

POLLUTANT DISPERSION STUDIES — AN UPDATE ON THE PROBLEMS
IN INDIAN COASTAL WATERS

G.N. Swamy

National Institute of Oceanography
Dona paula, Goa

Pollutant dispersion problems along the Indian coastal waters are characterised by site-specificity, as a result of seasonal and physiographic variabilities. The following brief description will elucidate the point:

North Gujarat is typically a large-tide regime with occasional cyclonic activity. Saurashtra coast has peculiar east-west tilt along the general north-south alignment of the west coast. Gulf of Khambhat (Cambay) is influenced by large river systems. North Maharashtra coast is typical of large inter-tidal zone with extensive rock outcrops. Both tide and wind dominate the regime, leading to well-mixed conditions almost throughout the year.

While Konkan coast is characterised by moderate tides, systematic winds and currents, the adjoining creeks and promontories have definite influence on these. Water temperature variations too are pronounced; the atmospheric temperature has shown intricate variabilities.

Presence of large rivers, estuaries and backwaters will add multiple dimensions to the problems of waste disposal because of the sensitivity of freshwater systems. Karnataka and Kerala coasts are distinctive in this respect. Further, the adjoining sandy stretches pose many other difficulties for the construction of sea outfalls.

Despite moderate tides, currents and other oceanographic activities, the coastal usage is hindered by excessive sand transport specially along, and possibly across, the shores of

Tamilnadu. Vertical gradient of water temperature is strong and the bathymetry is such that deep waters are encountered at a short distance from the shore.

Tuticorin may be similar to Madras coast except for the typical climatic features such as higher temperature, lower humidity, meagre precipitation, etc. Oyster beds, which are extensive here, are very susceptible to thermal damages.

Kanyakumari has a peculiar east-west setting and is close to a bioreserve. It is subject to the oceanographic influences of both the Bay of Bengal and the Arabian Sea. Tides being negligible, winds dominate the currents. Winds being strong and erratic, waves and currents too are unpredictable. Water temperature exhibits abrupt variations presumed to be the result of large-scale mass exchange.

Northern parts of the east coast of India are prone to severe cyclonic activity. They are also influenced by large river discharge.

The variabilities associated with the southwest and northeast monsoons over the Indian waters are all too well known.

In India the use of sea for domestic and industrial waste disposal has been of growing concern in recent years. Three of our four metropolitan cities are along the coast. A variety of industries directly using sea as a source and/or sink have been established. The industries include, among others,

Soda ash factories in Saurashtra coast

Petrochemical complex along the Gujarat coast

Various chemical factories in the Maharashtra -Gujarat coasts

Giant fertilizer factory near Bombay

Petrochemical industries in the Raigad belt

Beach resorts in Goa

Caustic soda factory in Karwar

Fertilizer and iron ore handling at Mangalore

Assorted chemical units along Cochin coast

Titanium factory of Trivandrum

Chemical plants at Tuticorin and along Madras coast

Paper pulp and other industries along Pondicherry coast.

In addition, there two atomic power stations on the sea shore presently-- Tarapur and Kalpakkam. Both Tarapur and Kalpakkam will soon have additional units. Kanyakumari region is considered for another nuclear power project. Jaitapur near Ratnagiri is yet another site for nuclear power generation in future. A nuclear fuel complex is expected near Tuticorin. There are a few thermal power stations also along the Indian coastline. Mangalore and Kanyakulam are going to have coast-based super thermal power stations, while Kakinada is considered for gas-based power plant. Malabar coast is also likely to have gas-based industries. Central part of the east coast is for a boom with seawater aquaculture.

The scenario thus is formidable.

The field oceanographer has therefore to handle a variety of problems at different sites. Methodology and instrumentation at one site is irrelevant at other sites. Basically the coastal oceanographer looks at the following physical parameters for assessing the dispersion potential of a site:

- Winds, waves
- Tides
- Currents
- Salinity, temperature, density
- Solar radiation
- Convection, evaporation, precipitation
- Three-dimensional turbulent motion
- River discharges.

Of these the three-dimensional turbulent motion cannot be measured instrumentally and is rather imbedded in the current structure. So far more than 25 sites have been studied for the above parameters with varying coverage.