

## DISCUSSION PAPER:

**Monitoring pollution in Lagos Lagoon systems**

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**Introduction**

The Lagos Lagoon is the largest in an extensive coastal system in the Gulf of Guinea (Map 1). It is linked in the east to the Lekki Lagoon and to the sea at its western end, near Lagos. Although the water is saline close to this single outlet to the sea, the Lagoon is essentially a large expanse of shallow freshwater, being fed by a number of major rivers. It is approximately 20 km wide, 50 km long and 0.5-5 m deep (mainly <2 m in the main body of the Lagoon), excepting where it is dredged to about 25 m in and around Lagos harbour (Webb, J E., 1958). The Lagos conurbation, population ~10 million, is the industrial capital of Nigeria and accounts for ~70% of the nation's industries.

Domestic and industrial wastes, from the metropolitan area, and persistent pollutants carried by rivers enter the Lagoon and affect its environmental and economic status. Research [Ajao, E A (1990); Ajayi, T O et al. (1989) and Okaye, B C O et al. (1991)] has indicated that accumulation of pollutants, such as heavy metals, are affecting the ecological balance and threatening the livelihood of local fishing communities. In addition, increased national environmental awareness has placed a high priority on maintaining the aesthetics of the Lagoon.

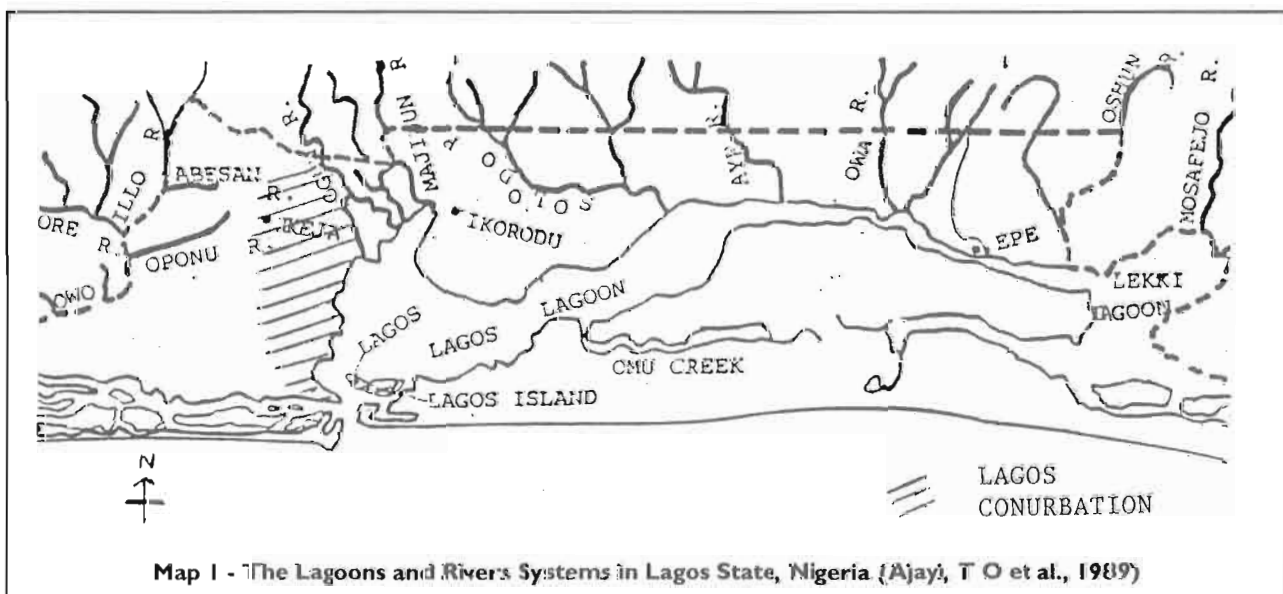
This paper describes briefly the sources and potential impacts of pollutants on the Lagoon, based on personal knowledge of the authors, site visits, available documentation and discussions with appropriate experts.. A pollution monitoring programme and possible actions to mitigate against pollution of the Lagoon are proposed. Funding for

this environmental monitoring and protection of the Lagoon, a component of the World Bank funded (IDA) Nigeria Environmental Management Project is being provided by the UK Overseas Development Administration (ODA).

**Impacts of pollution on the value of the Lagoon**

The Lagoon is of great value both locally and nationally. Of national importance is the diversity of flora and fauna that it supports. It provides transport of goods through the port as well as between villages along its banks. Locally it also provides water for drinking and for agriculture; a means for disposal of wastes; a source of food, especially fish and shellfish; sand which is dredged for use in the construction industry; a storage place for timber waiting to be processed; a site for recreation and a general amenity.

The value of the Lagoon is, however, reduced by some of the activities in and around it. The absence of a sewerage system in Lagos has led to a common practice of discharging untreated domestic and industrial wastes, directly or indirectly, into the Lagoon. Wastes interfere with the self-purification processes in the Lagoon; non-biodegradable chemicals accumulate up the food chain, affecting aquatic organisms and exposing humans to increased health risks. For instance, heavy metal contamination is a health hazard both for those who dredge sand and for those eating Lagoon fish in which metals have accumulated. Another reported but not quantified impact is on fish stocks.



Informal interviews with fish traders at the western end of the Lagoon indicated a reduction in both numbers and income.

### Sources of pollution

Most (potential) sources of pollution are concentrated at the western end of the Lagoon where the greatest concentration of heavy metals has been detected (Okoye, C O et al., 1991). There is the normal wide range of urban industries including breweries; manufacture of textiles, detergents, and pharmaceuticals; abattoirs and food processing; and petroleum industries. However other industries of local importance are the small and commercial fisheries, wood processing, and shipping. The absence of sewers and controlled sites for waste disposal leads to the discharge of tanker loads of septic tank sludge directly into the Lagoon (at Iddo Jetty). Apart from its oxygen demand, this organic waste results in a concentration of faecal organisms and hence a greater public health risk for people in this area or eating (shell)fish (especially undercooked) caught here. During one site visit (February 1992) faecal coliform count greater than 30,000/ml was obtained in an inlet close to the jetty. Additional pollution may be introduced by run-off from the extensive inter-island/mainland road network.

### Pollution monitoring programme

#### Objectives

- assessment of the present quality of the Lagoon in relation to flora, fauna and water quality;
- establishment of the hydrology of the Lagoon ;
- quantification of the health, financial and economic implications of pollution;
- devising appropriate solutions to clean and abate pollution; and
- establishing pollution control strategies to reduce pollution to acceptable levels within ten years.

#### Water quality monitoring

To provide baseline data on the Lagoon, a provisional list of parameters to be monitored has been prepared. Where possible, monitoring will be carried out on site. Analysis for parameters present at low levels or requiring sophisticated equipment, eg pesticides, will be laboratory based. The number and siting of sampling points will cover the whole of the Lagoon but will be concentrated at the western end of the Lagoon and possibly close to mouths of influent rivers. Depending on preliminary findings, frequency of monitoring will be established and the range of parameters may be modified. A long-term monitoring programme will be designed and implemented. To support this component, institution capacity building (human

resources development and laboratory facilities) is provided.

#### Effluent monitoring

To assess the scale of pollution and scope for remedial action, industrial (and septic tank) effluents will be monitored for quality and quantity. It is anticipated that consents will be established, within policy constraints, by negotiated rather than dictated agreements between industries and the enforcing agencies. Liaison between these actors, especially in relation to sequential improvements in effluent quality, should provide greater benefit in the long-term.

### Conclusion

Lagos Lagoon receives pollutants from a variety of sources. The quantity and impact of this pollution is largely unquantified. The project described briefly above aims to collect data on the effluents entering the Lagoon and the current status of the Lagoon itself. It is expected that the data collected during the project will lead to the design and implementation of a long-term monitoring programme for pollutants both in effluents and the Lagoon and the development of action plans to mitigate against impacts of pollution. The final outcome will be a reduction in levels of pollution entering the Lagoon and, hopefully a reduction in pollutants already present.

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### References

- Ajao, E A (1990) PhD thesis. "The influence of domestic and industrial effluents on populations of sessile and benthic organisms in Lagos Lagoon". University of Ibadan, Nigeria.
- Ajayi, T O, Ayinla, A O, Udolisa, R E K, Bolande, E O and Omotoyo, N O (1989). "Diagnostic survey of small scale capture and culture fisheries in Lagos State, Nigeria" Technical paper 56, Nigerian Institute for Oceanography and Marine Research, Nigeria.
- Dobie, P; Ince, M E and Winpenny, J T (1992). "Nigeria: Lagos Lagoon Project", Overseas Development Administration.
- Okoye, B C O, Afolabi, O A and Ajao, E A (1991). "Heavy metals in the Lagos Lagoon sediments". International Journal Environmental Studies Vol. 37 pp 35-41.
- Webb, J E (1958). "Ecology of Lagos Lagoon. The life-history of *Branchiostoma nigeriense* Webb". Phil. Trans. Roy. Soc. Bull. Vol 241, 335-353