

Plastic Waste Management and The Health Security of Rural and Urban Residents In Benue State

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Abstract

Poor plastic waste management remains one of the major challenges confronting the sustainable health security of rural and urban residents in Nigeria. The risks associated with the ugly incidence ranged from contamination of water sources and food chain, air pollution to chemical exposure with varying degrees of harm of human health. This study therefore, is a comparative assessment of the effects of poor plastic waste management on health security of rural and urban residents of Makurdi Local Government Area in Benue State, Nigeria. The focus was to examine the health risks which rural and urban residents in the area suffer as a result of improper or poor management of plastic waste products. Data were gathered from 400 respondents primarily through the use of semi – structured questionnaire (SSQ), while the supplementary tools were personal observation and secondary data sources like books, journals and other relevant online materials. Findings of the study revealed that poor management of plastic waste products has very severe harm on the health security of residents in the study area. The study concludes that plastic waste compromises the health security standards of both residents and the environment therefore, it should be managed effectively. The study recommends the initiation of an action plan to encourage behavioral change towards plastic waste management and investment in infrastructural development by both private and public agencies to manage waste effectively as part of the measures to tackle the menace.

Keywords: Plastic Waste, Management, Health Security, Low Density, Polyethylene, Effect

Introduction

Plastic waste management remains one of the global environmental challenges affecting sustainable health security in both local and metropolitan societies nowadays. Over the years, the use of plastics has become ubiquitous in human lives. From manufacturing to storage to cooking and other diverse areas, plastics are used in homes, schools, hospitals, business and markets premises, among other places. Plastics are found in educational materials, cooking utensils, on the international space station, in medical equipment, and indeed every job and livelihood on the earth. However, its single use and re-use convenience has posed challenges to health and the ecosystem, which is now affecting humanity.

Plastic waste used here refers to discarded plastic items and materials including packaging, products, and microplastics that are disposed of in an environment that adversely affects wildlife, wildlife habitat, and humans. Put differently, Plastics waste is essentially any plastic material that is no longer needed, discarded or destined for disposal. It encompasses a wide range of items from single – use plastics like bags and bottles to larger plastic products and microplastics that have broken down in to smaller pieces. The plastic waste is eventually broken down or

degenerated into particulates and are classified according to size into micro-plastics (<5mm) and nano-plastics (1-100 or 1-1000 nm) contaminating the entire environment (comprising air, water and land) causing various diseases and posing a threat to global public health. Some of the exposure pathways to these health challenges include: ingestion of the degenerative plastic products through contaminated food and water (in the form of seafood and table salt), inhalation (airborne micro- and nano-plastics including fibres from synthetic textile or dust) and via dermal contact (Jiang et al, 2020).

Health security on the other hand is conceived as the necessary actions, both proactive and reactive, to minimize the risk from severe public health events that could endanger populations across geographical and international lines. Therefore, health security focuses on protecting against threats that are consistent with pre-existing public health conditions. In essence, health is an invaluable resource that no community can afford to lose. The absence of this protection leads to public health insecurity, where individuals or groups face actual or perceived threats to their health. Conversely, health security exists when these threats are absent (Akpehe et al, 2020; WHO, 2019)

Plastic waste severely jeopardizes the health security of the population, especially where its management is poor. Improper and indiscriminate disposal of plastic waste including used chemical containers directly exposes residents to harmful chemicals leaching into food and water, thereby compromising the health status of residents (Gemini, 2025). According to the United Nations (UN), decades of overuse and a surge in short-lived, single-use plastics, has led to a global environmental catastrophe. Up to 12 million tons of plastics are being swept into the oceans annually and gyres, or so-called 'islands of plastic', are blossoming. While most plastics are expected to remain intact for decades or centuries after use, those that do erode end up as micro-plastics, consumed by fish and other marine wildlife, quickly making their way into the global food chain (Adewole, 2012). It is estimated that 1,000,000 plastic bottles are bought every minute and 500,000,000,000 plastic bags are used each year. About 13,000,000 tons of plastics leak into the ocean each year with 100,000 marine animals being killed by plastics annually. Scientists say, it takes 100 to 500 years or even more, for plastic to degrade in the environment and even after that, particles of it exist, of which can mostly be harmful (Akpoghome, 2020).

Plastic waste generation and mismanagement have direct consequences on human health and environmental sustainability. In many developing countries, waste rejection, and environmental emissions have resulted in the accumulation of plastic materials in water systems resulting in pollution of the water and adjoining ecosystems. The adoption of plastic materials such as polyethylene terephthalate (PET) and low/high-density polyethylene (L/HDPE) for food and water packaging in sub-Saharan Africa (SSA) has contributed to large volumes of discarded plastics in the region (Alaerts et al., 2018). This has become a serious threat to aquatic life, drinking water management, and public health security in general.

Plastic waste accumulation continues to pose developmental challenges for the provisioning of good drinking water for populations globally. The importance of drinking water is manifested in the amount of water in a fat-free body mass (Andrady, 2011). Ingestion exposure is the major pathway for many substances that enter the human body. In many regions around the world, plastic packaged water is the drinking water of choice for large populations (Geyer et al., 2017; Allen et al., 2019). Packaged water is generally sourced from surface water, underground well/borehole water, and municipal supplies, while the package may be virgin or recycled. Freshwater systems, including ground water wells, rivers and streams, remain significant sources of potable water for the vast majority of rural communities in Africa. The ultimate target of sustainable development goal (SDG) 6.1 is the universal supply of affordable drinking water by all and for all by 2030 (United Nations, 2020).

Although plastic materials are environmentally persistent, they are not stable and may undergo degradation, fragmentation, diminution, depolymerization, and demineralization (Nelms et al., 2019; Nkwachukwu et al., 2013). Various factors, including chemical, microbial, mechanical, and ultraviolet rays from the sun weaken the plastic material and eventually break its structural integrity. Generally, plastics are invasive materials with an indefinite life span,

that once produced require centuries or millennia to disintegrate, and particulate plastics may enter the global food chain. Plastic materials in contact with water may introduce these minute plastic materials into the water, which can then be ingested and may cause potential adverse health effects. Water treatment plants continue to face technological deficiencies in achieving 100% removal of particulate plastics in raw water systems (Nam et al., 2010; Wang, 2020b).

In many developing countries, rural communities drink water directly from freshwater systems without any depuration. On the other hand, municipal water supply systems rely on treatment programs such as filtration, ionization/deionization, and chemical/biological disinfection to process freshwater and deliver safe potable water to populations. Water treatment plants all over the world have been challenged by the presence of particulate plastics in raw water, and the removal of particulate plastics in waste water. An exploratory study conducted by Plastic Europe (2019) confirmed the presence of particulate plastics in advanced water treatment systems with indications that the particles could originate from abrasive weathering of plastic materials used in water purification. Plastic particles have also been sampled from borehole and well drinking water (Pivnenko et al., 2016; Tanaka et al., 2020).

Due to the inevitability of particulate plastics exposure in drinking water and their uncertainties in human health risk characterization, the scientific community continues to advance research that will improve our understanding of particulate plastics exposure. Particulate plastics are identified as an emerging environmental contaminant that will impact the integrity of global water resources but to what extent this and the resulting impact on human and environmental health will be, is still being determined. What is certain is that global, regional and national initiatives must interplay to drastically reduce their release and trophic accumulation. The subsequent narratives highlight the production and management of plastics and the impacts of particulate plastics on the environment and human health with a focus on Africa (Tait et al., 2019).

Also, 90 per cent of bottled water is found to contain plastic particles with 83 per cent of tap water having also been found to contain plastic particles. Recognizing the great danger these portend, the UN General Assembly included the issue of plastic pollution as a priority during the 73rd Session. The World Economic Forum in 2023 published research that revealed the presence of microplastics in 50 per cent of bottled water. The test revealed that only 17 bottles were free of plastic out of 259 examined. The average human consumes about 70,000 microplastics annually and plastic pollution has doubled over the past 50 years. Garcia & Mandy (2019) specifically highlight the varying adverse effects of plastic pollution, while rating Nigeria as number two in plastic imports in Africa. Exposure to plastic pollution can result in a variety of adverse effect on human health. As a result of the nano degeneration of plastics and their continuing interaction with the environment and ecosystem, the nano particles become potential carcinogens to the causation of many cancers both in the pediatric and adult age populations. Other effects of this degradation are but not limited to birth defects and impaired immunity. Thus, there has been a causal link between plastic pollution and the growing health problems in today's generation. For instance, there is a surge of non-communicable disease (cardiovascular diseases, respiratory disorders, cancers, diabetes mellitus, chronic inflammatory diseases, autoimmune disorders) in the general population. It is generally presumed that, the present ailments linked to this increasing trend of pollution (affecting the global food chain) may just be the tip of the ice-burg if the local and global control of this peculiar type of pollution is neglected.

There is likelihood from the foregoing that plastic production and consumption in Nigeria is set to increase even without concrete ways of managing its attendant waste. In the wake of these subsisting realities, not many researches have been conducted on the effect of plastic waste management on health security of rural and urban residents where the rate of plastic consumption is assumed to be very high and frequent. There is therefore a dire need to gather empirical evidence on the effects of poor plastic waste management on the health security of residents for informed action on public safety, effective management and social sustainability. It is against this backdrop, this study is therefore designed to examine the effects of plastic waste management on the health security of rural and urban resident in Benue state with the

following specific objectives; to ascertain the nature of waste management, examine the effects plastic waste management on health security, and assess the challenges of protecting the environment against plastic waste management in the study area.

Methodology

Study Setting

The study area of this research is Makurdi Local Government Area of Benue State in central Nigeria. Makurdi is the capital city of Benue State and has maintained the status since 1976 when Benue State was created out of the then Benue/Plateau. It is located on the main narrow gauge railway line running North from Port-Harcourt. Makurdi lies between longitude 8^o and 9^oEast and between latitude 7^o and 8^o Northern the Southern guinea savannah zone in the middle belt region of Nigeria. 80% of its population derives their livelihood from agriculture. According to the NPC Projection (2024), Makurdi Local Government Area has an estimated population of 433,700. It covered a total mass of 80.4km. It is bordered on the West and North by Lafia, Keana and Doma LGA of Nasarawa State, on the East by Guma LGA and on the south by Gwer and Gwer west LGA. The Local Government Area is divided into two major blocks by River Benue hence the north and south banks and has eleven council wards out of which five of them are classified as rural, while six are urban. As a state capital and commercial hub housing people of various statuses, Makurdi has become an epicenter of all sorts of plastic waste, which necessitates its choice as the setting for this study.

Study Population, Sample Size, Sampling Procedure

The study population comprises both urban and rural residents of Makurdi Local Government Area whose estimated population, according to the National Population Commission's projection in year 2022, totaled 433,700 persons. However, due to the vastness of the study area and resource constraints, only 400 respondents were sampled using Taro Yamane's formula to represent the entire afore - mentioned population. The study employed both cluster and purposive sampling techniques to select its actual respondents.

Data Collection and Analysis

Data were gathered primarily through the use of semi - structured questionnaire (SSQ), while the supplementary tools include: personal observation and secondary data sources like books, journals and other relevant online materials. The gathered data were analyzed quantitatively using simple frequencies distribution tables and percentages. The Statistical Package for Social Sciences (SPSS), version 27 was also used to aid the analysis.

Results and Discussions

Socio-Demographic Attributes of Respondents

The socio-demographic characteristics of the respondents captured in this study include sex, marital status, age, occupation, educational attainment and income.

Table 1: Socio-demographic Variables Distribution

Variables	Frequency (f) n = 400	Percent (%) % = 100
Sex		
Male	257	64.2
Female	143	38.8
Age Category		
18 - 30 years	232	58
31 - 64 years	148	37
65 years and above	20	5
Marital Status		
Single	272	67.9
Married	128	32.1
Educational Attainment		
Primary	66	16.5
Secondary	117	29.3
Tertiary	200	50.0
None	17	4.2
Occupation		
Civil servants	88	22.0
Traders	71	17.8
Famers	121	30.2
Artisans	60	15.0
Students	60	15.0
Annual Income		
<50,000	104	26.0
51,000-100,000	140	35.0
101,000-150,00	111	27.8
151,000-200,000	45	11.2

Source: Field Survey, 2025

Table 1 presents data on various socio-demographic variables as they relate to the respondents. In terms of the sex of respondents, the statistical data indicate that 257 (64.2%) respondents were male and 143(35.8%) respondents were female. Data on age also indicated that 232 (58%) respondents were within the age bracket of 14 –30 years, 148 (37%) respondents were between 31 and 64 years, while 20 (5%) respondents were greater than 64 years.

In terms of marital status, data showed that 272 (67.9%) respondents were single, whereas 128 (32.1%) respondents were married. The study also found that 66(16.5%) respondents acquired only primary education, 117(29.3%) respondents acquired secondary education, and 200(50%) respondents had tertiary education while, 17(4.2%) respondents had not acquired any formal education. Furthermore, the occupational distribution of the respondents depicts that 121 (30.2%) respondents were farmers, 60(15%) respondents were artisans, 71(17.8%) respondents were traders while, 88(22%) respondents were core civil servants, while, 60(15%) respondents were students

Finally, the annual income of the respondents, as depicted in Table 1, shows that 104 (26%) respondents earn less than NGN 51,000 annually, 140 (35%) respondents earn NGN 51,000 to 100,000 annually, 111 (27.8%) respondents earn NGN 101,000 to 150,000 annually, and 45 (11.2%) respondents earn NGN151, 000 to 200, 000 annually.

Types of Plastic Waste found among Rural and Urban Residents in Makurdi

This section of the study dwells on the types of plastic waste commonly found among urban and rural residents in the study area, which ranged from Polyethylene terephthalate to Polycarbonate as indicated in Table 2.

Table 2: Types of Plastic Waste

Type of Plastic Waste	Frequency (<i>n</i> = 400)	Percentage (%) (% = 100)
Polyethylene terephthalate or stomach plastic	92	23.1
High density polyethylene	33	8.3
Plastic container	54	13.6
Low density polyethylene	143	35.7
Polypropylene	52	13.1
Polystyrene	17	4.1
Polycarbonate	9	2.1

Source: Field Survey, 2025

Information in Table 2 depicted the various types of plastic waste obtainable among the ruralites and urbanites in Makurdi. Very specifically, 92 (23.1) respondents maintained that polyethylene terephthalate or stomach plastic is the most common type of plastic found around, 33 (8.3%) respondents were of the opinion that high density polyethylene was most common, while to 54 (13.6%) respondents, the common type of plastic waste was used (plastic) containers, 143 (35.7%) respondents averred that low density polyethylene was the most common type of plastic waste, 52 (13.1%) respondents indicated that polypropylene was the common type of plastic waste, 17 (4.1%) respondents maintained that polystyrene was the most common type, while 9 (2.1%) respondents averred that it was polycarbonate that was the most common type of waste.

From the foregoing, it could be inferred that low - density polyethylene is the most common form of plastic waste found in the study area probably due to its affordability, accessibility and portability. Since this type of plastic is relatively cheap and portable, it is used widely among market women / men, low and middle - range income earners in the area thereby accounting for its high waste volume. Furthermore, the low-density polyethylene plastics are readily available at stop - shops, provision store, farmers' markets and supermarkets etc. both in rural and urban areas thus, generating high level of waste at both locations. This finding corroborates that of Borelle et al. (2017) who averred that because the low-density polyethylene poses less harm to human health and its use is safe for food and beverages, makes this type of plastic the most widely used in the packaging of food, beverages and other. In a similar vein, Jambeck et al. (2015) also submitted that low - density polyethylene constitutes the most common forms of plastic waste found around in developing and developed societies due to their portability and versatility.

Effects of Plastic Waste Management on Health Security

This section dwells on the adverse effects of poor plastic waste management on the health security of residents.

Table 3: Effect of Plastic Waste Management on Health Security

Effects	Frequency (<i>n</i> = 400)	Percentage (% = 100)
Water - borne diseases	85	21.3
Malaria	28	7
Carcinogenic risks	94	23.6
Neurological& developmental issues	17	4.2
Cardiovascular disorder	87	21.6
Respiratory Illnesses	57	14.3
Hormonal system & metabolic disorder	32	8

Source: Survey, 2025

The statistics displayed in Table 3 on the effects of waste management on health security of residents showed that, 85 (21.3%) respondents opined that poor plastic waste management practices could contaminate water sources or bodies leading to water – borne diseases like typhoid, cholera, giardiasis, cryptosporidiosis and dysentery etc., 28 (7%) respondents averred that poor plastic waste management blocks water channels and causes water to log thereby breeding mosquitoes responsible for malaria, 94(23.6%) respondents maintained that poor plastic waste management causes carcinogenic risks, while 17(4.2%) respondents held that poor waste management inflicts residents with neurological and developmental issues. Furthermore, 87(21.6%) respondents indicated that poor plastic waste management exposes residents to cardiovascular disorders, 57 (14.3%) respondents submitted that poor plastic waste management leads to respiratory illnesses, whereas, 32(8%) respondents reported that poor plastic waste management could cause endocrine disorders interfering with hormonal systems and potentially leading to reproductive issues, and metabolic disorders.

The outcomes in Table 3 revealed that poor waste management poses great danger for the health security of residents, and the greatest manifestation of its effects is in the increasing rates of non-communicable diseases and cancers such as breast, lungs, gastrointestinal cancers in the area. Further findings had discovered that the indiscriminate burning of plastic waste releases highly toxic substances into the air, including dioxins, furans, polycyclic aromatic hydrocarbons (PAHs), and heavy metals that if inhaled, contributes to respiratory conditions like asthma, bronchitis, and chronic obstructive pulmonary disease (COPD) among residents. Plastic waste dumped indiscriminately into rivers, streams, and other water bodies have clogged waterways and caused water stagnations which serves as breeding grounds for disease vectors like mosquitoes and flies causing diseases such as malaria and cholera/diarrhea among others. In addition, the leaching of harmful chemicals (e.g., phthalates, bisphenol A (BPA)) from plastic wastes into water sources and food production chain poses a great challenge of endocrine disruption capable of interfering with hormonal systems and potentially leading to reproductive issues, developmental problems, and metabolic disorders. These have significantly compromised the health security of residents in the study area. The findings corroborated the results of the earlier study by Akpehe et al, (2020), which revealed that indiscriminate disposal of used agrochemicals containers among user – farmers in Benue local communities has far reaching effects on the health security of the locals with some health complications ranging from skin irritation, eye irritation, dizziness, fatigue, headache, abdominal pain, vomiting and erectile dysfunction.

The Challenges of Protecting the Environment against Plastic Waste

This section of the study dwells on the challenges associated with proper management of plastic waste in both rural and urban areas of Makurdi.

Table 4: The Challenges of Protecting the Environment against Plastic Waste

Challenges	Frequency (n = 400)	Percentage (% = 100)
Lack of political will	99	24.8
Ignorance	70	17.5
Absence of trained waste managers	90	22.5
Poor Funding	96	24
Absence of facilities for waste management	45	11.2

Source: Field Survey, 2025

The statistical outcomes in Table 4 about challenges associated with plastic waste management indicates that 99(24.8%) respondents blamed poor plastic waste management on lack of political will for waste management, 70 (17.5%) respondents attributed it to ignorance, 90 (22.5%) respondents blamed it on the absence of trained waste managers, 96(24%) respondents averred that poor funding by government and non-governmental organizations was responsible for

the challenges in the management of plastic waste, while 45 (11.2%) respondents opined that the poor state of waste management infrastructure was the major challenge involved in managing plastic waste. These findings imply that the challenges confronting effective plastic waste management in the rural and urban areas of Makurdi are majorly systemic. It also implies that the challenges are multifaceted requiring wholistic approach in addressing both the structural and knowledge gaps in waste management. The attribution of poor plastic waste management in the area to lack of political will and inadequate funding suggests that governmental support and resource allocation are critical to overcoming these challenges if the battle against poor plastic waste management must be won.

Conclusion and Recommendations

The study examined the effect of public waste management on the health security of Makurdi residents. Findings of the study showed that there are severe health security risks associated with poor plastic waste management ranging from contamination of water sources, air pollution to chemical exposure. The high percentage of respondents attributing poor waste management to carcinogenic risks, cardiovascular disorders, and respiratory illnesses indicates the harmful effects of this menace. Furthermore, the indiscriminate dumping and burning of plastic waste not only exacerbate waterborne and vector-borne diseases but also lead to endocrine disruption and developmental problems, ultimately compromising the well-being and health security of rural and urban residents who do not always suspect the danger it portends. The study concludes that plastic waste compromises the health security standards of both residents and the environment therefore, it should be managed effectively. The study recommends the initiation of an action plan to encourage behavioral change towards plastic waste management and government investment in infrastructure to manage waste effectively. Others include; implementing more environmental-friendly policies and initiatives, innovating new processes and incentives to stimulate effective recycling practices of plastic waste, as well as initiating a strong, meaningful collaborative partnerships between government, industry, and the consumers in effective management of plastic waste in the area.

References

- Adewole, A. T. (2012). 'Waste management towards sustainable development in Nigeria: A case study of Lagos state.
- Akpehe, G. A., Akuhwa, T., Chinta, E. T. & Mase, J. A. (2020). Indiscriminate disposal of used agrochemical containers and the health security of small holder rural farmers in Benue State. *Benue Journal of Social Sciences*, Makurdi, 7(1), 131 - 147.
- Akpoghome, T. (2020). Managing Domestic Waste in Nigeria: Legal Framework, Problems and Solutions. *International Journal of Environment, Ecology, Family and Urban Studies (IJEEFUS)*, Vol. 4, Issue 6, 7-28
- Alaerts, L., Augustinus, M., Van Acker, K. (2018). Impact of Bio-Based Plastics on Current Recycling of Plastics. *Sustainability*, 10, 1487;
- Allen, S., Allen, D., Phoenix, V.R. *et al.* (2019). Atmospheric transport and deposition of microplastics in a remote mountain catchment. *Nat. Geosci.* 12, 339-344 (2019).
- Andrady, A. L. (2011). Microplastics in the marine environment, *Mar. Pollut. Bull.* 62, 1596-1605.
- Borelle, S. B., Chelsea M., Rochman, M., Liboiron, A. L. Bond, Amy, L., Hillary, B., & Jennifer F. Provencher. (2017). *Opinion*, 114(38), pp. 9994-9997.
- Garcia, B., & Mandy, M. F. (2019). "Marine Plastic Pollution in Asia: All Hands on Deck!" *Chinese Journal of Environmental Law* 11-46.
- Geyer, R., Jambeck, J. R. & Law, K. L. (2017). Plastics. Production, use and fate of all plastics ever made. *Science Advances* (3), 1-5.
- Jambeck, J. R., R. Geyer, C. Wilcox, T.R. Siegler, M. Perryman, A. Andrady, R. Narayan., & K.L. Law. (2015). "Plastic Waste Input from Land into the Ocean." *International Solid Waste Association* 768-770.

- Jiang, B., Kauffman, A. E., Li, L., McFee, W., Cai, B., Weinstein, J., et al (2020). Health impacts of environmental contamination of micro- and nanoplastics: a review. *Environ Health Prev Med.* 25, 29. <http://doi.org/10.1186/s12199-020-00870-9>.
- Kehinde, O., Ramonu, O.J., Babaremu, K.O., Justin, L.D., (2020). Plastic wastes: environmental hazard and instrument for wealth creation in Nigeria. *Heliyon*, 6.
- Mangold, H., von Vacano, B., (2022). The Frontier of Plastics Recycling: Rethinking Waste as a Resource for High-Value Applications. *MacromolChem Phys* 223, 1-17. <https://doi.org/10.1002/macp.202100488>
- Mazhandu, Z.S., Muzenda, E., Belaid, M. et al. (2023). Comparative assessment of life cycle impacts of various plastic waste management scenarios in Johannesburg, South Africa. *Int J Life Cycle Assess*, 28, 536-553
- Nam, S., Seo, Y., Kim, M. (2010) Bisphenol A migration from polycarbonate baby bottle with repeated use. *Chemosphere* 79 (2010) 949-952.
- National Population Commission (2022). *Projection Priority Tables Volume 1*. National Population Commission
- Nelms, S. E., Barnett, J., Brownlow, A. et al. (2019) Microplastics in marine mammals stranded around the British coast: ubiquitous but transitory? *Sci Rep* 9, 1075 (2019).
- Nkwachukwu, O. I., Chima, C. H., Ikenna, A. O. et al. (2013). Focus on potential environmental issues on plastic world towards a sustainable plastic recycling in developing countries. *Int J Ind Chem* 4, 34 (2013).
- Pivnenko, K., Eriksen, M., Martín-Fernández, J., Eriksson, E., Astrup, T. (2016) Recycling of plastic waste: presence of phthalates in plastics from households and industry, *Waste Manage.* 54 (2016) 44-52.
- Plastics Europe (2019). Plastics - The Facts 2019: An Analysis of European plastics production, demand and waste data. <http://www.plasticseurope.org/application/files/9715/7129/9584/FINALwebversionplasticsthefacts201914102019.pdf> .
- Sun, Y., Wang, D., Li, X., Chen, Y., Guo, H., (2023). Public attitudes toward the whole life cycle management of plastics: A text-mining study in China. *Science of the Total Environment* 859, 159981.
- Tait, P., Brew, J., Che, A., Constanzo, A., Danyluk, A., Davis, M., Khalaf, A., McMahon, K., Watson, A., Rowcliff, K. and Bowles, D. (2019). The health impacts of waste incineration: a systematic review. *Aust NZ J Public Health*, Online; doi: 10.1111/1753-6405.12939
- Tanaka, K. et al. (2020). In Vivo Accumulation of Plastic-Derived Chemicals into Seabird Tissues. *Curr. Biol.* 30.
- United Nations (2020). The Sustainable Development Goals. UN, New York.
- Wang, Z., Lin, T., Chen, W., (2020b). Occurrence and removal of microplastics in an advanced drinking water treatment plant (ADWTP). *Sci.Total Environ*, 700.
- World Economic Forum (2023). Data benefits Ghana's fight against plastic pollution. <https://www.weforum.org/impact/data-benefits-ghana-fight-against-plastic-pollution/>
- World Health Organization (2019). Definition of health. Geneva, World Health Organization (WHO). <https://www.publichealth.com.ng/world-health-organisationwho-definition-of-health>.
- Yalwaji, B., John-Nwagwu, H., T.O. Sogbanmu, T., (2022). Plastic pollution in the environment in Nigeria: A rapid systematic review of the sources, distribution, research gaps and policy needs, *Scientific African*, 16.

Pictorials



Figure 1: Plastic waste products disposed by the riverbank.



Figure 2: Plastic waste products disposed in the local water source



Figure 3: Plastic waste products dumped in the water body



Figure 4: Plastic waste products dumped on a farm site.

Declaration:

I hereby declare that the above study is the outcome of the original research I carried out in collaboration with the other co - authors whose names are listed above. All authors whose works are cited in this research are dully acknowledged.

Dr. Godwin Akpehe