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RESEARCH ARTICLE

Status, Threats and Conservation of the Wetland Ecosystem Dominated with Mangroves in India

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ABSTRACT

Mangroves are one of the most undermined biological systems. They have immense ecological and economic advantages. Consistent, increment in natural and coastal development like a change of wetlands for hydroponics, construction for tourism, the tsunami has led to the demolishment of mangrove environments in India. The inhabitants of minor zones are at risk of losing their livelihood and there is a threat to the existence of the mangrove ecosystem. It has been noted that from a decade ago, about 40% of the Indian mangrove territories have been lost. At present, the environmental changes and increased anthropogenic activities have become a significant concern for the conservation and sustaining of the mangroves. Conservation of mangrove environment can be accomplished by increasing awareness about their significance among various stakeholders and safeguarding them through mandatory national policy and regulations. A specific policy like Coastal Zone Regulation has been formulated to ensure mangrove conservation, sustainable existence of local community habitat along the coastal area, fishing community, and coastal stretches for marine habitat have been protected.

Keywords : Mangroves, Coastal zone regulation, Mangrove conservation, Status and threats, Wetland ecosystem.

INTRODUCTION

The total global Mangrove cover spread across 123 countries is about 15 million ha, which accounts for about 1% of the World's Tropical Forest (India State of Forest Report 2019). As per Chapman (1976), mangroves are confined to tropical climates having an average monthly minimum air temperature of 20°C and above (Ellison, 1999). About 110 mangrove species belonging to 20 families are identified globally (Myint *et al.* 2019). In 1913, the term 'mangrove and 'mangrove' has been noted by the oxford dictionary, representing tropical shrubs or trees which are present in coastal swamps along with their tangled roots, which grow above the ground level (Mepham, 1985). According to one classification mangrove species are classified into two categories namely i) exclusive species (strict/obligate/true mangrove), they are found confined to mangrove environment only and ii) non-exclusive species (semi/back mangrove or mangrove associate), they are found in the mangrove, aquatic and terrestrial environment (Wang, 2011). The species of genus *Rhizophora* are exclusively found in mangrove forests and are not found in terrestrial networks. Mangroves, for the most part forming unadulterated stands, assume a critical role within the structure of the network. A morphological specialization in the mangrove environment is a salt blocking mechanism. Distinctive notable strengths of mangrove plants include airborne roots to check for anaerobic deposits, tie-rod-like support structures and roots that provoke outer soil, low tide potential, and high energy potential, salt fixation, salt discharge sliding viviparous leaves and shoots (Duke *et al.* 1998). Mangroves are a biological group of halophytic plants which are well known for salt tolerance. They are important biomass that protects the juvenile stock. Mangroves are valuable coastal habitats heavily loaded with nutrients which they constantly share with the adjacent habitats. They provide a large variety of economic as well as ecological products and support the diversity of marine and coastal ecosystems (Singh *et al.* 2012). Mangrove ecosystem has endangered as well as endemic species and is considered as the world's richest storehouse of ecological and economical values (Sandilyan, 2014).

Economic Benefit

Mangroves provide a benefit of more than US$ 65 billion/year in terms of flood protection (Menéndez et al. 2020). They act as a defense for the coastal wetlands and protect estuaries from cyclonic storms as well as battering waves (Ellison, 2008). If protection of human lives is considered, Vietnam, India, and Bangladesh receive maximum benefit but in terms of economic benefit, the USA, China, India, and Mexico receive the maximum benefit. Further, developing nations having mangrove vegetation receive a benefit of about US$ 33,000-57,000/ha/year (Menéndez *et al.* 2020). Costanza *et al.* (2014) estimated that the mangroves and tidal marsh provided about US$ 194,000/ha/yr worth of ecosystem services in 2011 which included benefits from storm protection, erosion prevention, etc. (http://www.mangrovealliance.org). Mangroves help people living in their vicinity by providing food, fuel, wood, pulp, etc., some of which are harvested commercially for livelihood. A diverse life form breed in the mangrove environment, including fishes, crabs, shrimps, mollusks, and warm-blooded animals like ocean turtles. They are home to a variety of settling, reproducing, and transitory winged animals.

Carbon Sequestration, Sink and Storage

Two huge repositories: The earthbound biosphere and the sea take up CO_2 roughly to an equivalent extent. A more prominent coefficient of difference for the take-up via land and sea demonstrates extensive yearly inconstancy in the assessment of CO_2 stockpiling by the sea and land. This could be because of the debilitating sink quality of the sea and expanding the limit of woods take-up in reaction to air CO_2 increment (Costanza *et al.* 2014; Spiecker, 1996). About 62-78% of the worldwide earthbound C is sequestered in the woods, and about 70% of this C is put away in the dirt with a moderate turnover rate (Lewis, 2004; Ciais P, 2008). Mangrove woods represents about 2.4% of tropical woods (Schimel, 1995) and to improve the precision of worldwide carbon sink evaluation of carbon elements is basic in the mangrove swamps (Guggenberg, 1994). Of the global forest cover, mangroves are responsible for only 1% of the carbon sequestration, but as a coastal habitat, the carbon sequestration is as high as 14% (Spalding, 1997). Globally, it is estimated that mangroves store about 21,914.17 Mt CO_2 of total organic carbon. Of this, 19,093.67 Mt CO_2 is stored in the upper 1 m of soil, and the remaining 2,820.50 Mt CO_2 in the above-ground biomass (Chmura, 2003).

Biodiversity

Mangrove biological system is substantial in inherited variety because of the event of both oceanic and earthbound species and their flexibility to a wide scope of harsh natural conditions, for example, high saltiness, high temperature, sloppy anaerobic soils, outrageous tides, and solid breezes, which changes viciously and now and again (Alongi, 2012). By and large, the biodiversity of mangroves environments can be extensively classified into two gatherings for example select / significant mangrove species (additionally called exacting / commit/ genuine mangrove) and non-elite / minor / partners mangrove species (www.globalmangrovewatch.org). The significant species are the severe or genuine mangroves. The minor mangrove species are less prominent components of the vegetation and infrequently structure unadulterated stands generally includes diverse endophytes. Das *et al.* (2014), reported about 74 mangrove species belonging to 27 genera from 20 families scattered through the world. Mangrove-related microorganisms incorporate microbes, growths, and organisms like protists, macroalgae, seagrasses, saltmarsh (Spartina), and different verdures, for example, various epiphytes (Vannucci, 2000; Tomlinson, 1986). In the tropical mangrove woods, there are roughly 100 epiphytic species from the families Orchidaceae, Bromeliaceae, Cactaceae, Araceae, Piperaceae, and Polypodiaceae dispersed through the covering and on trunks of mangrove trees. Mangrove-related faunal species are zooplankton, wipes, ascidians, epibenthos, infauna, meiofauna, prawns, shrimp, crabs, creepy crawlies, mollusks, fish, creatures of land and water, reptiles, fowls, and vertebrates (Das, 2014).

Aquaculture

In particular, the carrying capacity of the biological mangrove forest system for sea-going biota is obtained by the release of nutrients from mangrove leaf litter that tumbles to the lower part of the waters and assumes a substantial proportion as a supplementary turnover supply (N and P) that eventually influences the stock of fish. Fishermen look for fish, shrimp, and another water biota. Khalil, A. S. (2015) observed that the successful shrimp fisheries in Pakistan depend entirely on mangrove ecosystems.

Medicinal value

The secondary metabolites of A. officinalis like diethyl phthalate, hydroxy-4-methoxy benzoic, and oleic acid obtained from the leaves exhibited antibacterial and anticancer activity (Kathiresan, 2010; Giri, 2011). Spiro benzofuran, a flavonoid present in the leaf concentrates of *A. corniculatum* has antiplasmodial activity against *Plasmodium falciparum* (Khalil, 2015). The naphthoquinone namely 1,4-furanonaphthoquinone and its analogs from Avicennia plants displayed anticancer activity (Bhimba *et al.* 2010). Luteolin, from A. It has been found that marinas have antiproliferative and apoptosis functions. Undesirable concentrate of tea mangroves collected from the product of mangrove plants. Due to procyanidin present in the concentrate, *R. Stylosa* had high cell growth (Sundaram, 2012). Benzamide, an isolated alkaloid from *Rhizophora*. Antifouling behavior against barnacles was seen in mucronate. Benzamide, an alkaloid isolated from *R. mucronata*, antifouling activity toward barnacles was detected *Cyclotella caspia* (Itoigawa, 2001). Paracaseolide A with anticancer activity was isolated from the *Sonneratia paracaseolaris* mangrove plants (Miranti, 2018). Alkaloids present in the mangrove plant *A. ilicifolius* L. demonstrated to have activity against hepatic fibrosis in rodents (Liu, 2013). Procyanidins of *Heritiera fomes* were shown to have antimicrobial activity (Chen, 2011). Two tannins have been isolated from mangrove *Kandelia candle* and *R. mangle* and assessed for their antioxidant potential by Zhang *et al* (2010) and Wai *et al.* (2015).

INDIAN MANGROVES

India has a coastline of about 7516.6 km. Longitudinally mangroves habitats are present between 69°-89.5°E and latitudinal between 7°-23°N (Wangensteen *et al.* 2009). Indian mangroves are located in three zones namely) East Coast occupying about 2700 km, ii) West Coast occupying about 3000 km, and iii) Andaman & Nicobar and Lakshadweep Islands occupying about 1816.6 km coastline area (Chand, 2018; Mandal; 2008). Mangrove wetlands are spread at Andaman and Nicobar Island and the east coast but in the case of the west coast, they are predominantly localized (India State of Forest Report 2013). According to Thom's classification, Indian mangrove habitats are classified into i) Deltaic, ii) Coastal and iii) Island mangrove habitat (Zhang, 2010).

Biannual monitoring of mangroves started in India in 1997 through remote sensing techniques. Table 1 gives the state-wise distribution of mangrove areas in the different states/union territories of India from 1987 to 2019. The mangrove vegetation was detected in only 7 states/union territories in 1987 but its presence increased to 12 states/union territories in 2019. A recent survey done in 2019 showed that an area of 4,975 km^2 has been covered by mangrove which is about 3% of total mangrove cover in South Asia. Out of the total area, West Bengal has maximum mangrove cover (2112 km^2, 42.45%) followed by Gujarat (1177 km^2, 23.66%) (Fig. 1). Overall, mangrove cover has increased by 929 km^2 from 1987 to 2019, where the highest growth is seen in Gujarat which is about 750 km^2 followed by 180 km^2 in Maharashtra, 52 km^2 in Odisha, 36 km^2 in West Bengal, and 22 km^2 in Odisha. A decrease in mangrove cover is seen in Andhra Pradesh (91 km^2) and Andaman and Nicobar (70 km^2). Overall, the area under mangrove vegetation saw a gradual increase from 1987 to 1999. There was a sharp decline of 389 km^2 from 1999 to 2001 and a further decline of about 34 km^2 from 2001 to 2003. From 2003 onwards there has been a gradual increase in the area under mangrove vegetation. An increased mean annual change was observed in all the other states/union territories except Andhra Pradesh (-2.84 km^2) and Andaman and Nicobar Islands (-2.19 km^2). This is similar to what was observed by Sahu *et al*, 2015. Even then, since 2013 both have shown an increase in area under mangrove cover. The maximum increase in mean annual change in mangrove area from 1987 to 2019 is shown by Gujarat (23.44 km^2) followed by Maharashtra (5.63 km^2). From the last century, about 40% of mangrove cover has been lost by India (India State of Forest Report 2013). Whereas 10.4% of the area was lost by the east coast and 12.4% area was lost from Andaman and Nicobar Islands and 17.2% by the west coast area (Chaudhuri, 2015). Natural calamities, logging, shrimp farming, constantly carried out in Bangladesh, have directly affected the mangroves of Sundarban. It lost nearly 45% of its total mangroves area (Sahu, 2015; Chaudhuri, 2015; Kumar R, 2000).

The extent of mangroves in the world has decreased by

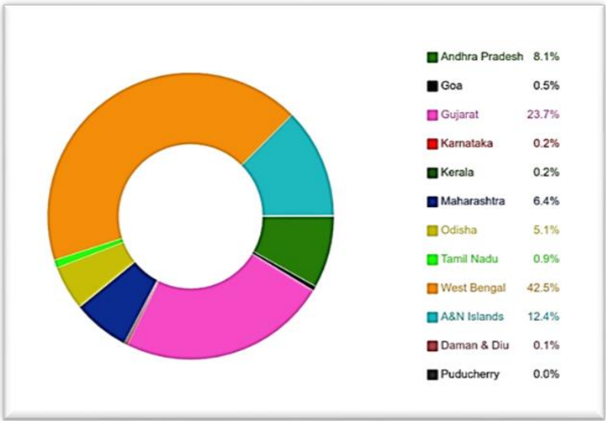

Fig. 1 - Area under mangrove cover in the different states/union territories of India during 2019.

6,057.45 km^2 between 1996 and 2016 (Chmura, 2003). Parida *et al*, 2020 observed an increase of 30.04 km^2 (13.5%) mangrove cover from 2009 to 2019 in Odisha which they attributed to plantation, awareness, restoration, and coastal zone management plan. They observed an increase of 15.54 km^2 in Hatamudia Reserve Forest, followed by 9.46% in the coastal belt of Bhadrak, 3.05% in Bhitarkanika National Park in Kendrapara, respectively (Jagtap 1993).

MANGROVE DIVERSITY

India has rich species diversity with a total of about 4,011 species. Of this, 77% is fauna (3091 species) and 23% flora (920 species). Out of the flora, the highest diversity of marine algae was around 60%, followed by fungi (11.2%), bacteria (7.5%) mangrove associates (9.3%), and mangroves (7.5%). (4.2%). There were approximately 59 species of mangroves in India from 41 genera and 29 families. On the east coast, almost 25 mangrove species have restricted distribution. It supports the lower organisms like planktons and benthos to dwell in the mangrove ecosystem. In India, 105 species of pieces are found which are supported by mangroves (Iftekhar, 2008).

Indian mangroves ecosystem consists of a distinctive group of microbes, fungi, plant as well as animal species together with mollusks, water birds, crustaceans including the number of endangered mammals like a dolphin, Royal Bengal tiger, and fruit bats. It covers various kinds of habitat like water bodies (creeks, rivers, bays, etc.), core forest, mudflats, seagrass ecosystem, litter-forest floors, and coral reefs. Two of the globally threatened mangroves *Heritiera fomes* and *Sonneratia griffith* are present in India (Parida, 2020). About 17% of a mangrove-dependent taxon is globally threatened and of which 3% are critically endangered (Chakraborty, 2011). Goutham-Bharathi (2014) observed 25 true mangrove species (belonging to 14 genera and 10 families) from the Andaman and Nicobar Islands (Kathiresan, 2010). A total of 16 true mangrove species has been recorded by Wakle *et al* (2018) from six study sites in Goa (Ramsar Convention on Wetlands, 2018).

Threats to Mangrove

Climate change has become a great concern for hydrological and ecological habitats and it is investigated by worldwide researchers. Due to its possible impacts on the increase in air and water temperature, the coastal region due to sea-level rise, the increase in atmospheric CO_2, changes in the quantity and nature of continental runoff, changes in the frequency and severity of extreme weather events, it is critical, etc. The different climatic conditions are extensively harmful to most of the wetland ecosystem (eg. Plankton, Benthic animals) (Goutham *et al.* 2014; Wakle, 2018). Mangroves usually respond to hazards which are resulting from global climate change because of the location at the continent-ocean interface Coastal wetlands have the potential to adapt to the rising waters and changes in local storm patterns under natural circumstances, but unfortunately, the combination of climate changes and human activity jointly alters natural conditions and disrupts coastal wetland hydrology, biogeochemical cycling and other processes (McLaughlin, 2002). Constant changes in an ecosystem lead to the tsunami which happened during the year 2004 in the Andaman and Nicobar also agricultural area affected in Andhra Pradesh along with other developmental activities of all the treats to mangrove, rise in ocean level might be the most dangerous (Durant, 2004; Morris, 2002), but even then, it is still a modest danger compared to anthropogenic activities like hydroponics cultivation (Field, 1995; Lovelock, 2007; IUCN,1989; Primavera, 1997). Rise in ocean level may be a significant reason behind anticipated decreases in the zone and wellbeing of mangroves and other flowing wetlands in the future (Alongi, 2002; Duke, 2007; Ellison, 1991; Nichols, 1999; Ellison, 2000; Cahoon, 2006, www.wpcouncil.org). Some of the major threats affecting the mangrove ecosystem are presented in Table 2.

Mangrove Conservation Policy

Constant climate change and anthropogenic activities lead to various threats in the mangrove ecosystem (Paul, 2017). Based upon anthropogenic activities and natural threats there are some policies for the conservation of mangrove i.e., management policy, policy and legislation, and conservation throughout the management. Management policy works like construction of artificial drainage system, mangrove management based on community, plantation-based upon benefits regarding science and ecosystem. National Wildlife Protection Act 1972, national forest policy 1952 forest conservation act of 1980, forest conservation act of 1988 (amended), coastal zone regulation act of 1991, coastal zone regulation act of 2011 and 2018 and biodiversity act of 2002. Conservation of mangroves can be done by sustainable management of forest ecosystem, joint forest management program, by plantation of mangrove species. Now a day it can be possible to spread awareness through education and by giving proper knowledge to the forest guard and local population to make the society attentive (Badola, 2012).

Coastal Regulation Zone (CRZ)

Random development had begun along the coasts, especially the sandy stretches of the nation, as there were not very much characterized laws administering beach front exercises. A remarkable enactment, called the Coastal Zone Regulation (CRZ) Notification (MoEF, 1991), issued under the Environment Conservation Act of 1986, was authorized by the Ministry of Environment and Forests. The principal motivation behind this notice was to secure, control, and limit ecological harm to delicate seaside stretches and biological systems including estuaries and backwaters from spontaneous human impedance, The government declared coastal stretches of oceans, bayous, estuaries, lakes, wetlands, and backwaters that are impaired by flowing movement (on the land side) up to 500 meters from the High Tide Line (HTL) and the Coastal Control Zone (CRZ) land between Low Tide Line (LTL) and HTL, as well as forced limits and proposed regulations for various beach front exercises.

The warning records different precluded exercises, a guideline of admissible exercises, techniques for checking and requirement, waterfront region characterization and improvement guidelines, standards for guideline of exercises, and definite rules for the advancement of seashore resorts and other residences. Table 3 highlights the differences between CRZ 2011 and CRZ 2018. Coastal zone regulation brings into existence for the security of local community habitat besides coastal area, fishing community and for the preservation of coastal stretches for development of marine environment to control the sea level rise because of global warming. As per CRZ 2018, 500 m is a range for the land area from the high tide line along the seafront. On the landward side, 500 m is the land area in between of high tidal line and hazard line.

The State Forest Departments and the Ministry of Environment and Forests, the region under the mangrove biome is growing, Government of India by way of forestation, restoration, plantation and conservation of mangroves. There is also a need for greater awareness through education to the masses and to make the forest guard and people living in the vicinity of mangrove ecosystems aware of the loss due to mangrove degradation.

CONCLUSION

The mangrove species have extraordinary significance in terms of the global economy and environment and hence need to be preserved as increased anthropogenic activities and natural calamities have led to a significant loss of mangrove forest area. Anthropogenic activities like oil spills, cutting of mangroves, aquaculture, agricultural expansion, tourism are major threats to the survival of mangroves. Besides, environmental changes like rising CO_2, ocean level and temperature, environmental pollution, cyclones, etc have added to the destruction of the mangroves. Intense global research and mangrove status assessment has led to national-level policy formulation and increased awareness drive among various stakeholders and the people dependent on and living in the vicinity of mangroves. Due to this, a gradual increase in area under mangrove vegetation is observed. There is a need for greater awareness as well as conservation and plantation efforts are required for the sustaining of the mangroves.

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Websites :
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Table1-Distribution of Mangroves (in km^2) in different states/union territories of India during 1987 to 2019

Year	Andhra Pradesh	Goa	Gujarat	Karnataka	Kerala	Maharashtra	Odisha	Tamil Nadu	West Bengal	A&N Islands	Daman & Diu	Puducherry	Total
1987	495	0	427	0	0	140	199	23	2076	686	0	0	4046
1989	405	3	412	0	0	114	192	47	2109	973	0	0	4255
1991	399	3	397	0	0	113	195	47	2119	971	0	0	4244
1993	378	3	419	0	0	155	195	21	2119	966	0	0	4256
1995	383	3	689	2	0	155	195	21	2119	966	0	0	4533
1997	383	5	901	3	0	124	211	21	2123	966	0	0	4737
1999	397	5	1031	3	0	108	215	21	2125	966	0	0	4871
2001	333	5	911	2	0	118	219	23	2081	789	0	1	4482
2003	329	16	916	3	8	158	203	35	2120	658	1	1	4448
2005	354	16	991	3	5	186	217	36	2136	635	1	1	4581
2009	353	17	1046	3	5	186	221	39	2152	615	1	1	4639
2011	352	22	1058	3	6	186	222	39	2155	617	2	1	4663
2013	352	22	1103	3	6	186	213	39	2097	604	1.63	1	4628
2015	367	26	1107	3	9	222	231	47	2106	617	3	2	4740
2017	404	26	1140	10	9	304	243	49	2114	617	3	2	4921
2019	404	26	1177	10	9	320	251	45	2112	616	3	2	4975

Table 2. Threats to mangroves

Major Threats	Description
Rise in CO_2 level	The global mean temperature increase results in a particularly high level of CO_2 concentration with other greenhouse gases which will again result in a cascade of physical and chemical changes in the aquatic system (McLeod, 2006). Some mangrove species have been found to react to elevated CO_2 levels and induce significant vegetation changes along natural gradients of salinity and aridity (Gilman, 2006).
Rise in Temperature	Increased atmospheric CO levels have contributed to a rise in global mean temperature that impacts biodiversity and destroy the entire system Temperature impacts the capacity of mangroves to acclimatize CO_2 because of the impediments to biochemical responses and freeze plant tissue prompting vascular embolism, drying out, or cell burst (Gilman, 2006).
Rise in sea level	An upward change inspection distribution would be the most noticeable result of sea level rise. Mangroves are additionally confronting dangers because of atmosphere change, particularly ocean level ascent (Christopher, 2006). Less significantly, mangroves are too undermined by an anticipated expanding recurrence and magnitude of extreme functions, for example, hurricanes (Ball, 1997; Krauss, 2008).
Poor rainfall	Low precipitation and increased evaporation can naturally lead to an increase in the salinity of the mangrove. Impacts of salinity on mangroves and a decline in net primary mangrove productivity, seedling growth and survival, a change in seedlings' growth and survival. There has been a decline in competition between mangrove species, a decline in the diversity of mangrove zones and a major decrease in mangrove areas (Ellison, 2014).
Cyclones	Muniyandi (1986) expressed that, pretty much every elective year Indian mangroves are influenced by significant tornadoes. The expanded force and recurrence of hurricanes normally increment the harm to mangroves through defoliation, remove of trees and tree mortality. It has been assessed that the all-out mangrove zone tumbled from 30,766 ha to 17,900 ha during the super typhoon (Cahoon, 2003).
Agriculture expansion	During the previous 100 years, about 1,50,000 ha of mangroves were obliterated for agrarian purposes in India and Bangladesh. A further burden on the regeneration and endurance of mangrove seedlings is hydroponics in mangrove regions. Richard and Friess (2016) found that conversion of area under mangrove vegetation was replaced by rice cultivation and this alone accounted for 20% decline in mangroves in Southeast Asia from 2000 to 2012.
Environmental Pollution	Contamination has made living spaces hard for mangrove endurance and development. Balu et al. (2020) detected PAH of pyrogenic and petrogenic sources in surface water and sediments of Sundarbans (Dasgupta, 2016; Paul, 2017)). Rajaram et al. (2020) found that mangrove in Tuticorin accumulated greater concentration of heavy metals in monsoon (Muniyandi, 1986). Arumugam (2018) observed higher than WHO recommended level of Pb and Cd in water. The study also found high levels of heavy metals in sediments from Muthupet (Richards, 2016). Alharbi et al. (2019) found heavy metal contamination in the coastal area of Red Sea at Yanbu (Balu, 2020).
Cutting of mangroves for timber	Individuals are devastating mangroves for kindling, charcoal and timber variety due to high calorific estimate of mangrove wood and elevated quality. For the chipboard and paper industry, mangrove wood is exceptionally suitable. So, for these reasons, backwoods have been cleared annually because of their modern importance (Rajaram, 2020; Friess, 2019).
Tsunami	The 2004 wave caused widespread mangrove destruction on the south shore of India and the Andaman and Nicobar Islands. The angry impact of the torrent waves was borne by the mangrove trees and the grinding made by these trees decreased the water speed and consequently saved the cities (Arumugam, 2018).
Salinity and sedimentation	Paul et al. (2017) found hyper salinity to be one of the reasons behind mangrove degradation at Fredrick Island and sediment deposition at Patibania Island and Henry's Island (Alharbi, 2019).
Aquaculture	Barbier & Ivar (1997) found that decreased shrimp production and benefit were indicated by the decline in mangrove habitat.84. About 30-40% of mangroves lost in India due to aquaculture (Sirikulchayanon, 2008; Lacerda, 1993).

Table 3. Comparison between CRZ 2011 and CRZ 2018

CRZ 2011	CRZ 2018
CRZ-I - The regions that are environmentally delicate with geomorphological highlights assume a significant function in keeping up the uprightness of the coast and the region between low tide line and elevated tide line.	CRZ-I-It incorporates naturally touchy territories, where no development is permitted aside from exercises for nuclear force plants and protection movement.
CRZ-ll - According to CRZ, 2011 Note, in compliance with 1991 Improvement Control Guideline (DCR) levels, Metropolitan regions, Floor Space Record (FSI) or the Floor Zone Proportion (FAR) is solidified under CRZ-II.	CRZ-ll - In the CRZ-II, 2018 Warning, it has been chosen to de-freeze the equivalent and grant FSI for development ventures, as swaying the date of the new Notice. This will empower redevelopment of these regions to meet the developing needs.
CRZ-III A - According to 2011 estimates, these are thickly inhabited rustic areas with a population density of 2161 for each square kilometre. These territories would have an NDZ of 50 meters from the HTL as opposed to 200 meters from the elevated tide line defined in the 2011 CRZ Note, as these regions have comparative characteristics such as urban areas.	CRZ III- The CRZ Notification, 2018 will lead to enhanced activities in the coastal regions thereby promoting economic growth and respecting the conservation principles of coastal regions.
CRZ-III These are thickly inhabited rustic areas with a population thickness of 2161 for each square kilometer, according to 2011 figures. These territories would have an NDZ of 50 meters from the HTL relative to the elevated tide line of 200 meters defined in the 2011 CRZ Note, as these regions have comparative characteristics.	CRZ-III B Provincial regions with population thickness below 2161 with continue to have an NDZ of 200 meters from the HTL for each square kilometer as per 2011 enumeration. In addition to improving life and improving India's economy. This would not only bring about an enormous working age.
CRZ -IV -The water zone from the low tide line to twelve nautical miles on the toward the ocean side will incorporate the water territory of the flowing affected water body from the mouth of the water body at the ocean up to the impact of tide which is estimated as five sections for each thousand during the driest period of the year.	CRZ-IV -It incorporates the water territory secured between low tide line and 12 nautical miles toward the ocean aside from fishing and related exercises, all activities condemning on the ocean and flowing water will be managed in this zone.
In 1991, the Ministry of Environment and Forests and Climate Change notified the Coastal Regulation Zone Notification with a view to the conservation and protection of the coastal environment, which was subsequently updated in 2011.The notice was amended on the basis of representations obtained from time to time.	It is expected that this notification will rejuvenate the coastal areas while reducing their vulnerabilities.

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