Policy Brief

Sustain Life Below Water,
Save Livelihoods & Human Health:
Evidence-Based Recommendations

[1,2]Temitope O. Sogbanmu

Key Messages

- There are increasing levels of priority and emerging pollutants in the Lagos lagoon, Nigeria, resulting in reduction in fish catch and adverse impacts on fisheries.

- The current environmental standards for Nigerian coastal waters do not include these priority and emerging pollutants. This has implications for sustainability of aquatic organisms (life below water – UN SDG 14) and ecosystem functioning.

- There is, therefore, an urgent need to develop contextual environmental guidelines for the priority and emerging pollutants.

- There is also need to mainstream stakeholder education and coastal communities' advocacy into environmental monitoring programmes.

Introduction (What's the Issue?)

Increasing levels of priority pollutants such as polycyclic aromatic hydrocarbons (PAHs), pesticides and emerging pollutants like pharmaceuticals and personal care products, plastics, polychlorobiphenyls, among others, have been observed in the Lagos lagoon, Nigeria. This is a cause for concern due to the cumulative and long-term adverse impacts on fisheries, other aquatic life and human beings whose livelihoods depend on these resources and who consume the fisheries. Therefore, there is an urgent need for contextual standards and frameworks for the management of this highly important aquatic ecosystem in Nigeria.

The Lagos lagoon is the largest of four coastal ecosystems in the Gulf of Guinea and bounds the most populous and metropolitan city of Lagos, Nigeria. The lagoon, due to its nature as an estuary, receives inputs and discharges into the Ogun River and the Atlantic Ocean depending on the tides and season. It provides various ecosystem services to the teeming population of Lagos and indeed Nigeria. For example, the lagoon supports one of the most robust and busiest seaports on the continent, the Lagos seaport which receives goods including petroleum products via ships, which berth at the Lagos harbour. Further, the lagoon is home to a few million coastal inhabitants who live and have their livelihood sustained by the fisheries resources and other ecosystem services afforded by the lagoon for over 60 years.

In order to manage aquatic ecosystems such as this and

following the dumping of hazardous wastes in the former Bendel state through a ship from the western countries in the early 1980s, the Federal Environmental Protection Agency (FEPA) was formed. The agency developed guidelines for environmental management including surface water quality guidelines adopted from foreign environmental agencies such as the United States Environmental Protection Agency (USEPA).

This agency was transformed into the Federal Ministry of Environment (FMENV) with the setup of various agencies including the National Environmental Standards and Regulations Enforcement Agency (NESREA) in the year 2007. This agency subsequently improved upon the environmental quality guidelines with the hope of taking into consideration the peculiarities of the Nigerian environment.

However, the guidelines were still majorly based on adopted guidelines with little emphasis on the peculiarities of surface waters in Nigeria. In 2015, several nations of the world including

Nigeria ratified the United Nations Sustainable Development Goals (UN SDGs) and the African Union (AU) Agenda 2063 goals to achieve a sustainable planet and the Africa we want by 2030 and 2063 respectively. One of the UN SDGs, SDG 14 borders on sustaining life below water which relates to ensuring the sustainability of aquatic life and resources.

Further, goal 7 of the AU Agenda 2063 goals is focused on environmental sustainability and climate resilience which aims to promote sustainable ways of managing the continent's natural resources and biodiversity among other priority areas.

Consequently, it becomes imperative for Lagos and indeed Nigeria more than ever before to evaluate the state of its aquatic ecosystems and take urgent actions to evaluate evidences to support contextual interventions and management plans to sustain its aquatic resources, livelihoods that depend on it and human health in the long term.

Evidence of Pollution in the Lagos Lagoon, Nigeria – Key Findings

Due to the tremendous anthropogenic pressure (Figure 1) on the lagoon over several decades including being a sink for run-off from non-point sources as well as a sink for direct discharge of wastes and effluents from thousands of industries which bound it, adverse impacts on fisheries and water quality have been reported in the lagoon ecosystem by several researchers [1-16].
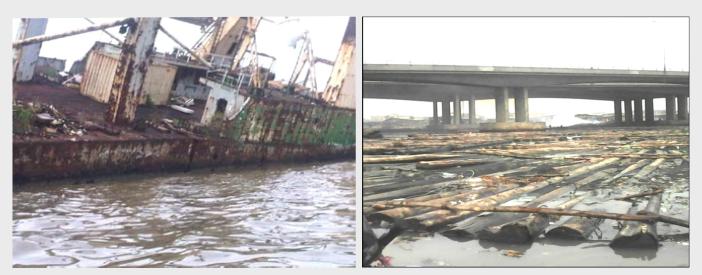

Figure 1: Abandoned ship (1A) and sawmill activities (1B) on the Lagos lagoon, Nigeria (Source: [9, 17])

Priority and Emerging Pollutants: Heavy metals, BTEX, phthalate esters, polychlorinated biphenyls, pesticides and pharmaceuticals have been detected in environmental matrices of the Lagos lagoon[12,18-21]. Cancer-causing PAHs are highest in surface water, sediments and fish species at shipping-prone zones (Atlas cove and Apapa) on the Lagos lagoon[22]. Based on robust ecological risk indices, six PAHs have been identified for intervention (Figure 2) [22]. Further, microplastics have been reported in the surface water, sediments and fisheries in the Lagos lagoon[16,28].
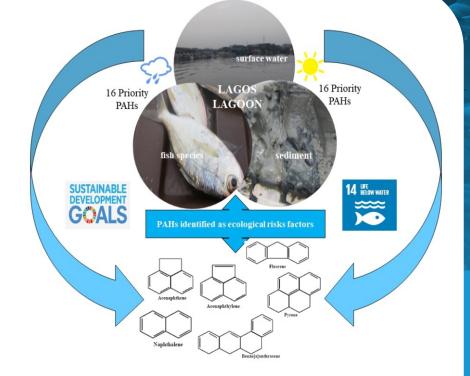
Figure 2: *Graphical abstract showing specific polycyclic aromatic hydrocarbons identified as ecological risk factors in the Lagos lagoon, Nigeria (Source: [22])*

Adverse biological effects due to pollutant mixtures in sediments: Cellular and genetic damage in rat and fish cell lines[24,25], developmental abnormalities and mortality in fish embryos exposed to sediment extracts from the Lagos lagoon have been elucidated[17,26].

Adverse Impacts on the lagoon's Biodiversity:
Hormonal dysfunction leading to expression of opposite sex characteristics in crab and fish species from the Lagos lagoon exposed at contaminated sites have been observed[15,27]. Also, studies have shown evidence of reduction in fisheries abundance and diversity[9,28,29] as well as abundance of pollution tolerant benthic macroinvertebrates[30] in the Lagos lagoon.

Fish Parasites in Captured Fishes from the Lagos lagoon:
Presence of parasites in fisheries resources of the Lagos lagoon with evidence of bioaccumulation of pollutants have been reported[31-34].

Poor Environmental Risk Knowledge of Coastal Communities/Dwellers:
Low level of education and lack of environmental risk awareness, advocacy and sensitization of coastal communities contributes to pollution in the Lagos lagoon[35].

Recommendations (Priority Actions)

→ **Contextual ecological risk indices and guidelines** should be developed based on the available research evidence of adverse effects of single and mixtures of pollutants on fisheries resources in the Lagos lagoon.

→ The **inclusion of specific PAHs** that pose risk to organisms in the Lagos lagoon in **ecomonitoring programmes** based on the UN Sustainable Development Goal 14 (life below water). The specific PAHs are naphthalene, acenaphthene, acenaphthylene, fluorene, pyrene and benzo[a]anthracene.

→ **Stakeholder education, sensitization and environmental advocacy** should be mainstreamed into environmental monitoring programmes of aquatic ecosystems in Lagos and Nigeria.

Acknowledgment

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Corresponding Author Contact Details:

[1]Ecotoxicology and Conservation Unit, Department of Zoology, Faculty of Science, University of Lagos, Akoka, Lagos, Nigeria
[2]Evidence Use in Environmental Policymaking in Nigeria (EUEPiN) Project, University of Lagos, Akoka, Lagos, Nigeria
Email: tsogbanmu@unilag.edu.ng; euepin@unilag.edu.ng
Website: https://euepin.unilag.edu.ng/; https://tosogbanmu.wordpress.com/

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