



Mangroves: Natural Protectors of the Coast

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Abstract

Human civilizations have advanced significantly thanks to oceans and coastal areas. The dynamism and vulnerability of coastal areas around the world are well-known. Nature has blessed India with 11,085 km of coastline and 4975 sq. km of mangrove cover. About 15.5 percent of India's population lives in the coastal areas. The coastal areas are subjected to large scale erosion. To protect the world from problems like sea level rise, flooding of coastal areas etc. protection of coastal is vital. As a result, the purpose of this paper is to investigate the role that mangroves play in preventing erosion along the coast. The coastal regions of India is home to about 15.5% of the country's population. Large-scale erosion affects the coastal areas. To keep the world safe from issues like rising sea levels and coastal flooding, among others. Keeping the coast safe is essential.

Keywords: Coastal Zone, Climate Emergency, Mangroves, Coastal Erosion, Structural measures,

Introduction:

Oceans have been a link between humans and land since the antiquity of man. They have bonded us together. The world's coastlines are renowned for their dynamism and vulnerability. In this day and age of climate emergency and global warming, coastal areas have gained a lot of attention. The following are some of the reasons why oceans and coastal areas are essential eco-systems: Oceans have a great control on the Climate

- Rare natural resources can be found only in the oceans.

- Between the lithosphere and the hydrosphere, the coast naturally serves as a buffer.
- The Sea gets the nutrients it needs from the Coast.
- Large-scale tourism is encouraged in coastal areas.
- The ocean disperses waste from land into the deep sea.
- Trade and commerce are governed by seas and oceans.
- The nation is naturally protected by the coast.
- More than a third of the world's population lives on the coast.

The dynamic intersection of land, air, and water is the coast. Our ever-changing coastlines are formed by a combination of wind and waves, tides and currents, migrating sand dunes and mud flats, and a wide range of plant and animal life. They are very different because they are always changing. The majority of us imagine a coast to be a long strip of sand with foaming waves breaking on the shore; In fact, there are many different kinds of coasts, including sandy beaches, rocky shores, coral reefs, and coastal wetlands (Watson, 1997).

Status of Indian Coast:

India's coastline extends from Tamil Nadu to West Bengal in the Bay of Bengal and from Gujarat to Kerala in the Arabian Sea. Erosion has been a problem along the Indian Coastline, affecting approximately 45.5% of our coastline in varying degrees (Commission, 2016).

The mainland coastal districts of India are home to 187.6 million people, or roughly 15.5% of the country's total population, according to the 2011 Census Report of India. India's island territories are home to approximately 4.4 lakh people. The precise length of the coast must be determined in order to manage the Coastal Zone effectively. Sadly, however, there is a lack of clarity regarding India's coastline's length. Organizations like the Survey of India (SOI), National Hydrographic Office (NHO), Rashtriya Barh Ayog (RBA), and respective Coastal State/UT have made numerous attempts in the past to determine the length of the coast. The length of the coast as determined by the RBA in 1980 is shown in table 1.

Table 1

Sr. No.	State/UT	Coastal Length in Kms
1	Gujarat	1600
2	Maharashtra	512
3	Karnataka	280
4	Goa	84
5	Kerala	560
6	Tamil Nadu	980
7	Pondicherry	20
8	Andhra Pradesh	960
9	Odisha	432
10	West Bengal	280
	Total	5708

Source: Central Water Commission, New Delhi December, 2016

The length of the coast as determined by the Survey of India and the National Hydrographic Office (NHO) in 1970 and 2011 is shown in Table 2.

Table 2

State/UT	NHO & SoI (1970)	NHO (2011)	% Change
Gujarat	1,214.70	2,125.82	75.01%
Maharashtra	652.60	896.98	37.45%
Karnataka	280.00	309.59	10.57%
Goa	160.50	181.48	52.39%
Daman & Diu		63.10	
Kerala	569.70	597.43	4.87%
Lakshadweep	132.00	121.92	-7.64%
Tamil Nadu	906.90	1,064.98	17.43%
Pondicherry	30.60	42.11	37.61%
Andhra Pradesh	973.70	1,272.55	30.69%
Odisha	476.40	667.12	40.03%
West Bengal	157.50	662.90	320.89%
Andaman and Nicobar	1,962.00	3,078.52	56.91%
Total	7,516.60	11,084.50	47.47%

Source: Central Water Commission, New Delhi December, 2016

The fact that the length of the coast is calculated differently is clear from table 2 above. The total length of the coast of both mainland coastal states and islands was estimated by NHO and SOI to be 7516.60 km in 1970. In 2011, the length of the coast was recalculated to 11,084.50 km, representing an increase of 47.47 percent. West Bengal's coastline was significantly longer than that of other states. The difference between the two calculations was 320.89 percent. The state of Gujarat showed a 75% increase. In a similar vein, with the exception of Lakshadweep, all of the states' coastal lengths had increased. It is interesting to

note that the length of coast of Goa in official records is indicated as 105 km whereas; NHO has determined the length of Goa's coast at 181.48 km.

Coastal Erosion:

The coastal ecosystem belongs to the group of the semi-terrestrial ecosystem. One of the few ecological provinces is the coastal ecosystem, where the many-sided interactions between the Hydrosphere, Lithosphere, and Atmosphere are completely balanced.

Numerous sub-ecosystems, such as mangroves, backwaters, wetlands, sand dunes, and estuaries, define the Coastal Ecosystems.

The coast of India is very diverse and constantly exposed to the whims and fancies of the sea, which has caused a lot of damage.

Table-3

State/UT	Sandy Beach %	Rocky Coast %	Muddy Flats %	Marshy Coasts %
Gujarat	28	21	29	22
Maharashtra	17	37	46	-
Karnataka	75	11	14	-
Goa	44	21	35	01
Kerala	80	05	15	-
Tamil Nadu	57	05	38	-
Andhra Pradesh	38	03	52	07
Odisha	57	-	33	10
West Bengal	-	-	51	49
Total Mainland	43	11	36	10

Source: Central Water Commission, New Delhi December, 2016

According to table 3, approximately 43% of the coast of mainland India is sandy, 11% is rocky, 36% is muddy, and 10% is marshy. All four types of coasts can be seen along the coasts of Goa, Gujarat, and Andhra, indicating a very diverse shoreline.

The Indian coast is undergoing extensive erosion on a massive scale due to both natural and human-caused factors. Already, it has been stated that significant erosion is occurring on approximately 45.50 percent of the coast. Numerous efforts have been made to halt the coast's erosion. The engineering techniques used to stop coastal erosion in various parts of India are listed below.

1. Seawall
2. Revetment

3. Off-shore breakwater
4. Groins/groynes/spurs
5. Offshore-Reefs
6. Artificial Headland
7. Beach Nourishment
8. Sand dune restorations

It has been observed that the structural measures adapted to control coastal erosion create a negative impact on the coastal ecosystems because they interfere with the coastal processes. As a result, growing coastal vegetation like mangroves and ipomoea is the best strategy for preventing erosion. Even during the devastating Tsunami, the mangroves were able to withstand a severe test in terms of coast protection.

Mangroves: the bio-shield:

The Portuguese words "mangue" and "grove," which mean "tree" and "stand of trees," respectively, are the source of the word "mangrove." Mangrove is a salt-tolerant shrub that typically thrives in tropical and subtropical intertidal zones, saline, or brackish waters. Mangrove plants can make fresh water from salty water, and many mangrove species have salt glands that can get rid of extra salt.

Nature has gifted the coastal states of India with mangrove forests. Mangroves are biologically the most diverse ecosystems. In the age of Global Warming and Climate Change, mangroves are vital because they have the capacity to store more carbon per unit area than any other ecosystem on Earth. The following table-4 portrays the distribution of mangroves in India.

Mangrove Cover in Indian Coastal States and Union Territories (1987-2019)

Assessment Year (Area in km ²)																
State/UT	1987	1989	1991	1993	1995	1997	1999	2001	2003	2005	2009	2011	2013	2015	2017	2019
A & N Islands	686	973	971	966	966	966	966	789	658	635	615	617	604	617	617	616
Andhra Pradesh	495	405	399	378	383	383	397	333	329	354	353	352	352	367	404	404
Daman & Diu	0	0	0	0	0	0	0	0	1	1	1	2	1.63	3	3	3
Goa	0	3	3	3	3	5	5	5	16	16	17	22	22	26	26	26
Gujarat	427	412	397	419	689	901	1031	911	916	991	1046	1058	1103	1107	1140	1177

Karnataka	0	0	0	0	2	3	3	2	3	3	3	3	3	3	10	10
Kerala	0	0	0	0	0	0	0	0	8	5	5	6	6	9	09	09
Maharashtra	140	114	113	155	155	124	108	118	158	186	186	186	186	222	304	320
Orissa	199	192	195	195	195	211	215	219	203	217	221	222	213	231	243	251
Puducherry	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	2
Tamil Nadu	23	47	47	21	21	21	21	23	35	36	39	39	39	47	49	45
West Bengal	2076	2109	2119	2119	2119	2123	2125	2081	2120	2136	2152	2155	2097	2106	2114	2112
Total	4046	4255	4244	4256	4533	4737	4871	4482	4448	4581	4639	4663	4628	4740	4921	4975

Source: Forest Survey of India, Dehradun. India State of Forest Report-(2015-17) (2017) & (2019)

Of the 195 countries of the world, Mangrove forest is found concentrated in 113 countries with an estimated area of 14.79 million hectares. The largest area was reported in Asia (5.55 million hectares), followed by Africa (3.24 million hectares), North and Central America (2.57 million hectares) and South America (2.13 million hectares). Oceania reported the smallest area of mangroves (1.30 million hectares). More than 40 percent of the total area of mangroves was reported to be in just four countries: Indonesia (19 percent of the total), Brazil (9 percent), Nigeria (7 percent) and Mexico (6 percent). Since 1990, the area of mangroves has decreased by 1.04 million hectares, but the rate of change more than halved over the reporting period, 1990–2020 from 47 000 hectares per year in the period 1990–2000 to 21 000 hectares per year over the last ten years. (UNEP, 2019)

From 1987 to 2019, the area covered by mangroves in India increased from 4046 square kilometers, as shown in Table 4. km versus 4975 sq. km, demonstrating a 929 sq. km (22.96 percent), which is encouraging. West Bengal has the greatest amount of mangrove cover, or 2112 square miles. km was followed by 1177 sq. km, 616 sq. miles, Andaman and Nicobar Islands km, and Andhra Pradesh's 404 sq. km.

Mangroves and Coastal Protection:

Coastline vegetation is essential for maintaining slope stability in coastal areas. They are vulnerable to coastal zone erosion due to human activities like tourism,
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infrastructure development, the dressing of sand dunes, and mangrove deforestation.

In preventing the destruction of the coast caused by storm surges, cyclones, tsunamis, high tides, and rough sea waves; the cover of mangroves serves as the first line of defence and is both cost-effective and highly effective. It can aid in the accretion of land and protect the coast from erosion. Mangroves grow naturally in intertidal zones, so there is no need to grow them.

About 46 percent of the Indian coast is either muddy or marshy hence; mangroves can be the best option for controlling erosion. Similarly, about 43 percent of the Indian coast is sandy which can be protected by planting native vegetation such as Casuarina, Oak, ipomeas etc for stabilizing the surface. Protection the coastal vegetation is important for the long-term protection of coast.

In some cases, re-vegetation fails because environmental conditions do not favor the growth of species at the particular site or there is ignorance as to how to plant properly given the same conditions. It is also possible that anthropogenic influences have completely altered the natural processes in the area. The most obvious indicator of site suitability for particular vegetation is the presence of vegetation already growing. This can be extended by other factors such as the slope, elevation, tidal range, salinity, substrate and hydrology (*Clark, 1995; French, 2001*).

Conclusion:

The shape, size, and productivity of coastal areas are constantly changing as a result of climate emergencies and global warming. One of the world's most populated regions, coastal areas contribute significantly to economic and cultural development. As a result, safeguarding the coast from misuse and abuse is crucial. Various structural and non-structural measures have been used to protect coastal areas. The majority of structural measures have had negative effects on coastal areas. The ability of mangrove vegetation to catch debris that is flowing in rivers and off the land contributes to the stabilization of the shoreline and the reversal of wave and storm erosion. Therefore, the most

effective strategy for safeguarding our coastlines from both natural and human-caused threats is coastal vegetation.

Bibliography:

1. Clark, J. R. (1995). *Coastal Zone Management Handbook*. Lewis .
2. Commission, C. W. (2016). *Status Report on Coastal Protection & development in India* . New Delhi: Central Water Commission .
3. CWC, C. E. (2014). *Shoreline Change Atlas of Indian Coast Vol 1 to Vol-6*. New Delhi: Coastal Erosion Directorate CWC.
4. FAO & UNEP, (2019). *The State of the World's Forest: Forest, Biodiversity & People*. Rome: Food and Agriculture Organization of the United Nations.
<https://doi.org/10.4060/ca8642en>
5. French, P. (2001). *Coastal Defenses: Processes, Problems & Solutions* . In P. French, *Coastal Defenses: Processes, Problems & Solutions* . Florence, KY, USA: Routledge.
6. Inda, F. S. (2017). *State Forest Report 2015-17*. Dehradun : Forest Survey of India .
7. Inda, F. S. (2019). *India State of Forest Report 2019* . Dehradun: Forest Survey of India .
8. Inda, F. S. (2017). *State Forest Report 2017*. Dehradun : Forest Survey of India .
9. Ministry of Environment & Forests, G. o. (01/09/2020, 19). *Mangrove Cover 2019*. http://www.frienvis.nic.in/Database/Mangrove-Cover-Assessment-2019_2489.aspx
10. Ministry of Environment & Forests, G. o. (2019, 08 19). *Mangrove Cover in India(1987-2015)*. http://www.frienvis.nic.in/Database/Mangrove-Cover-in-India_2444.aspx
11. Ministry of Environment, F. &. (2019, 8 22). *Mangrove Cover Assessment 2017*. http://www.frienvis.nic.in/Database/Mangrove-Cover-Assessment-2017_2456.aspx
12. Ramesh, R. a. (2003). *Coastal Urban Environment* . In R. a. Ramesh, *Coastal Zone Management in India - An Overview*. New Delhi: Capital Publication, New Delhi .