, goal, attainment

INTRODUCTION

The bungling urban growth, prominent population increase, low coordinated industrial setup and other human related activities in Nigeria cities' environment have resulted to generation of large quantity of wastes which are usually dumped indiscriminately on illegal dump-sites , thereby contaminating surface water and affecting the quality of the environment (Adedeji, Oludare, and Olayinka, (2014). Many major cities in Nigeria today are changing their environmental outlook into great potentiality both in good; socio-economic as well as in political affiliations worth commendable. Upon this however, some cities in the country, still live in shadow of neatness and tidiness. Cities are said to be engine of sustainability of all development and sources of economic growth. But environmental insinuation of such development deserves to be thoroughly managed, because its effects may be ill-felt, and hazardous. Whereas, such growth and development need to be thoroughly managed to suppress its laid-up consequences (Ahmed, 2013).

Leachate is an aqueous effluent generated as a result of rainwater percolating through wastes, as well as the inherent water content of waste themselves which serves as an important source of pollution in many environmental media around the world (Ojo, 1995). Leachate consists of undesirable material derived from the waste that it has passed through; the constituent of leachate depends on the waste it receives. A dumpsite that receives mixture of municipal, commercial and industrial wastes will have a leachate that is characterized as a water-based solution of four groups of contaminants namely; dissolved organic matter, inorganic macro components, heavy metals (Pb, Ni, Cu, Hg), and organic compounds (Oludare and Olayinka, 2014).The physical appearance of Leachate when it emerges from a dumpsite is either black or yellow liquid with an acidic and offensive smell. Leachate discharge has a great impact on the environment ranging from

land pollution to water pollution including surface and ground water pollution. This is because leachate flows with runoff into water bodies, thereby exposing the people in the surroundings of the dumpsite to various water borne diseases like typhoid, malaria, cholera, dysentery etc. while aquatic habitats are also disrupted.

The hazard posed by leachate on water has continued to increase greatly in the World. According to the World Health Organization (2011) more than a third of the world's people lack safe water supply, it's estimated that by 2025, more than two thirds of the global population will live in countries with serious shortage of clean water. Indiscriminate refuse disposal is found to be the major threat to water quality and has been suggested that water contamination is the leading cause of deaths and diseases. The main purpose of this work therefore is imperatively to examine the environmental impact of leachate discharge on illegal dumpsites and what potential susceptibility impacts this set of pollution are possessed for the people living within the vicinity of the illegal dumpsites.

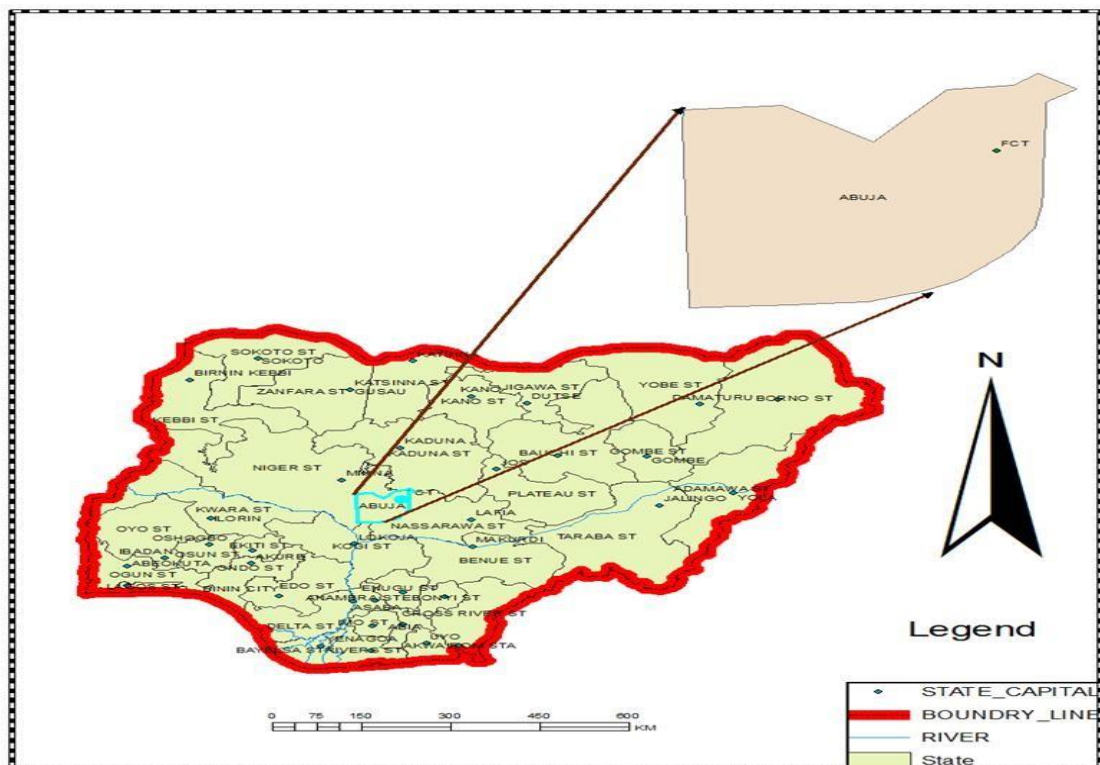
THE STUDY AREA

Kubwa is one of the district areas of Abuja, the capital city of Nigeria. It lies between latitude 8.250N and 9.200N of the Equator and longitude 6.450E and 7.390E of the Greenwich Meridian (see Figure.1.). Kubwa is the largest settlement in Abuja with population of 776,298 (NPC, 2006). Abuja has a tropical climate which is characterized by wet and dry season (World Bank, 2000; Nyeme, 2012). Rainfall in Abuja is majorly an orographic type, as a result of its location proximity to the windward side of the Jos plateau. Relative humidity is about 20% in the dry season and 50% in the wet season (Okunola, 2014). The soils of Abuja are generally shallow and sandy in nature, the high sand content makes the soil to be highly erodible and the shallow depth is a reflection of the presence of stony lower horizons (Olubunmi and Ndubusi, 2011). The vegetation type in Abuja is the Guinea Savannah, it comprises of tall grasses which are inter-spaced with scattered specie. Abuja is predominantly underlain by high grade metamorphic rock of

Precambrian age (Umar, Onimisi, and Jonah, (2013).The topography is rugged and undulating with the basement rock outcropping as hills and inselbergs and the geologic formation in the area comprises of basement complex rocks that form prominent hilly physiographic features (Agunwamba, 1998).The lowest elevation of Abuja is found in the extreme South West with an elevation of 70m above sea level. The highest elevation is found in the North East where there are many peaks over 760m above sea level. Hills occur either as clusters or form long ranges. Isolated hills called inselbergs are also found in some part of the city. The dominant occupation found in Abuja consists of administrative work because majority of government ministries, headquarters and federal secretariats are located within Abuja and as a result, government agencies employ the service of civil servants in the area. Some people most especially the Gwagi's also engage in primary occupation such as farming (cultivation of crops like yam, maize, vegetables etc.) and fishing among others.

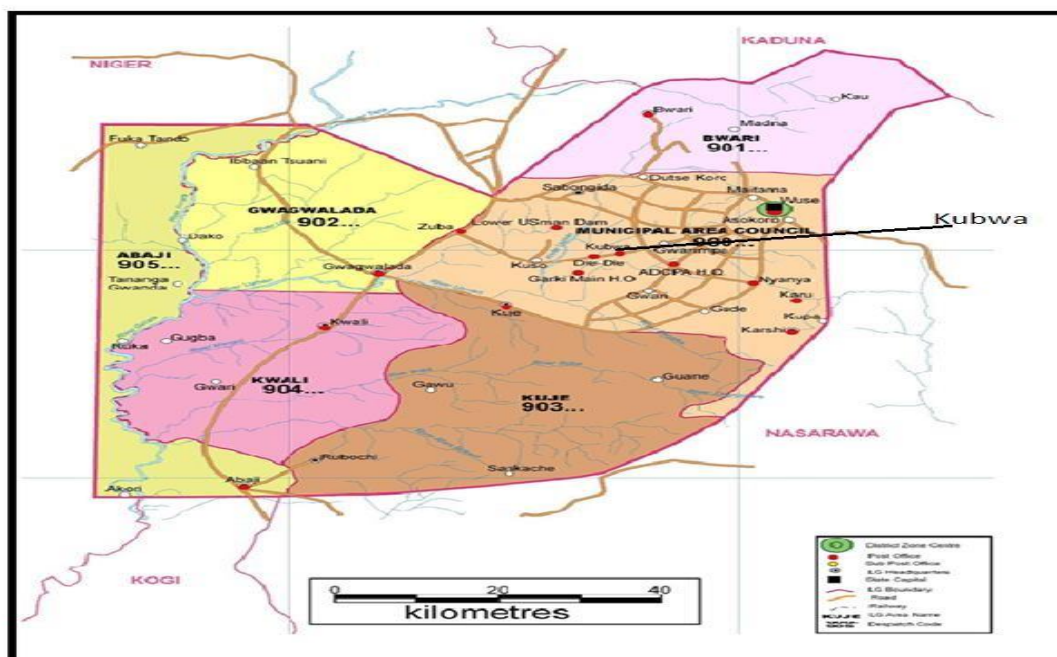
Abuja being the capital city of Nigeria has been planned to have series of waste management and control strategies for urban development. It has the Ministry of Environment and Abuja Environmental Protection Board (A.E.P.B) to manage its environments. Abuja Environmental Protection Board (A.E.P.B) was established by the Federal Capital Territory Administration (FCTA) on the 31st of July 1989 in accordance to decree No.10, section 47 of the Federal Environmental Protection Agency of Nigeria (FEPA, 1991). Abuja has four legal dumpsites; two old dumpsites namely Gosa and Wupa dumpsites and two newly created dumpsites- Bwari and Dustse- Makaranta(see Table 1) All are to complement the others in order to ease pressure on the previously existing two dumpsites (FEPA, 1991). However, many other major illegal dumpsites apart from Kubwa and others exist around Abuja metropolis, all are in the full fledged for discussion in this work (see Figure 2).

Figure 1: Map of Nigeria showing Abuja



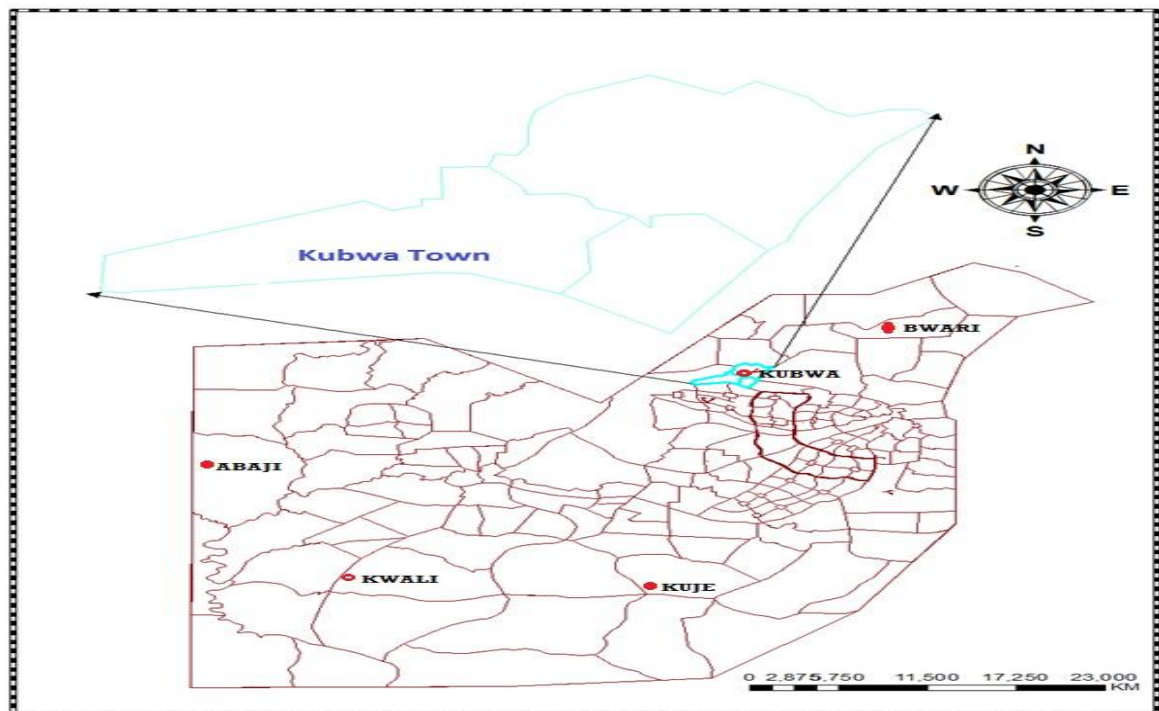
Source: Authors' compilation.

Figure 2: Map of Abuja showing the study area



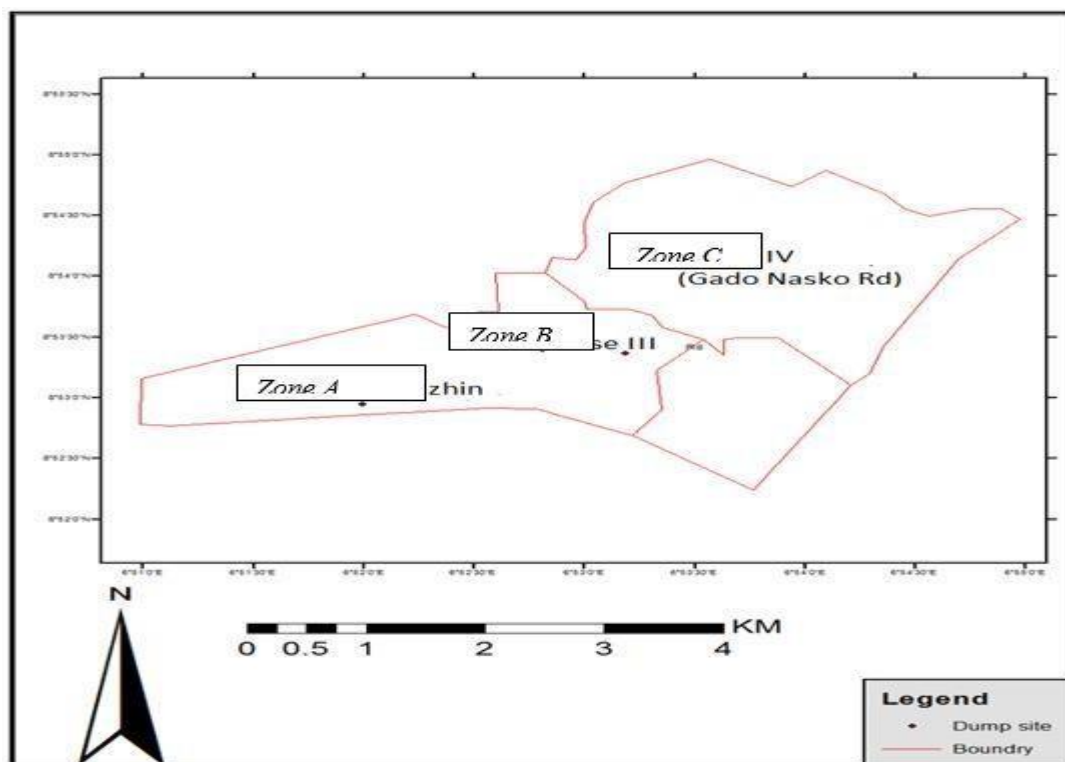
Source: Authors' compilation.

Figure 3: Map of Kubwa-Abuja showing the study area



Source: Authors' compilation.

Figure 4: Map of Kubwa-Abuja showing the study area



Source: Authors' compilation.

Table 1. Administration of Questionnaires to Zones/Area in Kubwa-Abuja

Dump Sites/ Zones	Area-Distance Delineated by Radius (in meters)	No of questionnaires	Percentage (%)
Byanzhin (A)	100-199	100	33.33
Phase III (B)	200-299	100	33.33
Phase IV (C)	300 and above	100	33.33
Total		300	99.99 (100)

Source: Authors' fieldwork compilation.

Several water borne diseases were discovered affecting people that residing in the zones of the study area, some of the diseases like; pathogens, causes and symptoms are discussed orally and in the scheduled questionnaires administered (see Tables 2-4). Common Health cases recorded as revealed from the questionnaires response indicated one death case in Zone A due to snake-bite commonly associated to dangerous reptiles that lived within the heaps of refuse in the area. As revealed by the residents from Zone A, the affected person was not taken to a nearby hospital on time. Other deaths from Zone C were due to illness contacted as a result of contaminants from the dumpsites mostly resulted from diarrhoea and dysentery with little attention or none.

Table 2. Leachate's Health Incidence in Kubwa-Abuja (ZONE A)

Zone A	Number of persons	infected Treated at Home (%)	Treated at Hospital (%)	No. of death Recorded	Remark
<i>Typhoid</i>	35	16(45.71)	19(54.28)	-	-
<i>Ghonorrhea</i>	17	9(52.94)	8(47.06)	-	-
<i>Malaria</i>	189	47(24.87)	142(75.13)	-	-
<i>Dysentery</i>	67	11(16.42)	56(83.58)	-	-
<i>Snake-bite</i>	5	2(40.00)	3(60.00)	1	<i>Lateness to attend available hospital caused death</i>

<i>Scorpion bite</i>	28	9(32.14)	19(67.86)	-	-
<i>Others</i>	15	11(73.33)	4(26.67)	-	-

Source: Authors' fieldwork compilation.

Table 3. Leachate's Health Incidence in Kubwa-Abuja (ZONE B)

<i>Zone B</i>	<i>Number of Infected persons</i>	<i>Treated at Home (%)</i>	<i>Treated at Hospital (%)</i>	<i>No. of death recorded</i>	<i>Remark</i>
<i>Typhoid</i>	15	3(20.00)	12(80.00)	—	—
<i>Diarrhoea</i>	8	1(12.50)	7(87.50)	—	—
<i>Malaria</i>	76	23(30.26)	53(69.74)	—	—
<i>Dysentery</i>	90	40(44.44)	50(55.56)	—	—
<i>Snake-bite</i>	—	—	—	—	—
<i>Scorpion-Bite</i>	42	9(21.43)	33(78.57)	—	—
<i>Others</i>	21	3(14.29)	18(85.71)	-	-

Source: Authors' fieldwork compilation.

Table 4. Health Incidence of Leacahte's Pollution on Environment in Kubwa-Abuja

<i>Zone C</i>	<i>Number of infected persons</i>	<i>Treated at Home (%)</i>	<i>Treated at Hospital (%)</i>	<i>No.of death Recorded</i>	<i>Remark</i>
<i>Typhoid</i>	82	12(14.63)	70(85.37)	14	Negligence, wrong infection/treatment caused death
<i>Diarrhoea</i>	45	4(8.89)	41(91.11)	02	Lateness to attend hospital Caused death
<i>Malaria</i>	77	19(24.68)	58(75.32)	—	-
<i>Dysentery</i>	115	10(8.70)	105(91.30)	01	Treatment of infections at Home caused death
<i>Snake-bite</i>	—	—	—	—	—
<i>Scorpion- bite</i>	14	7(50.00)	7(50.00)	—	—

Others	56	9(33.93)	37(66.07)	–	–
--------	----	----------	-----------	---	---

Source: Authors' fieldwork compilation.

METHODOLOGY.

The methods employed for this work are highlighted below: In the first place, reconnaissance visits were carried out by the researchers on different locations within Kubwa areas of Abuja for on-spot assessment. This was done in as to ascertain the locations of authorized and illegal adopted dumpsites and to update information collected from the secondary data source.

The said field assessments that were carried out complement the secondary data and they include data on the selected three illegal dumpsites in Kubwa namely; Byanzhin, Phase III and Phase IV. During this fieldwork, some preliminary mapping activities were carried out to delineate the larger area covered and surveyed and were later referred as; Zone A, B and C for easier understanding. The three zones covered: residential houses within 100 meters radius; residential houses within 200 meters radius and areas covered within 300 meters radius respectively (see Figures.1-4). Other primary data were directly collected through the administration of 300 hundred structured questionnaires in line with the objectives of the study and this to harmonize with the on-spot assessments mentioned above. The structured questionnaires were administered to 300 household heads chosen randomly within the three delineated zones (also see Figure.4).

Oral interviews were also conducted among the selected members of the general public such as; the target groups- individuals living within the designated areas, the government and the private agencies that controlled and managed wastes, and the selected Abuja Environmental Development Agency (AEDA) officers. The objective of identifying sociological perception and health impacts of dumpsites in Kubwa environs were focused in the oral interviews. Whereas, representatives from relevant departments and other health and environmental managers were not left out. Above all, three basic hypotheses were set to test if there is existence of any environmental consequence of leachate discharges from illegal dumpsites on Kubwa environs. (a) *H_i* - Adequate waste management will reduce the impact of environmental degradation and outbreak of diseases compared to indiscriminate refuse dumping that would lead to environmental fallout.

H_o- There is no significant difference between adequate waste management and indiscriminate refuse dumping.

(b) *H_i*- Those who reside close to dumpsites vicinity are much more susceptible to health hazard than those leaving far from dumpsite zones.

H_o-There is no difference in the susceptibility of residents to health hazard than those reside close to or far from dumpsite zones.

Table 5. Showing the Means Variation on Health Status Base on Dumpsites and Delineated Zone.

<i>Variables</i>	<i>Byanzhin Dumpsites</i>	<i>Phase III Dumpsites</i>	<i>Phase IV Dumpsites</i>
<i>Zone A(100-199m)</i>	6.57	6.17	7.22
<i>Zone B (200-299m)</i>	4.61	4.35	4.87
<i>Zone C(300 +)</i>	3.04	3.43	4.09

Source: Authors' Computation.

The health mean of each delineated zones in table 5 was obtained by computing from the number of times in which the respondents fall sick as a result of contacting waterborne diseases.

Table 6. Multiple Correlations between Health Status and Distance to dumpsites

(S) Zone	(T) Zone	Mean (S-T)	Difference	Std. Error	Sign. Level	95% Confidence Interval	
						Lower bound	Upper bound
A	B	2.0500*		.37579	.004	.8970	3.2030
	C	3.1333*		.37579	.000	1.9803	4.2863
B	A	-2.0500*		.37579	.004	-3.2030	-.8970
		C	1.0833	.37579	.063	-.0697	2.2363
C	A	-3.1333*	.37579	.000	-4.2863	-1.9803	B
		.37579	.063	-2.2363	.0697		

Source: Authors' Computation.

*. The mean difference is significant at the .05 level.

DISCUSSION OF FINDINGS.

There are quite a lot of people that were affected by water borne and other diseases among residents in the zones of study. Some of the diseases were mentioned orally and from the answers provided from scheduled questionnaires administered to respondents in the zones (see tables 2-4). Common health cases recorded indicated one death case in Zone A and due to snake-bite commonly associated to dangerous reptiles that lived within the heaps of refuse indiscriminately dumped in the area. As revealed by the residents from Zone A, the affected person was not taken to a nearby hospital on time. Other deaths from Zone C were due to illness contacted as a result of contaminants from the dumpsites mostly resulted from diarrhoea and dysentery among other contacted infirmity within the zones.

For example, common health cases recorded as indicated in Zone A showed that 189

malaria cases were recorded with 24.87% persons were treated at home and 75.13% of the total were treated at health institutions(privately owned or government hospitals). While, this was followed by dysentery cases which about 83.58% and 16.42% of the infected persons were treated at health institutions and at home respectively.

In the case of Zone B, out of the total number of 252 people that were infected by different types of one disease or the other, and as a result of chemical oozed out from the refuse dumped in the unauthorized areas (in the zone), 31.3% of the total illness were treated at home and 68.7% cases were treated at health institutions. No any death record was reported among the residents of the study area within the time frame of this study. However, in the case of Zone C in the Kubwa-Abuja, from 389 cases of infirmity on record, it was this area that has not less than 17(4.37%) death cases due to negligence, poor diagnostic or treatment of wrong ailment and/or treatment of infected persons at homes without attended the available health institutions. In all, this zone recorded 82 cases of typhoid, 77 malaria cases, 115 dysentery infections and 56 infirmities from other related water borne diseases. Generally, 71(18.25%) of the total cases were treated at home, while 318(81.75%) cases of infections were treated at big hospitals, cottage hospital and dispensary as the gravity of case(s) reflected. The results from the hypotheses tested also indicate as thus; From all indications, majority of the infected persons in the study area experienced one form of disease or the other except that the degree at which they are affected by malaria and dysentery and diarrhoea are higher than from other infirmities. Based on observed means, the error term is Mean Square (Error) = .212. It will be observed that there is statistical difference between each of the delineated zones (see Table 6).

(1) Zone A and Zone B, (2) Zone A and Zone C (3) Zone B and Zone C. from the results we can see that there is a statistically significant difference between all three delineated Zones Level ($p= 0.05$) The result shows that Zone A inhabitants are significantly more affected by health diseases related to proximity to dumpsites than inhabitants of Zone B at level of

($P = .04$) , Zone A and Zone C ($p = 0.00$) while there is no differences between Zone B and Zone C level ($p = .063$).

Therefore we accept both H_1 hypotheses because proximity to dumpsite is a key factor in experiencing impacts of leachate which is water borne diseases:

- (a) H_1 - Adequate waste management will reduce the outbreak of disease compared to indiscriminate refuse dumping.
- (b) H_1 - Those who reside close to dumpsites are much more susceptible to water borne diseases than those leaving far from dumpsites.

Environmental Impact Assessment of Leachate in Kubwa, Abuja

Kubwa inhabitants were in no doubt exposed to various consequences attributed to impact of mismanaged dumpsites like most urban centres in Nigeria. Apart from leachate that flow into Kubwa streams, local waste collectors known as Babanbolas (waste scavengers in exchange for money) emptied there collected waste in nearby streams (Chijioke, 2014). The resultant impacts of this display a lot of health implications, environmental degradation, virtual pollutions, disruption of natural eco-systems, rodents and pests attacks on Kubwa community. All these have great impacts that mount mammoth of effect on recurrent consumers of Government funds.

Figure 5: Illegal Dumpsites in Kubwa area (Plates 1 & 2).



Source: Authors' Computation.

Figure 6: Illegal Dumpsites in Kubwa area (Plates 3 & 4).



Source: Authors' Computation.

Figure 7: Illegal Dumpsites in Kubwa area (Plates 5).



Source: Authors' Computation.

Figure

Despite government efforts to alleviate illegal dumpsite in Abuja metropolis, the number of illegal dumpsites keeping on increased and this is as a result of the following;

1. Lack of moral ethics towards environment education, which most people are yet to learn due to their nonchalant attitudes towards environmental management.

2. Increasing migrants into Abuja city from all over the country also increasing the quantity of waste generated, thus making it more difficult to make adequate provision to commensurate with dumpsites
3. No enough manpower to manage wastes as different government have different policies for waste control and management
4. Poor Funding on the part of Waste Management Agency i.e in places where people pay to dispose waste makes it a challenge for the financially less privileged to comply with such policies.
5. Weak enforcement agency mostly in developing countries also makes people to be careless with waste management policies
6. Inadequate government facilities and infrastructure to control waste i.e. government plan for legal dumpsites are only in few in cities like Abuja, where there are old vehicles, unserviceable Ro-ro vehicles and other facilities are not intact or are badly managed.

CONCLUSION

From all indications, it could be seen that dumping of refuse on illegal or unauthorized sites is tantamount to act of untidiness, un-care free-attitudes that are associated with uncooperative behaviours to constituted authority. This does not only constitutes to menace to environmental degradation but also to real danger and threat to socio-economic and political development of the nation.

This paper has placed a substantial hope and priority on improvement of waste management strategies in the country in order to mitigate illegal dump of wastes that may lead to leachate actions on the environment. Waste could be asset and benefit to all if well monitored. Therefore, both the private companies and individuals could be encouraged to source for new wealth from refuse dumped in legal sites/areas and take

advantage of this by not allow waste to degenerate into leachate before it is well managed as being done in the developed world.

Finally, the work has also demonstrated a research effort on upgrading waste control and management in order to improve our health conditions away from any infirmity in Kubwa- Abuja and Nigeria as a whole. The bulk of control of waste and its management is however left to the government but above all, every community, individuals, also both private and public organization have unique roles to play in as to improve the quality of our environment in the country.

Recommendations.

1. Wellbeing is one of the liveable characteristics of a developed nation; combating illegal waste dumpsites will go a long way to preventing or eradicating water borne diseases that emanate from contagious leachate from the waste dumpsites in this country. Hence, the followings are solutions propounded by the respondents for a better improvement of people living in the study area:
2. Water purification method such as sieving, boiling before use is also advocated for.
3. Increase in enlighten of the populace about benefits and consequences of hygienic and in hygienic environment respectively.
4. Adequate low or zero cost transport facility should be provided by government for conveying waste to the legal dumpsites.
5. Sophisticated adoptions of waste resource management, which include reduce, reuse and recycle.
6. Community should work hand in hand with government to maintain and complement government efforts on waste management.
7. NGOs should also complement the effort of government in managing waste private industries should invest in waste management.

REFERENCES

- Adedeji, O.H. Oludare, H. and Olayinka, O.O.(2014). 'Concentrations of Heavy Metals in Dumpsite Leachate and effects on Adjacent Stream in Ajakanga', Ibadan Nigeria. *Journal of Applied Sciences in Environmental Sanitation*, 9(2): 113-122.
- Ahmed, Y. A. (2013); "Potential Impacts of Climate Change on Waste Management in Ilorin City, Nigeria. *International Journal of Science and Technology* 2 (1), 45-63. *Bahir Dar, University Ethiopia*.
- Agunwamba, J.C. (1998). "Solid Waste Management in Nigeria: problems and issues" *Environmental Management*, 6(22): 849-856.
- Chijioke, O (2014). 'Dumping of Refuses into Kubwa Streams', the Observer Newspaper, Abuja Nigeria..
- FEPA, (1991); Guidelines and Standards for Environmental Pollution Control in Nigeria. National Population Commission (NPC, 2006), Abuja, Nigeria.
- Nguyen, P.T. (2011). "Assessment of Plastics Waste Generation and Its Potential Recycling of Household Waste in Can, the City of Vietnam," *Environmental Monitoring and Assessment*, 1-4(175): 23-35.
- Nyame, F.K. (2012). 'Environmental Implications of the Discharge of Municipal Landfill Leachate into the Densu River and surrounding Ramsar Wetland on the Accra Metropolis', *Proceedings on Health*. Accra- Ghana.
- Ojo, O. (1995). 'Assessing and Managing Health Risks from Drinking Water Contamination: Approaches and Applications' (Proceedings of the Rome Symposium).
- Okunola, A.(2014) 'Assessment of Water Quality of Gurara Water Transfer from Gurara Dam to Lower Usuma Dam for Abuja Water Supply', *American Journal of Water Resources*.

Olubunmi, A.N. and Ndubuisi, A. (2011); 'Impacts of Industrial Effluent and Dumpsite Leachate Discharges on the Quality of Groundwater in Oyo state', Nigeria: *Journal of Biodiversity and Environmental Sciences (JBES)*, 3(1): 13-18.

Oyegun, R.A.(1987); Sediment Redistribution in Ilorin, Nigeria. *The Environmentalist*,7(2) 123-129.

Umar, A.M., Onimisi, M.Y. and Jonah, S.A. (2013). 'Measurement of Natural Radioactivity in Soil, Vegetation, and Water in the Industrial District of the FCT', *British Journal of Applied Sciences Technology*, 5(3): 26-274.

United Nations Environment Program Agency (UNEPA) (2006). "Informal Solid Waste Management,"
<http://www.unep.org/PDF/Kenyawastemngntsector/chapter1.pdf>.

World Bank (2005), "Waste Management in China: Issues and Recommendations," East Asia Infrastructure Development. <http://www.sciencedirect.com>.

World Health Organization (WHO) (2011), Costs and Benefits of Water and Sanitation Improvements at the Global Level. [http// www.who.int/water](http://www.who.int/water).