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Retaining Structure for Erosion Control in Coastal Region: Realistic Case Study of Udwada Coast

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Abstract: As Per Study it is estimated that nearly One-third of India's population lives on the coastal region and is dependent on its resources. As The Parsis Religion pray Fire, seashore water and Well water because of this religions The Heritage Town Udwada is popular of Parsis. The Udwada Atash Behram, also known as the Iran Shah, "King of Iran", is one of the eight fire temples of the Zoroastrian religion located in Udwada in the Indian state of Gujarat on the west coast of India. In that Coastal Shoreline erosion, storm surges and extreme events have resulted in severe loss of human life, damage to ecosystems and to property along the coast of India. Study is to be carried out in the Udwada region of Gujarat reveal's over the low-lying coastal zone, which has suffered significant erosion from the last Few Year. The study of Udwada coast directly supports the Integrated Coastal Zone Management (ICZM) Plan of the Gujarat State by this the identification and assessment of coastal hazards and the overall vulnerability to coastal flooding and erosion occurs. Thus the key results from this study can be used to save Heritage Property and the Development of Udwada and also can step toward mapping the hazard line for the entire coast of India which will help in protecting human lives and property living near the coastal areas of India.

Keywords: Coastal Erosion, Shoreline, Currents, Effect of Tide on Udwada Coastal.

INTRODUCTION

Introduction Coastal of the India: The coastal is awesome environments where natural atmosphere land and sea connect continuously influencing a strip of spatial zone know as coastal zone. In other words, coastal zones are the areas having the influence of both marine and terrestrial processes.

The coastal zones all over the world are regions of very high biological productivity, has an important component of the global life system. In that India has a long coastline of about 7500 km of which the mainland accounts for 5,400 km. Lakshadweep coasts extend to 132 km and Andaman & Nicobar Islands have a coastline of about 1,900 km.

The coast also includes 77 cities, including some of the largest and most dense urban agglomerations – Mumbai, Kolkata, Chennai, Kochi and Visakhapatnam. Nearly 250 million people live within 50km of the coastline.

The coastal environment of India plays a vital role in the nation's economy by virtue of its resources, productive of its ecosystem, concentration of population, exploitation of natural resources, discharge of waste effluent and municipal sewage, development of various industries, increasing load on harbors, spurt in recreational activities and above all petroleum exploration activities. Also the coastal activities such as fishing ports and shipping harbors, aquaculture, agriculture, tourism.

The Coastal ecosystems harbor wealth of species and genetic diversity, store and cycle nutrients, filter pollutants and help to protect shorelines from erosion and storms.

Impacts of Coastal Erosion:

The Coastal Zone is the interface land and sea and also most inhabited area and favourable place to undertake development activities. The coastal boundary between land and sea keeps changing its shape and position continuously due to dynamic environmental conditions. In That Shoreline changes induced by erosion and accretion are natural processes that take place over a range of time scales. They may occur in response to smaller-scale (short-term) events, such as storms, regular wave action, tides and winds, or in response to large-scale (long-term) events such as organic cycles that may significantly alter sea levels (rise/fall activities that cause coastal land subsidence or emergence.

Hence, most coastlines are naturally dynamic, and cycles of erosion are often an important feature of their ecological character. Wind, waves and currents are natural forces that easily move the unconsolidated sand and soils in the coastal area, resulting in rapid changes in the position of the shoreline. Waves change the coastline morphology and form the distinctive coastal landforms. The loose granular sediments continuously respond to the ever-changing waves and currents. The beach profile is important, in that it can be viewed as an effective natural.

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The Coastal Erosion Processes:

The Coastal erosion during storm surge, tsunami or even monsoonal high wave period usually evolves into disaster but the impact on coastal erosion will be for a shorter period. Coastal processes are the hydraulic and sedimentary processes driven by tides, currents, waves, coastal winds and tsunamis. Forces exerted by wind and water act on the ocean floor and shore face to drive currents, move sediments, erode exposed bedrock and shape the coastline, estuaries and the near shore seabed.

Recent Seatuation of Indian Coastalline

As Per Recent Investigation data of coastal Erosion along Indian Costal by The Indian Space research organization (ISRO)-Ahmadabad, Central Water Commission, Ministry of Water Resource of New Delhi and Kochi -India is that The coastal erosions can be viewed in two different aspects; one where the erosion rates are low but the threat of coastal erosion is for a longer time scale, while the second one is rather an ephemeral process, mostly concurrent with sporadic events and usually the loss is regenerated with the withdrawal of the event.

The destruction and loss of land due to sea erosion is a severe problem, particularly for a country like India facing explosive population growth. Coastline is a dynamic morphological entity, which responds to the external forces exerted by waves, tides, near shore currents and the resultant sediment transport.

When the resultant sediment transport entering a particular area is greater than the sediment going out from the area, accretion or beach development takes place. On the other hand, when there is a deficit of the incoming sediment supply into a particular area with reference to the sediment going out of the same area, beach erosion takes place. Beaches act as constant absorbers of the wave energy of water and though subject to small disturbances, remain in equilibrium. However, sometimes this equilibrium gets disturbed due to either natural phenomena or human intervention. When shore structures are constructed, it is quite likely that equilibrium condition is destroyed. Since this can cause considerable damage and reduce the effectiveness of such structures, it is necessary to study the equilibrium condition of shores before constructing such structures.

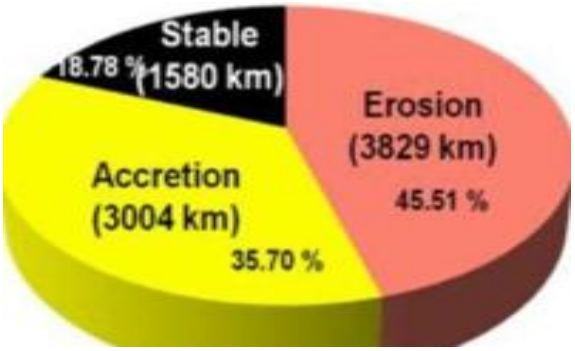

Figure 1: Length of shoreline under erosion, accretion and stable along the entire Indian coastal

TABLE 1: Coastal length under erosion, accretion and as stable in different Maritime States/Union Territories of India (Excludes mouths of rivers/streams/creeks and their inner parts)

Maritimes state and union territories	Erosion Length in Km	Accretion Length in Km	Stable Length in Km	Total Length in Km
Gujarat, Daman & Diu	486.43	297.9	697.71	1482.1
Maharashtra	449.5	244.4	48.29	742.26
Goa	27.03	46.98	81.38	155.39
Karnataka	106.12	118.6	73.31	298.08
Tamil- Nadu and Pondicherry	281.56	514.1	29.25	824.92
Andhra Pradesh	443.88	186.9	340.45	971.27
Odessa	199	205	32.1	436.1
West Bengal	115.06	19.46	147.68	282.2
Lakshad-weep Island	72.03	63.24	1.01	136.28
Andaman-n Island	740.37	944.8	36.83	1722
Nicobar Island	690.1	68.3	19.23	777.63
Total	**3829.1**	**3004**	**1580.8**	**8413.9**

The Digital Shoreline Analysis System (DSAS) is a freely available software application that works within the Environmental Systems Research Institute (ESRI) Geographic Information System (ArcGIS) software. The Digitized shoreline for the years 1990, 2001 and 2014 in the vector format are used as the input to the Digital Shoreline Analysis System (DSAS) to calculate the rate of shoreline change. The DSAS tool basically estimates the Net Shoreline Movement (NSM) and End Point Rate (EPR) which are used to derive the output maps of this study. The NSM calculates the distance between the oldest and the youngest shoreline for each transect and the EPR is obtained by dividing the NSM, by the number of years elapsed between the two shoreline positions. From 2001-2014 accretion with an average EPR of 0.65m/yr is witnessed. Overall, from 1990-2014, the shoreline analysis of this coastline (117km), reveals an eroding trend with an average EPR of -0.54m/yr and average NSM of -12.4m.

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Figure 2: In Between 1995 to 2015 Udwada Coastal eroded about 7 Feet to 8 Feet From its original level


Figure 3 plan and design of rough design of sea wall

The maximum accretion during this period is seen Umarsadi to Udwada where an erosion of 256.28m is seem from Umbhrat to Vansi. The cumulative action of waves and tides are responsible for the erosion/accretion trends observed along this coastline Rome of Muslims and catholic respectively.

Various methods for protection of coastal

In Coastal Area there are several ways or several methods to protect the coastal area, as per the conditions or problems. As per the Studies of coastal Following are the Types of Structure or solution to protect the coastal against the erosion.

1. Sea Dikes:
2. Sea Walls
3. Revetments
4. Groins
5. Bulkhead

Mangroves plantation

Design Preparation for coastal of Udwada:

After Various Literature and Coastal Study and Engineering knowledge the Udwada coastal has design Sea wall structure. After all data of shoreline, currents Udwada coastal situation, Development sea wall will be best solution against erosion and Heritage property protection. In any type of Structure design generally require all basic parameter as following:

- Study of site and visualized arise problems and site condition understand behavior of problems.(Past and actual condition of site study)
- Prepare Length for design of structure: Prepare design of Sea wall for critical area of Udwada coastal. It should start from S.P.P.Mistry High school to Gymkhana Ground of Udwada Town. This length estimated about 1500 meter long.
- Prepare Design Water Level at Udwada coastal: Prepare minimum and maximum water level is need to estimate the braking wave height at the preparing structure. Also in water level part preparing the stormed surge is to be estimate or analyses by historical record.
- Prepare Wave Height ,Wave Estimation, Braking Waves, Wave Run-up, Wave Overtopping Study for coastal of Udwada:

Wave Information frequently as energy based height of the zeroth moment Hm. In Deep water Average wave height Hs and Energy based height of zeroth moment Hmo are equal following equation for wave height (Hughes and Borgman 1987).

$$\frac{H_s}{H_{mo}} = \exp\left[C_0\left(\frac{d}{gT_p^2}\right)^{C_1}\right]$$

Where,

C0, C1 = Regression Coefficent given as 0.00089 and 0.834 respectively

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d = Water depth at point in question (i.e.toe of structure)
g = Acceration of gravity

Tp = Period of peak enegy density of the wave spectrum
Structural Stability and Flexibility by using large monolithic masses that resist force by using aggregation of smaller units.(i.e, Large reinforced concrete seawall, geometric concrete blocks revetment)

- Armor Unit Stability which is developed by Hudson 1961
- Reserve Stability: Quality of randomly placed rubble structure to resettle under wave condition that causes mirror damage.
- Prepare R.C.C. Design:The R.C.C. Design are to be carry by using stand pro Software by preparing general data and site analyses such as wind analyses, Earthquake zone, Tusnami zone, over tapping, Calculate Tide Impact, Soil analyses or geotechnical consideration for Foundation all are data analyzed for the design, In that design part the foundation of sea wall prepare of pile foundation as well as Toe protection design and overtopping design are to be in design.
- Prepare for local surface runoff and overtopping and runoff.
- Prepare expantion Joint: In Sea wall design we cannot constuct without any expantion joint. t provide at of sea wall joint of 15m

CONCLUSION

By the provision of seawall as per progress design, some of the following goals can be achieved efficiently. Development of Udwada Coastal and protection against the erosion as well as Heritage property of town also maintain Shore line of coastal, Effective and Economic performance of Breakdown Structure. Tourism Development of Udwada Coastal. Also by this design structure one more path should be carryout is that “Tide energy generation by mechanism as well as structure designing implementation.

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