

## Coastal Zone Environmental Management in Udupi District, Karnataka State, India

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**Abstract:** *The Udupi coastal zone represents varied and highly productive ecosystems such as mangroves, coral reefs and sand dunes. These ecosystems are under pressure on account of increased anthropogenic activities such as discharge of industrial and municipal sewage, land use, tourism, maritime transport, dumping at sea degrade the coast. It is necessary to protect these coastal ecosystems to ensure sustainable development. This requires information on habitats, landforms, coastal processes, water quality, natural hazards on a repetitive basis. The Coastal zone environmental management plan tool is also required for protection of environmental components.*

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### I. Introduction.

Karnataka's coast stretches for 320 kilometres along the three districts of Dakshina Kannada, Udupi and Uttara Kannada. Of these, Uttara Kannada has 160-kilometre long coastline while 98 kilometres are in Udupi district and the rest in Dakshina Kannada. It's three distinct agro-climatic zones range from coastal flatlands in the west with undulating hills and valleys in the middle and high hill ranges in the east that separates it from the peninsula. There is a narrow strip of coastal plains with varying width between the mountain and the Arabian Sea, the average width being about 20 km. The average height of the hinterland is 70 - 75 meters, but in some places it can be as high as 150 meters. Fourteen rivers drain their waters into the shore waters of Karnataka. The important estuaries include Netravati-Gurpur, Mulki, Hangarkatta, Gangolli, Sharavathi, Aghanashini, Gangavali and Kalinadi. Sand bars have developed in most of the estuaries. There are a number of barrier spits at Tannirbavi, Sasihitlu, Udyavara, Hoode, Hangarkatta and Kirimanjeshwara formed due to migration of coastal rivers. There are about 90 beaches with varying aesthetic potential that are suitable for beach tourism.

### I. Indian Laws and Regulations.

Apart from the Coastal Regulation Zone Notification, 2011 there are many legislations /Acts and rules related to coastal activities. The following are the important ones: Indian Fisheries Act, 1897; Indian Ports Act, 1902; Merchant Shipping Act, 1974, Wildlife (Protection) Act 1972; Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981; Indian Coast Guards Act, 1974; and Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981 and Environment (Protection) Act 1986; The Petroleum Act, 1934; National Environment Tribunal Act, 1995; Hazardous Wastes (Management and Handling) Rules, 1989. In addition to this, India has signed and ratified several international conventions relating to oceans and related activities. Some of these are related to marine environment and applicable to coastal area also. The important ones are the following: MARPOL 1973/1978; London Dumping Convention, 1972; Convention on Civil Liability for Oil Pollution Damages (CLC 1969) and its Protocol, 1976; Fund, 1971 and its Protocol,1979; CITES, Convention on Biodiversity, 1992 includes coastal bio-diversity also.

### II. Institutional Infrastructure

The Ministry of Environment and Forests and the Department of Ocean Development are the two nodal Departments that deal primarily on the coastal and ocean areas. In addition to this, there are several Ministries, Departments, State Government Bodies looking after several issues relevant to coastal management in this country and are listed below:

### **Departments/Agencies Responsibilities**

Ministry of Agriculture	Fisheries Management, Coastal Aquaculture
Ministry of Defence (Coast Guard)	Oil Pollution, Poaching, etc Pollution Control Board Coastal Pollution
Ministry of Commerce	Marine Products Development, Special Economic Zones Ports and Harbours
Ministry of Surface Transport	
Ministry of Tourism	Tourism Development
Ministry of Urban Development	Town and Country Planning
Ministry of Industries	Coastal Industries
Ministry of Mines	Coastal and Offshore Mining
Ministry of Home	Disaster Management
Ministry of Petroleum and Natural Gas	Exploration and Exploitation of Oil and Natural Gas.
Ministry of Chemicals and Fertilizers	Storage and Handling of Chemicals and Fertilizer in the Port areas.
State/Union Territory Environment Department	Coast and Marine Management Under Water Act, Air Act.

However, Coastal Regulation Zone Notification 2011 implemented by the Ministry of Environment and Forests (MoEF), is the single regulation that takes care of most of the activities in the coastal area.

### **III. Coastal Area classifications in Udupi District**

Coastal area between Navunda and Coondapur town as well as river Kollur, Chakra and Haladi are depicted in this map. The mangrove habitation, mud flats, the area between LTL and HTL and the outstanding beauty area along the Maravanthe beach are classified as CRZ – I. Rest of the area is mostly rural, hence demarcated as CRZ – III.

#### **Coondapur to Paranalli area.**

The mangrove habitation, the mud flats, the area between LTL and HTL are classified as CRZ – I. Urban area of Coondapur town municipality is demarcated as CRZ - II. Rest of the area is mostly rural, hence demarcated as CRZ – III.

#### **Coondapur to Badanidiyur area**

The mangrove habitation, the mud flats, the area between LTL and HTL are classified as CRZ – I. Urban area is demarcated as CRZ – II. Rest of the area is mostly rural, hence demarcated as CRZ – III.

The Shore stretching from Tenkanidiyoor to Mattu area. The mangrove habitation, the mud flats, the area between LTL and HTL, and offshore islands are classified as CRZ – I. Rest of the area is mostly rural, falling under as CRZ – III.

The area between Uliyaraguli to Badagrama of Udupi taluk covers in this map. Basically the area is under agriculture and hence classified as CRZ – III. The area between LTL and HTL is categorized as CRZ – I

The area between Yeramal and Nadisal of Udupi taluk

This stretch comes under rural category with major activities being agriculture. Considering this, the area is being classified as CRZ – III. The area between LTL and HTL is categorised as CRZ – I.

#### **IV. Coastal erosion**

The Udupi District coast is subjected to three types of erosion; occurring along the open beaches, mouths of rivers/estuaries and the tidal reach of rivers causing considerable loss of land, vegetation and revenue.

About 30 percent of the area under coastal zone is subjected to moderate soil erosion and 16 percent of the area to severe soil erosion. The annual rates of soil erosion vary from 5-15 tons/hectare to 15-40 tons/hectare in moderate to severe soil erosion areas. The problem is relatively more severe in Udupi Coasts. The erosion becomes severe due to the synchronization of high flood in the river with strong wave Activity during southwest monsoon.

#### **V. Hotspots**

The inventory and evaluation of the status of the resources and environmental quality based on secondary data enabled the identification of different hotspots with respect to major environmental issues of the ecosystem.

- a. Occupational Pressure: Urban center of Udupi
- b. Marine pollution: Urban centers of Udupi
- c. Salt intrusion: Udupi
- d. Sea erosion: Coondapur, Kodi, Hangarakatta and Kirimanjeshwara
- e. Siltation: Coondapur and Mulki ports
- f. Unsustainable Fishing: Udupi coast
- g. CRZ Violation: All along the coast

#### **VI. Problems of beaches of Udupi District:**

The major problems those are detrimental to the beach ecosystems of Udupi Dist of Karnataka state are the following:

1. High density of population
2. Coastal erosion
3. Littering of beaches
4. Poor sanitary conditions
5. Disappearance of native vegetation.

##### **6.1. High density of population:**

The occupational pressures are very high with impact on the beaches and their vegetation. Coastal Udupi has two urban agglomerations i.e Udupi and Kundapur and villages. The coastal area has minor ports and fish landing centres.

##### **6.2. Coastal erosion:**

The beaches are one of the three areas of soil erosion the other two being mouths of rivers/estuaries and the tidal major sources being rivers and beaches. Coastal erosion is due to the combined forces interventions mainly are coastal protection structures, breakwaters, dredging in harbours, removal of sand from beaches etc. The short period waves (storm waves) rip open the beaches, taking the material away into deep water, while long period waves (swells) push this material back on to the shore. The flood flow in rivers flowing parallel to the coast makes the adjacent beaches more vulnerable to erosion. Intensive coastal erosion takes place from May end to middle of August, which is not continuous. There is a period of deposition in between and the net effect is erosion.

The following areas along the Udupi District coast have been subjected to erosion during the last three decades: -

- I) Udupi Taluk: Mulur-Kapu-Kaipanjaj, Mattu area; Hoode-Kemmannu- Kodi-Paramapalle.
- II) Kundapura Taluk: Kodi-Kundapura-Gangolli; Maravanthe-Gijjadi. This erosion is attributed to storm waves, longshore currents and increase of pore water pressure in the coast parallel river beds and blind tributaries resulting from massive fluvial discharge during monsoon periods.

**6.3 Littering of beaches:**

It is a major problem and there is no mechanism for garbage clearance and disposal.

**6.4 Poor Sanitary conditions:**

Poor sanitary conditions have been observed in all fish landing centres and fishing villages.

**6.5 Disappearance of native vegetation:**

There has been much destruction of the flora of beaches in the recent decades due to ever increasing human pressures. Except for some of the plantations of exotic Casuarina trees the natural trees and shrubs such as Calophyllum, Pongamia, Morinda Citrifolia, Etythrina variegata, Pandanus, Odoratissimus have largely disappeared. The dune vegetation of herbs and creepers and shrubs are variously affected by sand removal, trampling, grazing, dumping of trash etc.

**VII. Coastal zone Environment Management Plan for Udupi District**

**1. Beach protection through bio-shielding:**

The construction of seawalls to end Erosion and breakwaters can have adverse consequences. Seawalls and breakwaters should be restricted to areas where they are extremely necessary. Since a good beach is the best protection for the coast, beach nourishment, strand vegetation etc. along with selected technological interventions should be preferred.

**2. EIA for seawalls and breakwaters:**

Construction of seawalls/breakwaters should be subjected to comprehensive environment impact assessment.

**3. Beaches to be zero waste areas:**

Steps should be taken to promote beaches as zero waste areas through awareness programmes, village and town level solid waste management programmes, providing sanitation facilities all along the coast and periodic cleaning of beaches.

**4. Baseline Knowledge on Flora and Fauna:**

Beaches should be evaluated for their floristic and faunal richness and appropriate restoration and conservation plans to be implemented for suitable beaches.

**5. Special protection for turtle breeding areas:**

Many of the beaches which marine turtles like Olive Ridley visit to lay eggs should be given special protection and preferably be brought under co-management programmes.

**6. Beach Management to Strengthen Local economy:**

Planting of various plant species of medicinal, food and other economic value, suitable for beaches need to be promoted and brought under co-management with the local people. Beach beautification programmes through restoration of natural vegetation can also enhance their tourism potential and benefit the local residents.

**7. Nursery of beach plant species:** District-wise plant nurseries may be started for propagation of key plant species, both local and selected introduced ones, after proper evaluation of their economic and ecologic values.