

ASSESSMENT OF SOLID WASTE HEAVY METAL CONCENTRATIONS IN MAISANDARI WARD, MAIDUGURI METROPOLITAN COUNCIL, BORNO STATE, NIGERIA

Alhaji Mukhtar¹, Joseph C. Akan (Ph.D)² and Abdulsalam Barkindo(Ph.D)¹

¹Department of Geography, University of Maiduguri, Nigeria

²Department of Chemistry, University of Maiduguri, Nigeria

*Corresponding Author's email: agmukhtar75@gmail.com



DOI: 10.29816/sjss.9.1.3

ABSTRACT

Maisandari ward, as a component of the state capital, has witnessed high influx of migrants as a result of its rapid urbanization and as a result insecurity bedeviling the state. This has increased the consumption patterns and consequently waste generation and more pressure on the municipal authorities responsible for solid waste management. In spite of the efforts made by relevant agencies refuse still decorates the streets of Maisandari ward and in some cases blocking drainages, roads and channels causing flooding posing danger in the community. The broad objective of the study is to assess the concentration of heavy metals in solid waste of Maisandari ward of Maiduguri Metropolitan Council. Solid waste samples were collected at sites along major streets and taken in carefully branded purified polythene bags for laboratory preparation and analysis. Results showed that Maisandari ward soil is contaminated by heavy metals as the results of all the samples are higher than the permissible limit of such metals as spelt out by the World Health Organisation (WHO). Heavy metals detected were attributed to the disposal of waste from residential areas. Both the Risk Index (RI) and Adverse Effect Index (AEI) exhibited the presence of heavy metal in the studied solid waste. The solid wastes were mainly household wastes.

Keywords: Assessment, Metals, Concentrations and Maisandari.

Introduction

Waste is an early problem with mankind. The rate at which heaps of waste emanates from residential quarters is a major concern to every nation of the world. In the developing nations, waste is usually disposed off on the ground where it will turn to compost to improve soil fertility. In recent time, increase in population and urbanization increase in population and urbanization has contributed

to the generation and disposal of waste. The disposal of waste has proved to be a major public health issue and a vital factor affecting the quality of the environment. This pattern is more pronounced in emerging nations such as Nigeria. Municipal Solid Wastes (MSW) includes waste generated as a result of household pursuits, among other activities. In addition, wastes generated from hospital,

public areas, wastes derived from streets activities as well as small scale activities are inclusive. Waste generated from agricultural activities and large scale industrial activities are not the concern of this research.

Maisandari ward, as a major component of the state capital is a big host for migrants as a result of its fast urbanization, and mainly as a result of insecurity bedeviling the state. Despite efforts made by agencies like Borno State Environmental Protection Agency (BOSEPA), refuse still litters the streets of Maisandari ward and in several instances grid locking drainages, roads and water channels leading to overflows that pose a hazard to community.

The first step towards a sustainable solid waste management is to gain understanding of the nature and composition of the waste being generated in time and space. It has been reported that the composition of solid refuse differ from spot to spot, from family unit to family unit and even in the same household; it could also vary from time to time. Hence, way out should be site exact. This research is designed to present the concentration of heavy metal in Solid Waste been generated in three different locations in Maisandari Ward Within Maiduguri Metropolis, Borno State, which differs in socioeconomic activities for an integrated Municipal Solid Waste Management scheme.

Objectives of the study

The broad objective of the study is to assess the concentration of heavy metal in solid waste in

Maisandari Ward of Maiduguri Metropolitan Council. The specific objectives were to:

- i. the determination some heavy metal levels in the solid waste;
- ii. evaluate the possible dangers posed by solid waste to the health of the residents in the study area.

Materials and Methods

Maiduguri metropolitan council, as the large study area, is contiguous with Konduga and Jere local government areas. Maiduguri, the state capital is an urban area of 208 square kilometres (Waziri, 2012). The area is within 11°46'18"N and 11°53'21" N and 13°03'23" E and 13°14'19" E. The figure presented below as Fig 1 is the map of study area.

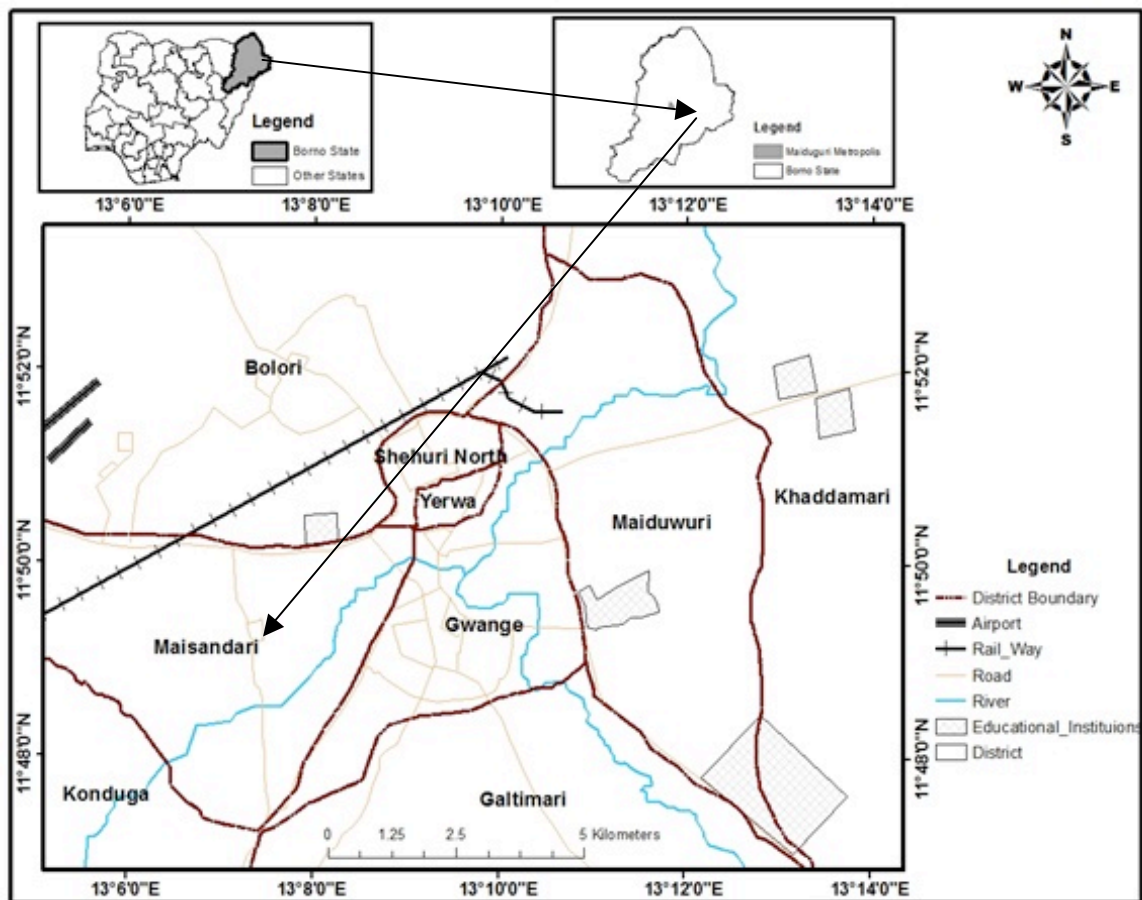


Fig.1 Maiduguri Metropolitan Council

Source: Waziri (2012).

Maisandari is located in Maiduguri Metropolitan Council. The study area shares borderline with Bolori District to the north, Galtimari District in the southern part, Jere Local Government to the west and Gwange District to the east. The study area is constituted by several administrative segments which include Moduganari, Tsallake, Ngomari Old airport, Unguwan Doki, Shuwari, and Suleimanti, among others. By size, it is the largest political ward in Maiduguri Metropolitan Council. The metropolis as the larger community has its roots linked to the historical settlement of Yerwa instituted in 1907 and continues to play the role of the administrative nerve centre of Kanem Borno

Empire (Waziri *et al.*, 2009). The city was built coincidentally at a very strategic hitherto fairly occupied area of Maiduwuri and has been occupying the crossroads of several savannah kingdoms and thus has served and continues to serve as the marshalling point of trans-Saharan trade between the Maghreb and the lands alongside the Gulf of Guinea. In view of its status a marshalling point, waves of migrations and assorted merchandise have always ended in this city. This historic characteristic of Maiduguri has never faded not even under the colonial era. These and other roles are still being played by the city, resulting in associated waste (Waziri *et al.*, 2009). According to Chiroma *et al.*, (2016) this

has been a factor to the rapid growth of population (i.e. through natural increase and immigration) of the city. As it is a norm to generate waste through human activities, Maiduguri as a city also contributes its quota to the waste generated from the activities of the heterogeneous population (Richard & Mollie, 2006; Hamnett, 2011). Maiduguri among others plays the functions of religious, commercial, administrative, judiciary and educational to other states of the northeast. Maiduguri was the provincial headquarters of the region during the colonial rule (1907-1960) and the managerial center of present Borno State.

Sample Collection Points/Methods

Solid waste samples for the study were collected at dump sites along major roads of Bulumkutu, Moduganari and Shuwari of the study area. In each of the areas designated as sample point, samples were collected from three locations tagged as S1 to S3. Solid waste samples were contained in clean polythene bags that were properly labelled and conveyed to the laboratory of Chemistry Department, the University of Maiduguri for preparation and analysis. The materials collected as waste were mainly wooden, polythene bags that almost decomposed to fine soil particles.

Sample Preparation

All solid waste samples were dried and crushed, using a pestle and mortar to ensure homogeneity and sieved through a 2mm mesh sieve. The samples were placed in clean plastic bags and sealed pending digestion and analysis. Digestion of Soil Samples for Heavy Metal determination, two grams (2g) of the

oven-dried solid waste samples were weighed into a well-washed glass beaker. Samples were digested by the addition of 20 cm³ of aqua regia mixture of HCl and HNO₃ (ratio 3: 1), and 10cm³ of 30% H₂O₂ was poured in small portions with precautionary measures to avoid any possible over flow leading to loss of material from the beaker. The beaker wall and watch glass were rinsed with refined water and the samples were filtered out to separate the insoluble solid from the supernatant liquid. The volume was adjusted to 100cm³ with distilled water. Fundamental analysis of samples determination of Chromium (Cr), Manganese (Mn), Iron (Fe), Copper (Cu), Nickel (Ni), Cadmium (Cd), Aluminum (Al), and Lead (Pb) were carried out directly on each final solution using Perkin-Elmer analyst 300 Atomic Absorption Spectroscopy (AAS). Calibrated Standard solutions of each element: Cr, Mn, Fe, Cu, Ni, Cd, Hg, and Pb were made ready prepared according to Sc 200 manufacturer for atomic absorption spectroscopy. A known 1000 mg/l concentration of the metal solution was prepared from their salts.

Concentration of Heavy Metals in solid Waste

The concentrations of heavy metals (Cr, Mn, Fe, Cu, Ni, Cd, Hg, As and Pb) in solid waste from Moduganari area from point S1 to S3 are presented Table 1. Of all the metals tested for Fe shows the highest concentration in all the sampling points, whereas Hg shows the lowest concentration. The concentration of heavy metals in samples of solid waste from Bulumkutu area is presented in Table 1.

Table 1: Mean Concentrations of Some Heavy Metals in Solid Waste from Moduganari Area, Maiduguri

Concentrations (mg/kg)									
Locations	Cr	Mn	Fe	Cu	Ni	Cd	Hg	As	Pb
S1	34.22 ^a ±3.42	75.23 ^a ±1.94	192.34 ^a ±9.66	56.99 ^a ±5.23	55.34 ^a ±5.65	92.03 ^a ±4.33	18.93 ^a ±0.34	43.29 ^a ±3.34	47.03 ^a ±4.30
S2	54.09 ^b ±2.65	64.23 ^b ±8.44	172.05 ^b ±6.01	72.33 ^b ±8.98	41.03 ^b ±4.51	88.34 ^b ±5.09	12.38 ^b ±4.99	68.34 ^b ±2.94	38.45 ^b ±5.33
S3	72.34 ^c ±5.09	82.10 ^c ±6.43	143.02 ^c ±7.23	48.23 ^c ±5.54	28.93 ^c ±2.43	72.01 ^c ±6.21	15.92 ^c ±1.09	39.45 ^c ±5.94	72.20 ^c ±8.34

Within Columns Mean with different letters are statistically different, P< 0.05

Table 2: Mean Concentrations of Some Heavy Metals in Solid Waste from Bulumkutu Area, Maiduguri

Concentrations (mg/kg)									
Locations	Cr	Mn	Fe	Cu	Ni	Cd	Hg	As	Pb
S1	39.34 ^a ±4.23	93.20 ^a ±6.34	204.22 ^a ±10.33	61.02 ^a ±6.33	59.34 ^a ±3.29	97.23 ^a ±9.34	25.39 ^a ±1.02	49.11 ^a ±4.03	55.93 ^a ±5.34
S2	63.09 ^b ±4.30	78.34 ^b ±5.34	184.45 ^b ±13.22	81.02 ^b ±7.34	55.23 ^b ±6.33	93.23 ^b ±7.20	18.29 ^b ±1.03	74.54 ^b ±7.34	46.32 ^b ±4.95
S3	88.23 ^c ±7.93	89.34 ^c ±8.34	162.89 ^c ±11.03	58.34 ^c ±9.23	34.39 ^c ±5.34	82.20 ^c ±8.43	21.98 ^c ±3.20	45.92 ^c ±2.20	77.34 ^c ±2.34

Within Columns Mean with different letters are statistically different, P< 0.05

Table 3: Mean Concentrations of Some Heavy Metals in Solid Waste from Jiddari /Polo Area, Maiduguri

Concentrations (mg/kg)									
Locations	Cr	Mn	Fe	Cu	Ni	Cd	Hg	As	Pb
S1	28.34a±7.22	68.34a±4.39	183.39a±10.22	48.74a±3.84	46.55a±2.29	84.98a±3.29	15.33a±1.21	37.98a±6.87	40.65a±5.98
S2	45.34b±4.39	55.23b±2.39	164.34b±11.29	67.34b±6.83	36.74b±5.98	77.22b±7.98	9.23b±0.34	58.98b±8.97	32.98b±3.87
S3	64.33c±3.45	73.29c±9.17	135.33c±10.74	39.84c±5.54	22.43c±2.98	63.98c±7.32	17.22c±0.76	32.76c±7.68	55.96c±4.39

Within Columns Mean with different letters are statistically different, P< 0.05

The highest Pb concentration of 77.34±2.34 mg/kg is detected at the Bulumkutu area; it is followed by Moduganari area, while Polo area has the least value. The high concentration of Pb at Bulumkutu area can largely be attributed to metal works which are common in the area to the area stated. Analysis Of Variance (ANOVA) confirms a significant difference in Pb content in all the sampled points. The concentration of Pb in the study area is higher than that reported by

Charlesworth *et al.*, (2003). Charles worth et al reported lead concentration of 48 µg/g in the four states of United Kingdom. In a similar manner it is also higher than the range of 1.01–2.9 µg/g as reported by Al-Khashman and Shawabkeh (2006) in the roadside dust of Jordan.

Cu is also injurious to human and animal health when the safe limit is exceeded (Bakirdere and Yaman, 2008). The highest Cu concentration is detected at Bulumkutu

sample with a value of $81.02 \pm 7.34 \text{ mg/kg}$, whereas Polo samples records the lowest value of $39.84 \pm 5.54 \text{ mg/kg}$. Iron (Fe) was established to be the dominantly detected compared to other metals in the study area. Fe is a vital component of all living organisms playing a crucial role in metabolism of food, and transportation of oxygen in the living cell. It is also known in the fusing of DNA and movement of electrons from one point to another. According to Lynch and Baynes (1996) the presence of Fe in a diet plays a vital role in the retardation incidence of anemia related diseases. High concentration of Fe is observed at points S1 than S2, while point S3 showed the least concentration. ANOVA confirm that there is a significant disparity of Fe content in all the sampled points.

Ni is also pollutant to the environment. The highest Ni concentration in the solid waste is detected at Bulumkutu area with a value of $204.22 \pm 10.33 \text{ mg/kg}$. Polo area records the least concentration of $134.33 \pm 10.74 \text{ mg/kg}$. ANOVA confirms that there is significant difference in the Ni content in the study area. According to Al-Shayeb and Seaward (2001), the presence of Nickel in the environment is largely as a result of emissions from gasoline driven vehicle engines. Other contributory factors include abrasion and corrosion of Ni from vehicle parts. Lee *et al.*, (2005) stated that the burning of fossil fuels and refining of metals such as Cu are also contributing Ni to the atmospheric content.

The highest Cr concentration in the solid waste samples is observed at Bulumkutu area with a value of $88.23 \pm 7.93 \text{ mg/kg}$, while the least value is detected at Polo area with a value of $28.34 \pm 7.22 \text{ mg/kg}$. ANOVA also confirms that there is a significant difference in Ni content in all the sampled points.

Highest concentration of Mn is observed at the Bulumkutu area solid waste. At the Bulumkutu area, Mn concentration of $93.20 \pm 6.34 \text{ mg/kg}$ is noted. It is followed by Moduganari area, while the least value is detected at Polo area. ANOVA confirms that there is significant variation in the Mn content in the study area. The deficiency of manganese in human body is likely to be severe in skeletal and reproductive systems. In a similar vein, high doses of Mn have adverse effects primarily on the lungs and brain.

Cd is released to the environment as a result of cadmium–nickel battery production. Considerable quantity is also released to the environment from the usage of paints as well as plastic. Highest concentration of Cd in the solid waste of the area studied is observed at Bulumkutu area, while Polo area recorded the least concentration. (ANOVA) confirms that there is a significant divergence in the Cd content in all the sampled area. Fergusson and Kim (1991) suggested that the amount of Cd in the environment where human being lives should not exceed $0.5\text{--}4.0 \text{ mg/kg}$. But the investigation carried out reveals that Cd levels in the solid waste exceed the prescribed range. Kalac and Svoboda (2001) reported that cadmium (Cd) is accumulated mainly in kidneys, spleen, and liver, and its blood serum level increases considerably following mushroom consumption.

The highest concentration of Zn in solid waste samples is observed at Bulumkutu area, while Polo area has the lowest value.

The possible dangers posed by solid waste to the health of the residents in the study area.

In Hakanson method, the different potential toxic-response factors of different heavy metals concentrations are taken into consideration. Therefore, the method of

Hakanson was found comprehensive. In this research, that method was adopted to evaluate the possible dangers from the studied heavy metals in the roadside soil. The possible dangers or potential ecological risk factors ($E(i)$) of different heavy metals and the potential ecological risk indices (RI) were calculated in accordance with Hakanson (1980), and the following $E(i)$ and RI values give an indication of ecological risk:

$E(i) < 40$; $RI < 150$ = low potential ecological risk
 $40 \leq E(i) < 80$; $150 \leq RI < 300$ = moderate potential ecological risk

Table 4: Calculated Ecological Risk Indices of Individual Heavy Metals (E_r^i) and Ecological Risk Indices of Moduganari Area (RI)

$80 \leq E(i) < 160$; $300 \leq RI < 600$ = considerable potential ecological risk

$160 \leq E(i) < 320$; $RI \geq 600$ = very high potential ecological risk

$E(i) \geq 320$ = dangerous

Table 4 shows the calculated ecological risk of individual metals and ecological risk index. The ecological risk index ranges as follows:- 1.09 to 23007 at Moduganari; 1.29 to 24307 at Bulumkutu; and 0.93 to 21245 at Polo. The adverse effect assessment values for metals ranged from 0.61 to 135.33 for Moduganari; 0.75 to 145.92 for Bulumkutu and 0.54 to 124.97 for Polo solid waste area.

Table 4: Calculated Ecological Risk Indices of Individual Heavy Metals (E_r^i) and Ecological Risk Indices of Moduganari Area (RI)

Locations	E_r^i							RI
	Cr	Cu	Ni	Cd	Hg	As	Pb	
S1	1.09	15.24	11.2	23007	3786	56.22	9.92	26886.7
S2	1.78	19.55	8.31	22085	2476	88.75	8.11	24687.5
S3	2.38	12.9	5.86	18003	3184	51.23	15.23	21274.6

Table 5: Calculated Ecological Risk Indices of Individual Heavy Metals (E_r^i) and Ecological Risk Indices of Bulumkutu Area (RI)

Locations	E_r^i							RI
	Cr	Cu	Ni	Cd	Hg	As	Pb	
S1	1.29	16.32	12.00	24307	5078	63.78	11.8	29490.2
S2	2.08	22.48	11.20	23307	3658	96.81	9.77	27107.3
S3	2.90	15.60	6.96	20550	4396	59.64	16.32	25047.4

Table 6: Calculated Ecological Risk Indices of Individual Heavy Metals (E_r^i) and Ecological Risk Indices of Jiddari/Polo Area (RI)

Locations	E_r^i						RI	
	Cr	Cu	Ni	Cd	Hg	As	Pb	
S1	0.93	13.03	9.42	21245	3066	49.32	8.58	24392.3
S2	1.49	18.01	7.44	19305	1846	76.6	6.96	21261.5
S3	2.12	10.65	4.54	15995	3444	42.55	11.8	19510.7

Table 7: Adverse Effect indices of seven potentially harmful heavy metals in the Moduganari Solid Waste Samples

Locations	Cr	Cu	Ni	Cd	Hg	As	Pb	
S1	0.61	3.04	71.87	135.33	108.8	6.01		1.56
S2	1.08	3.87	53.29	129.91	71.15	9.49		1.27
S3	1.37	2.58	37.57	105.91	91.49	5.48		2.39

Table 8: Adverse Effect Indices of Potentially Harmful Heavy Metals in the Bulumkutu Solid Waste Samples

Locations	Cr	Cu	Ni	Cd	Hg	As	Pb	
S1	0.75	3.26	77.07	142.99	145.92	6.82		1.85
S2	1.19	4.33	71.73	137.10	105.12	10.35		1.53
S3	1.67	3.12	44.66	120.88	126.32	6.37		2.56

Table 9: Adverse Effect Indices of Potentially Harmful Heavy Metals in the Polo Solid Waste Samples

Locations	Cr	Cu	Ni	Cd	Hg	As	Pb	
S1	0.54	2.61	6.045	124.97	88.10	3.28		1.35
S2	1.38	3.60	47.71	113.56	53.05	8.19		1.09
S3	1.22	2.13	29.13	94.09	98.97	4.55		1.85

Cd has the highest Eir values (15995 to 23007) followed by Hg (1846 to 3786), indicating dangerous potential ecological devastation (Tables 4 to 6). Other heavy metals (Cr, Cu, Ni and Pb) had Eir less than 20, implying that they are low potential ecological risk. Based on the calculated RI (19510.7 to 29490.2), the solid waste from all the study locations exhibited hazardous potential ecological risk. The study area with high Eir and RI, are considered as hotspots of Hg and Cd pollution (Tables 7 to 8). Results from Eir and RI within the study area need urgent attention. The magnitudes of the adverse effects (AEI) of the studied metals on the benthic biota were assessed by contrasting entire concentrations of individual heavy metals to their threshold effect levels (Munñoz-Barboza *et al.*, 2012; Baraud *et al.*, 2017) as follows:

$AEI = \frac{[Mi]}{TEL}$

[Mi]

[Mi] is the concentration of the heavy metal i

TEL is the Threshold Effect Level of the metal i, a minimum concentration below which biological effects are expected to occur rarely. According to the above equation, if the AEI is less than 1, the concentration of a metal is not high sufficient to root adverse effects to the benthic organisms. In contrast, an AEI value greater than 1, suggests that the metal could cause adverse biological effects. Except Cr at point S1, the heavy metal concentrations in the solid waste samples exceeded the TEL value of 1. Results from AEI shows that Cd, Hg and Ni are most likely to induce negative biological effects followed by

Cr, Cu and Pb (Tables 7 to 10). AEI values shows that the study area is highly polluted; requiring urgent remediation efforts. Hence, the ecological risk and adverse effect assessment identified Cd and Hg as the biggest pollutant in the solid waste. Thus, potential ecological risk indices demonstrated that Cd and Hg had hazardous effects and moderate potential effect for other metals, whereas AEI values suggested adverse biological effects for all the metals except Cr.

Conclusion

The analyses show that samples collected is sporadically tainted by heavy metals. The disposal of waste from residential areas is the main source of solid waste heavy metals. Metal works are also contributory factors. Cd and Hg pose most serious ecological risk to study area. According to AEI values, all the metals are envisaged to produce adverse biological effects. The results of all the samples are higher than the permissible limit of such metals as spelt out by the World Health Organisation (WHO). The study further indicated that the study area is out in the open to high loadings of potentially harmful heavy metals. Based on the findings of the study the following recommendations are forwarded. The residents are to be more enlighten on the possible sources of heavy metals; discard the remnant solid waste in a manner that is friendly to the environment; detoxifier should be used in order to reduce negative impacts of the waste deposited at various dump sites.

References

- Al-Khashman, O. and Shawabkeh, R. (2006). Metal distribution in soils around the cement factory in southern Jordan. *Environmental Pollution*, **140**:387-394.
- Bakirdere, S., and Yaman, M. (2008). Determination of lead, cadmium and copper in roadside soil and plants in Elazig, Turkey. *Environmental Monitoring and Assessment*, **136**(13):401-410.
- Baraud, F., Leleyter, L., Lemoine, M. and Hamdoun, H. (2017). Cr in dredged marine sediments: Anthropogenic enrichment, bioavailability and potential adverse effects. *Marine Pollution Bulletin*, **15**, 303-308. <https://doi.org/10.1016/j.marpolbul.2017.05.039>
- Charlesworth, S., Everett, M., McCarthy, R., Ordonez, A. and De-Miguel, E. (2003). A comparative study of heavy metal concentration and distribution in deposited street dusts in a large and a small urban area: Birmingham and Coventry, West Midlands, UK. *Environment International*, **29**:563-573.
- Chiroma, M.A; Isa, A.H; Usman, A.S; Kagu, A; & Ijafiya, I. (2016). Impacts of infill development on land use in Ibrahim Taiwo Housing Estate, Maiduguri, Nigeria. In Proceedings of International Conference on Science, Technology and Social Sciences 2016(ICSESS2016) Universiti Teknologi Malaysia.
- Fergusson, J. E., and Kim, N. D. (1991). Trace elements in street and house dusts: sources and speciation. *Science of the Total Environment*, **100**:125-150.
- Hakanson, L. (1980). An ecological risk index for aquatic pollution control: *Sedimentological Approach of Water Resources*. **14**:975–1001.
- Hamnett, S. (2011). Designing high-density cities for social and environmental sustainability. *Australian Planner*, Mar 1; 48(1):61-4
- Kalac, P. and Svoboda, L. (2001). A review of trace element concentration in edible mushrooms. *Food Chemistry*, **69**:273-281.
- Lee, P., Yu, Y., Yun, S. and Mayer, B. (2005). Metal contamination and solid phase partitioning of metals in urban roadside sediments. *Chemosphere*, **60**(5):672-689.
- Lynch, S. R., and Baynes, R. D. (1996). Deliberations and evaluations of the approaches, endpoints and paradigms for iron dietary recommendations. *The Journal of Nutrition*, **126**:2404-2409.
- Muñoz-Barboza, A., Gutiérrez-Galindo, E. A., Daesslé, L. W., Orozco-Borbón, M. V. and Segovia-Zavala, J. A.(2012). Relationship between metal enrichments and a biological adverse effects index in sediments from Todos Santos Bay, northwest coast of Baja California, México. *Marine Pollution Bulletin*, **64**, 405-409.
- <https://doi.org/10.1016/j.marpolbul.2011.11.023>
Accessed on 23rd /09/2016 at 6:00 Pm.
- Richard, L and Mollie, B.H (2006). The tropical waste dilemma: waste management in Panama. *International Journal of Emerging Markets*, Vol. 1 Issue: 3, pp.225– 234.
- Waziri, M. (2012). Spatial Pattern of Maiduguri City: Researchers' Guide: Adamu Joji Publishers, Kano City.
- Waziri, M; Kagu, A and Monguno, A.K (2009). Issues in the Geography of Borno State. Adamu Joji Publishers: Kano.