RESEARCH
Proposals for Rehabilitation and Management of Isipingo Lagoon and Estuary, South Africa

SANJIV KALICHARRAN
ROSEANNE DIAB*
Department of Geographical and Environmental Sciences
University of Natal
King George V Avenue
Durban 4001, South Africa

ABSTRACT / The Isipingo lagoon and estuary, situated to the south of the Durban metropolitan area, on the east coast of South Africa, has been subjected to intense environmental degradation. Historical events, such as the building of a major airport and the development of an industrial township, have contributed to the reduction in water flow from $10^2 \times 10^6 \text{m}^3/\text{yr}$ to $3 \times 10^5 \text{m}^3/\text{yr}$ between 1952 and 1969. Current environmental issues such as water quality, litter, noise, air pollution, and solid waste dumping are described. A rehabilitation and management program that seeks to address these issues is proposed. The main objectives of this program are: the improvement of the water flow, the improvement of the water quality, and the curtailment of the destruction of littoral zone elements. The rehabilitation proposal is summarized by means of a flow chart, which lists short-, medium-, and long-term actions and identifies parties and/or organizations responsible for implementing the actions. A two-tier management structure is proposed, with the first level comprising an environmental monitoring committee, consisting of organizations with scientific expertise who would function in a watchdog capacity, monitoring restoration efforts and intervening where actions are contrary to the objectives of the rehabilitation program. The second level would consist of an estuarine management committee, which would be responsible for evaluating the restoration program and modifying objectives where necessary.

The Isipingo lagoon and estuary is situated on the east coast of South Africa at a latitude of 30°S, 21 km south of the center of the Durban metropolitan area. The river is only 27 km long and has a catchment area of 47 km² (Brand 1967). The mouth of the Isipingo River consists of both an estuary and a lagoon. The latter is frequently closed to the sea, whereas the former is connected to the sea by two pipelines (Figure 1).

Its geographical position in a rapidly expanding urban-industrial area has meant that the Isipingo lagoon and estuarine system has been subjected to the negative effects of urban development. According to the director (conservation) of the Wildlife Society of South Africa, no other estuary has suffered such abuse and degradation as has the Isipingo. Originally, this area was one of the finest estuarine and mangrove habitats on the entire Natal coast (Cooper 1985).

The objectives of this article are to document the historical events that have contributed to the degradation in the Isipingo lagoon and estuary, and to identify the current environmental issues that need to be addressed if the lagoon and estuary are to be successfully rehabilitated and managed. Thereafter, a management plan that seeks to address these issues is presented and discussed.

Historical Perspective

In tracing the historical developments that have contributed to the current degraded state of the Isipingo estuarine system, there emerge three distinct periods. The first period extends from the time of the early European settlement, initiated in the late 1840s, up to the year 1952. During this time, much of the indigenous vegetation was cleared for sugarcane cultivation, market gardening and township development. However, while the character of the vegetation surrounding the estuary changed dramatically during this period, the Isipingo River continued to function as a healthy estuary (Ward 1980). The Isipingo River was joined at the estuary by the Mlazi River, and the mean annual flow of the joint system was about $10^2 \times 10^6 \text{m}^3/\text{yr}$ (Swart 1987).

A dramatic change in the estuary came about in 1952, with the construction of the main airport for the city of Durban. The airport was constructed in the
floodplain of the Mlazi River, necessitating the diversion of the Mlazi into a concrete-lined canal, which now enters the sea 4 km north of the Isipingo estuary. The mean annual flow of the Isipingo system was reduced to $6 \times 10^6$ m$^3$/yr (Swart 1987), which resulted in the blocking of the river mouth by wave-deposited sand. An attempt to try to increase the tidal interchange was undertaken by installing two concrete pipes of 1 m diameter each below the sandbar (Ward 1980).

The third period commenced in 1969 and was marked by the development of the Prospecton industrial township, which led to the diversion of the Isipingo River, southwards into the Mbokodweni River, with sluice gates being installed at the head of the Prospecton canal system to regulate the flow and thereby prevent flooding of the industrial area. The diversion channel and sluice gates are indicated on Figure 1. The flow of the Isipingo River was reduced to $3 \times 10^6$ m$^3$/yr (Swart 1987), resulting in only 3% of the original flow.

Environmental Degradation: The Issues

Water Flow

The underlying problem in the Isipingo system is the inadequate flow, which prevents the estuarine system from functioning naturally. The sluice gates at the head of the Prospecton canal system are intended to remain open except in the event of floods or during maintenance of the canals. However, in practice, at least one sluice gate remains closed most of the time (Raiman 1989 personal communication). Furthermore, the Prospecton canals are poorly maintained, with silt, litter, hydrophytes, and industrial effluents severely reducing the flow into the canals. Both the sluice gates and the canals fall under the control of the Borough of Amanzimtoti, which has no controlling interest in the status of the Isipingo estuary, which is under the jurisdiction of the Borough of Isipingo.

Concomitant with the reduction in freshwater input to the Isipingo estuary is a reduction in sea-to-freshwater exchange. The reduced river flow, coupled with the northward longshore drift of sand, a characteristic feature of the coastline, has resulted in the virtual closure of the river mouth. Twin concrete pipes, which were installed below the sandbar to facilitate tidal interchange, have been unsuccessful. Benefits from the backwash effect of the sea only occur to the estuary during spring tides.

Water Quality

Poor quality water enters the Isipingo estuary as a result of upstream activities such as industrial effluent from the Prospecton industrial township, treated sewage effluent from Umldazi Waste Water Treatment Works, and also rapidly expanding informal settlements in the Isipingo catchment, which are without any form of water supply or sanitation. A number of surveys conducted by Umgeni Water testify to the poor quality of the water (Furness 1988) (Umgeni Water is the water supply authority in Natal). At five of the 11 sites sampled in the lower reaches of the

![Figure 1. Location map of study area.](image-url)