

CONSERVATION OF COASTAL RESOURCES OF INDIA

Arun H. Parulekar
National Institute of Oceanography, Dona Paula, Goa

The coastal zone, is one of the few vibrant regions where intense interactions among sea, air and land are dynamically balanced. Having an intricate biological and physical environment, the coastal zone consists of a system of interfaces, interdependently and hierarchically with the primary interface generally synonymous with the shoreline. In the absence of an agreed definition, the coastal zone of India is estimated to extend 20 kms on either side i.e. landward and seaward, of the shoreline and is projected to measure approximately 0.3 million square kilometers.

An area of intense clash of interest among traditional and potential user community, some of the traditional and future use patterns of coastal resources are :

- * proximity to areas of dense population. It is estimated that 200 million or 25% of India's population lives within the coastal zone.
- * worldwide, almost 60% or more of the marine fish catch through fishing and farming is taken from the coastal zone. India is also no exception.
- * 38% of all type of industries are located in the coastal zone.
- * major ports, harbours, naval and other strategic establishments (petroleum refineries and terminals; nuclear power plants; rocket and missile launching and testing facility) are sited in the coastal zone.
- * increasing demand for beach tourism, marine sports and recreation activities.
- * present and emerging demands for reclamation and consequent urbanization.

Economic importance of the coastal zone has been a strong impetus for the ever-increasing demand for the resources utilization. The coastal zone of India, a meeting point of sea, land and air, exhibits an unanticipated range of variations in and amongst biological, chemical, geological, meteorological and physical processes. Characterized as a fluid in constant motion, the marine environment, as a whole and the coastal zone in particular, display a wide magnitude of fluctuations, in relation

to space and time. Through numerous investigations on hydro-biology and related aspects, general information on the water quality, nearshore circulation, accretion and erosion of shoreline, incidence and magnitude of cyclonic storms, surges and tidal waves, is now readily available for some of the coastal areas of India.

Recent studies by the use of Remote Sensing techniques, are generating voluminous information on shoreline changes, littoral drift, status and expanse of coastal vegetation, biological productivity profile of nearshore water as also the magnitude of degradation of coastal areas in terms of land use patterns and resource utilization. Thus, the scientific information on the type, magnitude, and extent of interaction among biological, chemical, geological, meteorological and physical factors in the coastal zone of India, is available on a modest scale.

It is evidently clear, that the resources and the environment of the coastal zone of India, are subjected to an increasing variety and severity of impacts as a result of the increased pace of industrial development and the pressures of an ever-increasing human population. As an evolutionary response to environmental and man-made changes through ages, the coastal ecosystems have developed adaptive capabilities to assimilate and minimize the probable adverse impact and deleterious effects. However, in recent times, the scale and magnitude of man-made interference in the coastal zone of India has increased so much that the self-cleansing and assimilative capacity of the coastal zone is not only losing its high potentials for generating renewable resources but has resulted in the development of 'hot spot' in the coastal environs of some of the metropolis cities of India.

The coastal zone of India encompassing diverse but dynamic ecosystems, is subjected to a variety of inputs of organic and inorganic contaminants as a direct effect of industrialization, agricultural operations, deforestation, urbanization and demographic pressures. Rivers alone discharge 16.0 million tonnes of sediments, annually into the coastal zone of India. The greatest impact of river-borne sedimentation, besides siltation and shallowing of river mouth (a navigational hazard) is on coastal productivity, fisheries, seafarming and tourism.

Domestic sewage is another important but undesirable input. The city of Bombay annually discharges about 400 million tonnes of sewage and related effluents to the coastal zone. The sewage outfall from Calcutta city also totals about 400 million tonnes per year. The annual input of domestic sewage, mostly raw and untreated to the sea by the coastal population of India is

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estimated to be 0.41×10^6 m³.

Similarly the industrial effluents and sewage input, through
rivers to the coastal zone of India, is projected to be 50×10^6 m³
and the solid wastes and garbage generated by coastal population
to be 34×10^6 tonnes/year.

No authentic data on the entry of residues of pesticides,
insecticides, fertilizers and synthetic detergents into the
coastal zone of India, are on record. However, deducing from the
annual use patterns of these new generation chemicals, it is

15×10^6 tonnes of fertilizers and 1,25.00 tonnes of synthetic
detergents, are destined to be received by the coastal zone of
India. Similarly, excluding infrequent oil spills, on an
average, about 3000 tonnes of petroleum residues in the form of
tar ball loading are deposited on India beaches each year.
Similarly, the residues from mining operations, dredging spoils

and beach sand extraction, estimated to be 2×10^6 tonnes/year,
also have their destiny in the coastal zone.

Various impacts of industrial, agricultural sewage, domestic
and petroleum waste on the biota and ecology of coastal zone are
manifested through fish mortality, eutrophication, discolouration
of water, hydrogen sulphide formation, obliteration of coral
patches, degradation of mangrove vegetation, weed growth in
shallow coastal water bodies, and tainting of fish and
shellfishes. Contaminants also enter the coastal zone as huge
amount of silt as one of the direct consequence of deforestation
leading to loss of nutrient-rich top soil. Similarly, land
reclamation and erosion, though local to regional in nature,
unless curbed, can assume a national dimension. Another emerging
problem concerns the deleterious effects of unplanned beach
tourism on coastal ecosystems in specified areas.

Of late, some efforts in the form of long term studies,
pertaining to environmental monitoring of coastal ecosystems
threatened by man-made changes are on record. The magnitude of
detrimental effects of dredging on the coral formations and
mangrove vegetation in Gulf of Kutch, along the northwest Coast
of India, has been quantified. Similarly, the long term effects
of industrial and sewage disposal on the nearshore biota and
fisheries in the coastal ecosystems of Bombay have been
evaluated. Qualitative and quantitative effects of mining
rejects on the estuarine environment, biota and shell fisheries
in Goa are also on record. Such long term studies though few in
number, form the baseline for devising long term conservation and
monitoring plan.

Extent to which the coastal zone and ecosystems, therein, are affected, qualitatively and quantitatively, by man-made changes and environmental variability, is still not well understood. Even a slight change in the pattern of distribution, behaviour and physiology of biota can be taken advantage of and used as a warning system for avoiding greater damage in later years. This is of direct relevance in the utilization, management, monitoring and conservation of coastal environment and resources.

The trends of development in the developed and developing countries in the past, have been marked by serious environmental impairment, which is simply not sustainable. Such pressures can erase the resource base from which man must inevitably gain the sustenance. From ecological and resource consideration, a system to evaluate water quality based on the health of biota reflects directly on the prevailing conditions. The advantage of monitoring is that it directly correlates the effects of polluting input on the environment and biota, as the coastal ecosystems, at the organism level, integrate the overall effects of a combination of contaminants.

The future developments should be based on environmentally sound sustainable management of coastal resources and should avoid destruction of resource base on which sustainable development depends. This can be monitored, by identifying :

- * the present and future use demands on coastal resources and classify on scientific basis the specific areas for definite utilization like fishing, seafarming or coastal aquaculture, siting of industries, housing ports & harbours, land reclamation, beach tourism and recreation like marine sports, biospheres, marine land complex, aquarium and natural reserve/sanctuary.
- * ecologically sensitive areas for conservation.
- * identify the source of pollution and prepare an inventory of causative agents for treatment and safe disposal.

Existing and emerging scientific and technical information can be better mobilized and applied more effectively and efficiently to ensure sustained rather than short term benefits. If development and management of coastal resources is to be sustainable the probable environmental impact due to present and future exploitation and utilization of resources, must be assessed, beforehand and an environmentally sound and a viable approach adopted for the management of activities which make up the development process. The natural resources of the coastal zone, if harvested and managed on sustainable basis, can prove to be inexhaustible, not literally, but realistically.