



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

INTERNATIONAL JOURNAL
OF CURRENT RESEARCH

International Journal of Current Research
Vol. 14, Issue, 04, pp.21293-21303, April, 2022

DOI: <https://doi.org/10.24941/ijcr.43390.04.2022>

RESEARCH ARTICLE

SUNDARBAN: AN ANALYSIS OF WORLD'S SINGLE LARGEST COASTAL MANGROVE FOREST

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ARTICLE INFO

Article History:

Received 19th January, 2022

Received in revised form

16th February, 2022

Accepted 29th March, 2022

Published online 30th April, 2022

Keywords:

Sundarban, Sundari tree, Islands, plant species, animal species, Royal Bengal tigers, advantage, Pride, Tourist attraction, writings on, National park, UNESCO World Heritage Site, problems, climate change mainly, possible solutions, awareness of people, goodwill of Government.

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ABSTRACT

Sundarban is the largest delta in India as well as world's largest delta, formed by the rivers Ganges, Brahmaputra and Meghna., Extending about 260 km along the Bay of Bengal from the Hooghly River Estuary in India to the Meghna River Estuary in Bangladesh. Sunderban covers an area of 4262 sq. km in India. The name may have been derived from the word Sundari or Sundri, the local name of the mangrove species. Its mangrove forest acts as a natural flood barrier, protecting the coastal population from the devastating impact of cyclones that hit the region. However, increased deforestation and damage to the mangrove forests for extraction of resources is not only leaving the coasts progressively exposed and more vulnerable to storms, but also depleting the rich biodiversity of the region. Sundarban is the pride of Bengal for many reasons. The most important is the existence of the black-striped yellow tigers known as the royal Bengal tiger. Even UNESCO is taking care of this tigers. Now-days the people of Sundarban is facing several severe problems like (1) Very crisis of the safe drinking water (2) Shortage of ground water (3) Saline of surfers and river water (4) Acute poverty (5) Poor health management and sanitation practices (6) gender discrimination (7) Inadequate transport facilities (8) frequent natural calamities (9) Limited livelihood options (10) Ignorance of Government services and many more. The possible solutions are (1) Supporting them in uplifting their income generation capacity and reducing their dependence on the conserved area (2) Need to include integrated efforts for restricting growth of population in the region (3) Policies targeted at universal education (4) Eradication of gender bias and women empowerment (5) To address the region's conservation challenges, internalization of a development plan with strong components on land management, sustainability of natural resource base, disaster management and livelihood management in the context of climate change is imperative and many more. The Sundarban delta in India has been a priority region for WWF-India since 1973 and it is also an ecologically fragile and climatically vulnerable region that is home to over 4.5 million people. Securing the future of the Sundarbans, its biodiversity and people requires a long term vision that can integrate climate adaptation and conservation strategies. Water salinity simulation and modeling would be a proper tool for decision making and allow planners to protect the Sundarban ecosystems in future.

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Citation: Hiralal Jana and Debabrata Basu "Sundarban: an analysis of world's single largest coastal mangrove forest", 2022. International Journal of Current Research, 14, (04), 21293-21303.

INTRODUCTION

The Sundarbans a UNESCO World Heritage Site is located at the South eastern tip of the South 24 Parganas district about 110 km from Kolkata. Sundarban is the largest delta in India. Sundarbans are a part of the world's largest delta, formed by the mighty rivers Ganga, Brahmaputra and Meghna.

Situated on the lower end of Gangetic West Bengal. It is one of the most attractive and alluring places remaining on earth, a truly undiscovered paradise. The Sundarbans is the largest single block of tidal, halophytic mangrove forests in the world.. They are vast tract of forest and saltwater swamp forming the lower part of the Ganges Delta, extending about 260 km along the Bay of Bengal from the Hooghly River Estuary in India to the Meghna River Estuary in Bangladesh.

Sunderban covers an area of 4262 sq. km in India. It is the largest Tiger Reserve and National Park. Apart from being a unique largest mangrove eco-system of the world, the Sundarbans has the world's largest deltaic mangrove forests and is also home to one of India's most iconic wildlife species - the Royal Bengal Tiger. It is also the world's largest estuarine forest criss-crossed by hundreds of creeks and tributaries, intersected by a network of tidal waterways, small islands of salt-tolerant mangrove forests and mudflats. The interconnected network of waterways makes almost every nook and corner of the forest accessible by boats or rafts making. The Sundarbans also serves as a crucial protective barrier for the inhabitants in and around Kolkata against the floods that result from the cyclones which are a regular occurrence. Sundarbans have also been enlisted amongst the finalists in the New 7 Wonders of Nature. Sunderban is spread over 54 islands and two countries. It is one of the last preserves of the Bengal tiger and the site of a tiger preservation project. It is also the biggest Mangrove Forest of Bangladesh. In the south-western part of Bangladesh, in the district of greater Khulna, lies the Sundarbans. It is a virgin forest which until recently owed nothing to human endeavour and yet nature has laid it out with as much care as a planned pleasure ground. For miles and miles, the lofty treetops form an unbroken canopy, while nearer the ground, works of high and ebb-tide marked on the soil and tree trunks and the many varieties of the natural mangrove forest have much to offer to an inquisitive visitor. The Sundarban is the largest mangrove forest in the world (140,000 ha). The forest lies at the feet of the Ganges and is spread across areas of Bangladesh and West Bengal, India, forming the seaward fringe of the delta. The forest covers 10,000 km² of which about 6,000 are in Bangladesh.



Picture of Sundarban

Nomenclature: Sundarban is a unique ecosystem dominated by mangrove forests and gets its name from the Sundari trees. The Sundarbans in Bengali language "Shundorbôn" is the largest single block of tidal halophytic mangrove forest in the world. The name Sundarban can be literally translated as "beautiful jungle" or "beautiful forest" in the Bengali language Sundar, "beautiful" and ban, "forest" or "jungle". The name may have been derived from the Sundari trees that are found in Sundarbans in large numbers. Alternatively, it has been proposed that the name is a corruption of Samudraban Bengali: Shomudrobôn "Sea Forest" or Chandra-bandhe name of a primitive tribe. But the generally accepted view is the one associated with Sundari trees.

History: The history of the area can be traced back to 200–300 AD. A ruin of a city built by Chand Sadagar has been found in the Baghmara Forest Block. During the Mughal

period, local kings leased the forests of the Sundarbans to residents. In this period, Raja Basanta Rai and his nephew took refuge in the Sundarbans from the advancing armies of Emperor Akbar. Many of the buildings which were built by them later fell to hands of Portuguese pirates, salt smugglers and dacoits in the 17th century. Evidence of the fact can be traced from the ruins at Netidhopani and other places scattered all over Sundarbans. The area was mapped by the Surveyor General as early as 1764 following soon after proprietary rights were obtained from the Mughal emperor Alamgir II by the East India Company in 1757. Systematic management of this forest tract started in the 1860s after the establishment of a Forest Department in the Province of Bengal, in India. The first Forest Management Division to have jurisdiction over the Sundarbans was established in 1869.

The Sundarbans was declared a reserved forest in 1875–76, under the Forest Act, 1865. The first management plan was written for the period 1893–98. In 1875 a large portion of the mangrove forests was declared as reserved forests under the Forest Act, 1865. The remaining portions of forests was declared as reserve forest the following year and the forest, which was so far was administered by the civil administration district, was placed under the control of the Forest Department. A Forest Division, which is the basic forest management and administration unit, was created in 1879 with the headquarter in Khulna. In 1911, it was described as a tract of waste country which had never been surveyed, nor had the census been extended to it. It then stretched for about 266 km from the mouth of the Hugli to the mouth of the Meghna and was bordered inland by the three settled districts of the 24 Parganas, Khulna and Backergunje. The total area including water was estimated at 16,902 km². Attempts at reclamation had not been very successful. The Sundarbans were everywhere intersected by river channels and creeks, some of which afforded water communication between Calcutta and the Brahmaputra Valley, both for steamers and for native boats.

Sanctuaries in Bangladesh: The Bangladesh part of the Sundarbans is estimated to be about 4,110 km², of which about 1,700 km² is occupied by waterbodies in the forms of river, canals and creeks of width varying from a few meters to several kilometers. The forest lies under two forest divisions, and four administrative ranges viz Chandpai, Sarankhola, Khulna, and Burigoalini, Satkhira and has sixteen forest stations. It is further divided into fifty-five compartments and nine blocks. A new Khulna Forest Circle to preserve the forest was created in 1993 and a Conservator of Forests has been posted. The direct administrative head of the Division is the Divisional Forest Officer who is also based at Khulna. The Divisional Forest Officer has a number of professional, sub-professional and support staff and logistic supports for the implementation of necessary management and administrative activities. The basic unit of management is the compartment. There are 55 compartments in four Forest Ranges and these are clearly demarcated mainly by natural features such as rivers, canals and creeks. There are three wildlife sanctuaries established in 1977 under the Bangladesh Wildlife (Preservation) Order, 1973.

Distribution: The Sundarban mangrove forest covers an area of about 10,000 km², of which forests in Bangladesh's Khulna Division extend over 6,017 km² and in West Bengal, they extend over 4,260 km² across the South 24 Parganas and North 24 Parganas districts. 2585 sq. kms of the Indian Sundarban forms the largest Tiger Reserve and National Park in India.

Sunderban national park is located at the South Eastern tip of the 24 Paraganas district in the state of West Bengal. The total area of the Indian part of the Sunderban forest, lying within the latitude between 21°13'-22°40' North and longitude 88°05'-89°06' East, is about 4,262 sq km, of which 2,125 sq km is occupied by mangrove forest across 56 islands and the balance is under water. The park is surrounded by a buffer zone of 885 square kilometers. This also mainly consists of mangrove forests. The four Sunderban national parks have been lumped together as they all share common features of the estuarine mangrove ecosystem.

Natural boundaries of Indian Sundarbans National park

Northside-Netidhopani & Gosaba
 Southside: Bay of Bengal
 Eastside: Haribhanga river
 Westside: Matla river

Islands:-It surprises to learn that the abode of Sundarbans, which is spread across 4000 sq. km, is an archipelago of 102 islands. Out of these 102 islands, 54 are inhabited by people, while the rest of the area is covered by forests.

Table 1. Some of the important islands of Sundarbans

Sl.	Island	Sl.	Island
1	Kumimari Island	10	Kalash Island
2	Rangabelia Island	11	Haliday Island
3	Mousuni Island	12	Tin kona Island
4	Sagar Island	13	Dayapur Island
5	Lohachara Island	14	Bali Island
6	New Moore Island	15	Dublar Char Island
7	South Talpatti Island	16	Henry Island
8	Ghoramara Island	17	Kanak Island
9	Sajnekhali Island	18	Marichjhanpi Island

Table 2. Major rivers of Sundarbans

Sl.	Major rivers	Sl.	Major rivers
1.	Piyali river	9.	Hogol river
2.	Matla river	10.	Korotal river
3.	Haringhata river/Baleswar river	11.	Gosaba river
4.	Raimangal river	12.	Malancha –Mandarbaria river
5.	Hariabhanga river	13.	Shela river
6.	Saptamukhi river	14.	Kalmi river
7.	Muri Ganga river	15.	Peechkali river
8.	Bidyadhari river	16.	Gomati river

Map of Sundarban:- The tract extends approximately 260 km west-east along the Bay of Bengal from the Hugli River estuary in India to the western segment of the Meghna River estuary in Bangladesh and reaches inland for about 80 km at its broadest point.



(Sundarban, northeastern India and southern Bangladesh, designated a UNESCO World Heritage site in 1997.)

Fig. Map of Sundarban

Plant estimation:- This exceptional biodiversity supports 334 plant varieties, 165 algae and 13 orchid species, and much more. The Sundarbans Mangroves ecoregion on the coast forms the seaward fringe of the delta and is the world's largest mangrove ecosystem. The dominant mangrove species is sundari. Mangrove forests are not home to a great variety of plants. They have a thick canopy, and the undergrowth is mostly seedlings of the mangrove trees. Besides the sundari, other tree species are there in the forest. Twenty-six of the fifty broad mangrove species found in the world grow well in the Sundarbans. The commonly identifiable vegetation types in the dense Sundarban mangrove forests are salt water mixed forest, mangrove scrub, brackish water mixed forest, littoral forest, wet forest and wet alluvial grass forests. The Bangladesh mangrove vegetation of the Sundarban differs greatly from other non-deltaic coastal mangrove forests and upland forests associations. Unlike the former, the Rhizophoraceae are of minor importance.

Table 3. Few of Sundarban plant species

Sl.	Common name	Botanical name
1.	Sundri or sundari.	<i>Heritiera fomes; Heritiera littoralis</i>
2	Grey mangrove	<i>Avicenniamarina</i>
3	Passur	<i>Xylocarpusmekongensis,</i>
4	Dhundul or cannonball mangrove	<i>Xylocarpus granatum</i>
5	Keora	<i>Sonneratia apetala</i>
6	Kankra	<i>Bruguiera gymnorhiza</i>
7	Goran	<i>Ceriops decandra,</i>
8	Khalsi or black mangrove	<i>Aegiceras corniculatum</i>
9	Gajjan	<i>Rhizophoramucronata</i>
10	Golpata	<i>Nypa fruticans</i>
11	Gewa /Genwa	<i>Excoecaria agallocha</i>
12	Wildrice	<i>Porteresia coarctata</i>
13	Grass	<i>Myriostachya wightiana</i>
14	Spear grass	<i>Imperata cylindrica</i>
15	Khagra grass	<i>Phragmites karka</i>
16.	Hantal palm	<i>Phoenix paludosa</i>
17.	Shingra	<i>Cynometra ramiflora</i>
18.	Amur	<i>Aglalacucullata</i>

A total of 245 genera and 334 plant species were recorded by David Prain in 1903. The characteristic tree of the forest is the sundari. It yields a hard wood, used for building houses and making boats, furniture and other things. New forest accretions is often conspicuously dominated by keora and tidal forests. It is an indicator species for newly accreted mudbanks and is an important species for wildlife, especially spotted deer. There is abundance of dhundul or passur and kankra though distribution is discontinuous. Among palms, *Poresia coaractata*, *Myriostachya wightiana* and golpata, and among grasses spear grass and khagra are well distributed. The varieties of the forests that exist in Sundarban includes mangrove scrub, littoral forest, saltwater mixed forest, brackish water mixed forest and swamp forest. Besides the forest, there are extensive areas of brackish water and freshwater marshes, intertidal mudflats, sandflats, sand dunes with typical dune vegetation, open grassland on sandy soils and raised areas supporting a variety of terrestrial shrubs and trees. The mangrove vegetation of Sundarban consists of 64 plant species with the capacity to withstand estuarine conditions and saline showering on account of tidal effects. In the month of April and May the flaming red leaves of the Genwa the crab-like red flowers of the Kankra and the yellow flowers of Khalsi can be seen. Biodiversity of the Sundarban:- Mangrove forests are biologically productive ecosystems and Sundarban, too, is home to a very rich floral and faunal diversity. The region encompasses 85 per cent of mangrove habitat in India with 63 of 69 mangrove species found in the country.

Table 4. Common name and scientific names of animals of Sundarban

Sl.	Common name	Scientific name	Sl.	Common name	Scientific name
1	Royal Bengal Tiger	<i>Panthera tigris</i>	18	King cobra	<i>Ophiophagus hannah</i>
2	Estuarine Crocodile	<i>Crocodilus porosus</i>	19	Indian spectacled cobra	<i>Naja naja</i>
3	Water Monitor Lizard	<i>Varanus salvator</i>	20	Indian python	<i>Python molurus</i>
4	Gangetic dolphin	<i>Platinista gangetica</i>	21	Green turtle	<i>Chelonia mydes</i>
5	Olive Ridley Turtle	<i>Lepidocheelys olivacea</i>	22	Spotted deer	<i>Cervus axis</i>
6	Fishing cat	<i>Prionailurus viverrinus</i>	23.	Irravaddy dolphins	<i>Orcaella brevirostris</i>
7	Leopard cats	<i>Prionailurus bengalensis</i>	24.	Turtle	<i>Batagur baska</i>
8	Macaque	<i>Macaca sylvanus</i>	25.	Gharials	<i>Gavialis gangeticus</i>
9	Wild boar	<i>Sus scrofa</i>	26.	Indian muntjacs	<i>Muntiacus muntjak</i>
10	India grey mongoose	<i>Urva edwardsii</i>	27.	Water buffalo	<i>Bubalus bubalis</i>
11	Fox	<i>Vulpes vulpes</i>	28.	Common monkey	<i>Rhesus macaque</i>
12	Jungle cat	<i>Felis chans</i>	29.	Swamp deer	<i>Cervus duvaucelli</i>
13	Flying fox	<i>Pteropus medius</i>	30.	Javan rhinoceros	<i>Rhinoceros sondaicus</i>
14	Pangolin	<i>Manis crassicaudata</i>	31.	Chitra turtle	<i>Chitra indica</i>
15	Chital	<i>Axis axis</i>	32.	Barking deer	<i>Muntiacus muntjak</i>
16	Hilsa	<i>Tenualosa ilisha</i>	33.	Indian dog shark	<i>Scoliodon laticaudus</i> (locally known as Kamote)
17	Spotted javelin fish	<i>Pomadasys hasta</i>			

Table 5. Common name and scientific names of some birds of Sundarban

Sl.	Common name	Scientific name	Sl.	Common name	Scientific name
1	Kingfisher	<i>Alcedo atthis</i>	16	Lapwings	<i>Vanellus indicus</i>
2	White bellied sea-eagle	<i>Haliaeetus leucogaster</i>	17	Water hens	<i>Amaurornis phoenicurus</i>
3	Herons	<i>Ardea cinerea</i>	18	White ibis	<i>Eudocimus albus</i>
4	Egrets	<i>Egretta alba</i>	19	Pariah kites	<i>Milvus migrans</i>
5	Storks	<i>Ciconia ciconia</i>	20	Spotted doves	<i>Spilopelia chinensis</i>
6	Sandpipers	<i>Actitis hypoleucos</i>	21	Coots	<i>Fulica cristata</i>
7	Woodpeckers	<i>Blythipicus pyrrhotis</i>	22	Swamp partridges	<i>Francolinus gularis</i>
8	Barbets	<i>Psilopogon haemacephalus</i>	23	Mynahs	<i>Acridotheres tristis</i>
9	Shrikes	<i>Lanius excubitor</i>	24	Ducks	<i>Anas platyrhynchos</i>
10	Drongos	<i>Dicrurus macrocercus</i>	25	Stints	<i>Calidris minutilla</i>
11	Curlew	<i>Numenius arquata</i>	26	Pintails	<i>Anas acuta</i>
12	Tern	<i>Sterna hirundo</i>	27	Teals	<i>Anas crecca</i>
13	Whimbrel	<i>Numenius phaeopus</i>	28	Cormorants	<i>Phalacrocorax fuscicollis</i>
14	Pelican	<i>Pelecanus occidentalis</i>	29.	Masked finfoots	<i>Heliopeia personatus</i>
15	Plovers	<i>Charadrius melodus</i>			

The algal flora of Sundarban has not been examined in detail, however, a total of 150 species has been identified in a recent study in the Indian part of Sundarban.

Animal estimation:- The Royal Bengal Tiger in all its glory calls the Sundarban its home. It hosts a modest population of about 400-450 Tigers. Its varied variety of 260 species of birds, 59 reptiles, and rich marine life makes this a must-visit for adventure seekers. A total number of 1,434 faunal species has been recorded, despite fragmented record of most faunal group in the region. The rich estuarine and coastal marine life on the Indian side of the forest consists of 165 species, which includes hilsa, spotted javelin fish and others. Seven amphibian and 59 reptile species are also present that include king cobra, Indian spectacled cobra, Indian python, olive ridley turtle, green turtle and others. Several species of kingfisher, white-bellied sea-eagle, herons, egrets, storks, sandpipers, etc., are the water fowl common in the region. Forest birds like woodpeckers, barbets, shrikes, drongos and others are also abundantly found. The Sundarbans support one of the largest population of tiger, spotted deer and wild boar that occur in large numbers and form the principal prey of the tiger. It is home to many rare and globally threatened wildlife species such as the estuarine crocodile, royal Bengal tiger, Water monitor lizard, Gangetic dolphin, and olive ridley turtle. The forest in India is divided into the Sundarbans Tiger Reserve and 24 Parganas (South) Forest Division, and together with the forest in Bangladesh is the only mangrove forest in the world where tigers are found. The Royal Bengal Tigers have developed a unique characteristic of swimming in the saline waters, and are famous for their man-eating tendencies.

Root character:- Most importantly, mangroves are a transition from the marine to freshwater and terrestrial systems, and provide critical habitat for numerous species of small fish, crabs, shrimps and other crustaceans that adapt to feed and shelter, and reproduce among the tangled mass of roots, known as pneumatophores, which grow upward from the anaerobic mud to get the supply of oxygen.

Popular culture of Sundarban:- The Sundarban is celebrated through numerous Bengali folk songs and dances, often centred around the folk heroes, gods and goddesses specific to the Sunderban (like Bonbibi and Dakshin Rai) and to the Lower Gangetic Delta (like Manasa and Chand Sadagar). The Bengali folk epic Manasamangal mentions Netidhopani and has some passages set in the Sundarbans during the heroine Behula's quest to bring her husband Lakhindar back to life.

Birds:- Lothian Island Bird Sanctuary is located in South 24 Parganas district in West Bengal, it is one of the famous wildlife sanctuaries in the area. The Lothian Island is famous for different species of birds including Black-Capped Kingfisher, Curlew, White-Bellied Sea-Eagle, Tern and Whimbrel. The watchtower can be used to explore the national park's wilderness and can spot many birds like the pelican, kingfishers, plovers, lapwings, white-bellied sea eagle, sandpipers, and more. The Sundarbans wildlife sanctuary also hosts a wide species of birds. The brown winged kingfishers as well as masked finfoots are some of the endangered and most beautiful birds among the somewhat 170 species of avifauna of the Sundarbans.

Some other mostly seen birds in this national park are storks, water hens, white ibis, pariah kites, spotted doves, coots, swamp partridges, mynahs, herons, pelicans, lots of ducks, stints, woodpeckers, plovers, pintails, teals, comorants and many more.

Fisherfolk:- Fishing in the creek and rivers is practiced by the communities settled on the fringe of the protected forest area, and communities living along the coastline go into the sea for fishing. Fishermen, referred to as jele locally, are known to use both traditional methods and motorised boats for fishing. Fishing in the Sundarbans comes with its share of occupational hazards which include encounters with predators and unfavourable weather conditions.

Advantages of Sundarbans:- Sundarbans is a part of the largest delta in the world which is formed by the rivers Ganga, Brahmaputra and Meghna. The region is a swamp adjacent to both the plains and the sea and is intersected by several river tributaries, creeks and canals. Although the topography makes the region uncondusive for habitation, it is densely populated, with villages spaced around the edges of the forest. Its mangrove forest acts as a natural flood barrier, protecting the coastal population from the devastating impact of cyclones that hit the region. However, increased deforestation and damage to the mangrove forests for extraction of resources, which are high in economic value, is not only leaving the coasts progressively exposed and more vulnerable to storms, but also depleting the rich biodiversity of the region.

Sundarban is the pride of Bengal for many reasons:- Among all those reasons, the most important is the existence of the black-striped yellow tigers known as the Royal Bengal Tiger. These tigers are not just mere animals to this forest but a matter of pride. Even UNESCO is taking care of these tigers. A few years ago they were at a verge of extinction but with the proper vigilance of the government officials and local help, they are now rejuvenating. Sundarban Tourism is one of the biggest factors in enhancing the care of the tigers all the more.

The ten most important facts concerning Sundarban Royal Bengal Tiger:-

- These tigers are found mostly in Sundarbans.
- These tigers are specifically found in the Mangrove forests. They love to inhabit in the mangroves.
- The black-striped yellow tigers are the National animal of India.
- Once it was news that a completely black tiger was found in the species of Royal Bengal Tiger in 1846.
- Their sensory nerves are commendable. They excel in hearing and seeing things well.
- The most interesting facts are that these tigers are coy to humans.
- Their hunting times begin with the vanishing of daylight.
- They are endangered species because of the high demand for their skin and some of their body parts are essential to make medicines.
- The Government of India has created Wild Life Sanctuaries to preserve these tigers in large numbers.
- They are special to the Bengal region and pride for India.

Tourist Attractions in and around Sundarbans National Park:-The Sundarbans National Park, an invincible kingdom of

Royal Bengal tigers, is one of the most riveted tourism destinations in the eastern belt of India, especially for the wildlife and nature lovers. Tourist destinations in and around the national park are:

Sajnekhali Bird Sanctuary:The Sajnekhali Bird Sanctuary which is situated on a land between the Peechkali and Gomati Rivers, and the only place in the Sundarbans forest to take a walk. Also, there is a Mangrove interpretation center located inside this sanctuary. **Sajnekhali watchtower:-**the second most famous watchtower in the Sundarbans Park after the Sudhanyakhali. It is a fascinating tourist place which also has a crocodile park, a museum and the Bonobibi temple inside the premises of the watch tower land. Here, the permit to visit other areas of the Sundarbans forest issued by the forest office. Most famous watchtower in the Sundarbans area, the Sudhanyakhali watchtower is strategically placed in the center of the tiger reserve zone. It is an amazing place from where one can view most of the tiger reserve area and can also spot a large number of tigers. Other two watch towers are Netidhopan, Haldi.

Bhagbatpur Crocodile Project:One of a kind, Bhagbatpur Crocodile Project is a crocodile breeding farm located in the Bhagbatpur area of the Sundarbans. It is known as the hatchery of the world's largest estuarine crocodile.

Piyali Island: Known as the gateway to the Sundarban, the Piyali Island is situated in the Sundarban at a distance of 72 km from Kolkata. This place is in the close proximity to Sajnekhali and developed as the tourist complex to enhance the tourism activity in and around the Sundarbans National Park. The Piyali River flows amid the island to converge with the Matla River.

Lothian Island Wildlife Sanctuary: The Lothian Island Wildlife Sanctuary is located on a small island of having 38 sq km of area and easily accessible from Namkhana. The Lothian Island is famous for being home to various bird species. However, there is no tiger in this island thus making this island a favorite place for nature lovers as they can walk amid the greenery which largely consists of mangrove trees without any fear of the tiger.

Chulkati & Dhulivasani:-The forest of Chulkati and Dhulivasani is located adjacent to the Kalas Island and a famous stop by in the Sundarban for its diverse wildlife. With various rivers crisscrossing an area of around 462 sq km, it offers you some extraordinary view of nature like the Sundarban. A 53-feet high watchtower which is located deep in the Ramganga range in the Sundarbans forest will provide a complete view of flora and fauna around the tower.

Hiran Point:-The Hiran point which is located at the southern periphery of the Sundarbans is surrounded by beautiful water bodies from three sides and offers one a great view around.

Haliday Island:- The Haliday Island, which is also located on the southern side of the Sundarbans is an attractive tourist spot and widely known for being home to the barking deer.

Haliday Island Wildlife Sanctuary:-Located in the Haliday Island, the Haliday Wildlife Sanctuary is spread over an area of 6 sq km and is one among the three Wildlife Sanctuaries

which enrich the Sundarban Biosphere Reserve. The Holiday Island is located on the bank of Matla river.

Tin Kona Island:-This is a spectacular Island in the Sundarban National Park and a perfect place to spot tigers and deer.

West Bengal a beautiful state:- The state has got everything. With innumerable adventurous places to explore, West Bengal gives holiday season a new direction.

Writing on Sundarban:- Several novels have been written by authors in the setting of Sundarbans that are based on the rigors of the lives of villagers and fishermen which include *The Mystery of the Black Jungle* by Emilio Salgari, *Sundarbani Arjan Sardar* by Shib Sankar Mitra and Padma Nadir Majhi, by Manik Bandopadhyay. Also, the Booker Prize winning novel, *Midnight's Children* by Salman Rushdie's and *The Hungry Tide* by Amitav Ghosh are set in the Sundarbans. This forest is adopted as the setting of Kunal Basu's short story "The Japanese Wife" and the subsequent film adaptation. Manik Bandopadhyay's Padma Nadir Majhi was made into a movie by Goutam Ghose. The Sundarbans has been the subject of a detailed and well-researched scholarly work on numerous non-fiction books, including *The Man-Eating Tigers of Sundarban* by Sy Montgomery. In *Up The Country*, Emily Eden discusses her travels through the Sunderban. Numerous documentary movies have been made about the Sunderban, including the 2003 IMAX production *Shining Bright* about the Bengal tiger. The acclaimed BBC TV series *Ganges* documents the lives of villagers, especially honey collectors, in the Sundarbans. Apart from these India's wildlife has been the subject of many other tales like *Jataka* and *Panchtantra*.

Sundarban National Park:- Sunderban national park is located at the South Eastern tip of the 24 Paraganas district in the state of West Bengal. The Sundarbans are a part of the world's largest delta formed by the rivers Ganges, Brahmaputra and Meghna. Sunderban is a vast area covering 4262 square kms in India alone, with a larger portion in Bangladesh. 2585 sq. kms of the Indian Sundarban forms the largest Tiger Reserve and National Park in India. About 4,262 sq km, of which 2,125 sq km is occupied by mangrove forest across 56 islands and the balance is under water. The national park is a mazy network of tiny islands, mudflats and tidal waterways which present a very good example of a natural awe-inspiring scenery. Sundarban consists an area of about 4100 sq kilometers out of which around 1700 sq kilometers are river, canals or creeks. The area is not only known for natural scenery and tiger it's also abode of wide range of fauna and flora including 58 species of mammals, 55 species of reptiles and around 250 species of birds. The park is surrounded by a buffer zone of 885 square kilometers. This also mainly consists of mangrove forests. The four Sunderban national parks have been lumped together as they all share common features of the estuarine mangrove ecosystem.

Best Season of Sundarban National Park:-The best time to visit Sunderban is during winters between December and February, although the park is open for longer from September to March. This is the period when the maximum migratory birds are also present here.

Access of Sunderban National Park:-The Sunderbans are not easily accessible. To get to the Sundarban national park in India the nearest airport is Calcutta, the nearest railway station is Canning, and the nearest town is Gosaba.

From the park headquarters at Canning take the country motor launch (5 hours) to Sajnekhali. Declared as a UNESCO heritage site, this park has its own charm to attract tourists at this place.

Flora in Sundarbans National Park: The Sundarban forest is the largest mangrove forest in the world so undoubtedly the mangrove tree is the prime fauna of this region. More than 300 species of plants are found in the entire Sundarbans region.

Fauna in Sundarbans National Park: The Royal Bengal Tigers, at the apex of the food chain, are ruling the Sundarbans National Park with their massive population that crosses 400 counts. However, tigers are the prime focus for the tourists here, but apart from this beautiful striped beast, there are various other fauna enrich the park with their grace and also attract wildlife lovers equally.

Climate of Sundarban National Park: The climate in Sunderbans forest is generally soothing and pleasant with the temperature ranging from the 20 degree Celsius to 48 degree Celsius. As the region is in the proximity of the Bay of Bengal, the humidity is fairly high around 80% and also sees heavy rainfall. During the summer season, which stays from March to May, the climate is hot and humid. The monsoon season starts from mid-May and lasts till mid-September. During this time period, the atmosphere is humid and windy. The area often sees storms during May and October which even turns into the cyclones. From October to February is the winter season and the climate is comparatively cold. UNESCO World Heritage Sites:- Sundarban is a mangrove area in the delta formed by the confluence of the Ganges, Brahmaputra and Meghna Rivers in the Bay of Bengal. It spans from the Hooghly River in India's state of West Bengal to the Baleswar River in Bangladesh's division of Khulna. Four protected areas in the Sundarban are enlisted as UNESCO World Heritage Sites, viz. Sundarban National Park, Sundarban West, Sundarban South and Sundarban East Wildlife Sanctuaries.

Establishment of power plants: Proposed Nuclear Power Plant at Sundarbans, West Bengal. Some of intellectuals strongly oppose the West Bengal Government's proposal to set up a nuclear power plant. Any nuclear plant would be hazardous and harmful to the health of the people of the State. The adverse effect that such a plant will have on the health of the people will be irreversible and of very severe consequence. It appears that in response to the proposal of National Power Commission, the West Bengal Government has agreed to allot land and provide other facilities for installation of a nuclear power plant in our State. Majority of the people are extremely worried and concerned about the aforesaid proposed installation of nuclear plant in the Sundarban area, for, inter alia, the following reasons:-

- Installation would have extreme adverse effects on the environment of that area.
- Installation will have serious adverse effects on the ecology of that area.
- The underground water of the concerned place would be polluted.
- Nuclear power plant has been proved to be extremely costly and unsafe to human health.
- Environmental balance in and around the nuclear plant will be affected.

- 6) The accidents at Chernobyl, Ukraine, USSR where more than 6 lakhs people were affected.
- In Japan, due to the worst nuclear accident in last September 1999, numerous people were exposed to radiation and died.

Ecological succession:- Ecological succession is generally defined as the successive occupation of a site by different plant communities. In an accreting mudflats the outer community along the sequence represents the pioneer community which is gradually replaced by the next community representing the several stages and finally by a climax community typical of the climatic zone. Robert Scott Troup suggested that succession began in the newly accreted land created by fresh deposits of eroded soil. The pioneer vegetation on these newly accreted sites is keora, followed by grey mangrove and golpata. As the ground is elevated as a result of soil deposition, other trees make their appearance. The most prevalent, though one of the late species to appear, is Genwa. As the level of land rises through accretion and the land is only occasionally flooded by tides, Sundari begins to appear.

Endangered species:- The Sundarban region is renowned as a refuge for a variety of animal species, many of them rare and endangered. Notably, it is one of the last preserves of Bengal tigers. Other mammals include spotted deer, wild boars, otters, wildcats, and Ganges river dolphins, but several species that once inhabited the region—including Javan rhinoceroses, guar, water buffalo, and spotted deer—are now believed to be extinct there. Forest inventories reveal a decline in standing volume of the two main commercial mangrove species – sundari and gewa— by 40% and 45% respectively between 1959 and 1983. Despite a total ban on all killing or capture of wildlife other than fish and some invertebrates. The endangered species that live within the Sundarban and extinct species that used to be include the Bengal tiger, estuarine crocodile, northern river terrapin (*Batagur baska*), olive ridley sea turtle, Gangetic dolphin, ground turtles, hawksbill sea turtles and king crabs (horse shoe).

Climate change impact:- During each monsoon season almost all the Bengal Delta is submerged, much of it for half a year. One of the greatest challenges people living on the Ganges Delta may face in coming years is the threat of rising sea levels caused mostly by subsidence in the region and partly by climate change. Already, Lohachara Island and New Moore Island/South Talpatti Island have disappeared under the sea, and Ghoramara Island is half submerged. In many of the Bangladesh's mangrove wetlands, freshwater reaching the mangroves was considerably reduced from the 1970s because of diversion of freshwater in the upstream area. Also, the Bengal Basin is slowly tilting towards the east because of neo-tectonic movement, forcing greater freshwater input to the Bangladesh Sundarbans. As a result, the salinity of the Bangladesh Sundarbans is much lower than that of the Indian side. Agricultural activities had destroyed around 17,179 hectares of mangroves within three decades (1975–2010). Shrimp cultivation had destroyed another 7,554 hectares. Apart from the human-animal conflict faced by the population dependent on the forest resources for their livelihood, the region is living under the threat of another reality—climate change. As Sundarbans is a low-lying region and extremely prone to cyclones, climate change significantly impacts the region's flora, fauna and its population. It has been observed that the surface water temperature in Sundarbans, over a period

of 37 years, has increased at an accelerated rate of 0.5°C in comparison to global increase in the surface water temperature, which stands at 0.06°C every decade.

Climate Change Has Increased Vulnerability To Trafficking In The Sundarban:- Kultali and Joynagar regions have agriculture as their main source of income. The socio-economic conditions, in general, are very poor and they also demonstrate the highest rate of crime against women in the Sundarban. Also, in the vulnerability analysis done by UNDP HDR, the two blocks are classified as extremely vulnerable. A case study done in these areas of Sundarban shows the highest rates of human trafficking of girls in the region. The year 2009 witnessed the highest number of women being trafficked that coincided with the occurrence of cyclone Aila. The cyclone had destroyed the houses and livelihoods of the inhabitants, leaving them to perish in utter deprivation. Life got progressively insecure and using these vulnerable conditions as opportunities, girls started getting trafficked at an unprecedented rate. While men migrated elsewhere to earn a living, middlemen took this as an opportunity to ensnare the women of the house in the sex trade. According to the local people of Gosaba, tourism has increased the business of middlemen taking women off to the tourists for the sex trade. The Sundarbans are a collection of densely populated islands in India's sprawling Ganges Delta. This remote region, on the Indian-Bangladesh borders, has always been vulnerable to the malice of human traffickers, an issue that was exaggerated by Cyclone Aila in May of 2009. The impoverished families are often forced to send their young children, aged as young as 9 years, to work in factories or small shops in order to earn. The prevalence of child labour has enabled human trafficking in several regions. The traffickers often deceive young girls and families with fake promises of marriage or employment. The girls are then abducted and sold into prostitution or are made to work as domestic workers, sometimes even as far as the middle-east. These girls are never able to come back to their families.

Key contributors to people's vulnerability in the Sundarbans to trafficking was

- An absence of social or educational infrastructure.
- Inequities supported by gender, caste, class, religion and indigeneity.
- High rates of gender-based violence, landlessness and lack or loss of livelihoods.
- Food insecurity and hunger.
- Severe poverty and indebtedness.
- Natural disasters and environmental degradation.
- Displacement or forced migration.

Man made disasters – Oil spills are one of the biggest man made disasters that affect the people as well as the environment of Sundarbans. The oil spill of 2014 which was caused by the Southern Star VII, a Bangladeshi ship created a lot of destruction especially to the aquatic life. On 9 December 2014 an oil-tanker named Southern Star VII, carrying 358,000 litres of furnace oil, was sunk in the Sela river of Sundarbans after it had been hit by a cargo vessel. The oil spread over 350 km² area after the clash, as of 17 December. The slick spread to a second river and a network of canals in the Sundarbans and blackened the shoreline. The event was very threatening to trees, plankton, vast populations of small fishes and dolphins.

The event occurred at a protected Sundarbans mangrove area, home to rare Irrawaddy and Ganges dolphins. Until 15 December 2014 only 50,000 litres of oil from the area were cleaned up by local residents, Bangladesh Navy and the government of Bangladesh. Some reports indicated that the event killed some wildlife. There are concerns regarding the construction of 1320 megawatt coal-fired Rampal power plant near the Sundarban.

Rampal Power Station:-In August 2010, a Memorandum of Understanding was signed between Bangladesh Power Development Board (BPDB) and India's state-owned National Thermal Power Corporation (NTPC) where they designated to implement the coal-fired Rampal power station by 2016. The proposed project, on an area of over 1,834 acres of land, is situated 14 kilometres north of the Sundarbans. This project violates the environmental impact assessment guidelines for coal-based thermal power plants. Environmental activists contend that the proposed location of the Rampal Station would violate provisions of the Ramsar Convention. The government of Bangladesh rejected the allegations that the coal-based power plant would adversely affect the world's largest mangrove forest.

Widow Village: - It is believed that most of the families have been attacked by the man-eater tigers in one of the villages (the Widow Village) of Sundarbans, which is a home to India's resilient Tiger Widows .

Health problems: - Peoples' health in the Sundarban is classified into two groups according to their links to the following areas:- (1) health status, and (2) health care utilization. Health status –general morbidity rate is higher than the state average. Children are three times more vulnerable to respiratory ailments which also top the prevalence list. In general, almost all types of communicable diseases are highly prevalent. Environmental problems –such as skin related ailments are also very common. The impact of arsenic poisoning was quite visible in the blocks where groundwater is heavily contaminated with arsenic. People, who collect forest and river products, are under constant threats of animal attacks. The incidence of snake bites recorded in the local hospitals, were high. The dual burden of communicable and non-communicable diseases is quite evident like urban West Bengal. Coronary heart diseases (CHD) are estimated to affect 6 percent of population aged 40 years or more. Similarly, about 2.4 percent of adult population (>40 years) indicated high risk of arthritis while 42.4 percent were already diagnosed which was higher than the corresponding state average (35.3%). Bronchial Asthma chronically affects the elderly population at 8 percent prevalence rate. The inequalities in the spread of these ailments are also worth noting. Women and poor are more vulnerable to chronic ailments such as Arthritis and Asthma. There are other chronic problems, such as vision problems (farsightedness) which, despite their disproportionately high burden, remain largely unaddressed due to low perceived severity. Remarkably, high prevalence of mental health problems are due to strong presence of various psycho-social stressors. Reported cases of deliberate self-harm cases have increased in the last few years. About half of the children (below 5 years) are chronically malnourished leading to their vulnerability to respiratory and gastro-intestinal ailments. Prevalence of respiratory ailments among children is higher than the state average. One in three children in the Sundarban was found to have suffered at least one episode of

cough with difficulty in breathing (faster than usual, short and rapid breaths) in the last two weeks compared to only 13 percent in West Bengal. Women share disproportionately higher burden of ailments than men do especially in the 15-59 age group. Data in the body mass index (BMI) of selected mothers indicate a little less than one-third of women (31.5%) were underweight.

Bad effect of tourism:- The tourism industry has become very successful in the Sundarban, with annual visitation increasing from around 50000 in 2002 to around 117000 in 2010. One of the main attractions for tourists is the Royal Bengal Tiger, which is widely used in advertising. Although the growing tourism business benefits the local economy, it has proven detrimental to the natural environment of the Sundarbans due to habitat destruction for hotel construction, pollution by garbage disposal, poor sanitation, and noise caused by mechanized boats. Uncontrolled tourism is likely to lead to more boardwalk construction and erosion of peat banks, which will result in changes in substrate structure, seedling distribution, faunal diversity and species composition.

Recent threats to the mangrove ecosystem- The threats are arising partly due to biotic pressure from the surrounding environment and, partly due to human induced or natural changes in the upper catchments. These can be outlined as below:

- Reduced flow of sweet water into Sundarban mangrove system
- Extension of non-forestry land use into mangrove forest
- Straying of tiger into villages along the western boundary of Sundarban
- Demand for small timber and fuel wood for local consumption
- Poaching of tiger, spotted deer, wild boar, marine turtles, horse shoe crab etc
- Uncontrolled collection of prawn seedlings
- Uncontrolled fishing in the water of Reserve Forests
- Continuous trampling of river/creek banks by fishermen and prawn seed collectors
- Chemical pollution through marine paints and hydrocarbons
- Long International Border along the Eastern boundary of Indian Sundarban
- Organizational and infrastructure deficiencies

Problems of conservation: - Conservation challenges in the Sundarbans:-

- The Sundarbans is a fragile ecosystem housing one of the largest stretch of mangrove forests that provides a variety of ecosystem services and must be protected. On the other hand, there is the impact of human activity in the region which depends on the climate change-induced adaptation challenges of the population, in the absence of required development initiatives, social equity and governance system.
- Despite several rules and policies passed for conserving the mangrove forest, encroachment in the protected area for agriculture and extraction of resources continues.
- Natural scientists and economists have been raising concerns on the lack of planning that has hurt the region and has brought the ecosystem at the threshold of its

carrying capacity. The lack of planning has been attributed to the region's administration that is handled by multiple agencies which were set up to support implementation of national and international conservation initiatives attached with the Sundarbans.

- The protection strategy of Sundarbans has been critiqued as follows:
- ...it may be noted that the entire Sundarbans (both the forested as well as the inhabited areas) has been designated as a biosphere reserve by the Central Government. However, while the areas demarcated as protected forests for tiger conservation and for the protection of the coastal zone are being regulated directly by the Central Government, the inhabited areas are governed by the State Government. This is a cause for communication breakdown, loss of time and resources and duplication of work between the Central and State forces.
- Further, the absence of a master plan of conservation for the region despite the presence of two planning agencies, the Sundarban Development Authority and the Sundarban Development Board, functional for past 25 years, has drawn criticism from the development workers in the region.

Factors that contribute to the environmental issues in Sundarban

- Sea Level Rise – The rise in sea level in the core areas of Sundarbans made a worst effect on the human settlement in the nearby blocks. The rise in sea level has deprived the people of their main sources of livelihood - agriculture and fishing. A lot of agricultural land is being submerged under the water.
- Salinity – The river water salinity rate slowly increases with time and more rivers were affected by the salinity in the Sundarban. Sundarban mangroves spread across the Ganges Delta. The increased salinity is caused due to the scarcity of the fresh water in the Ganges. The reduction in the flow rate of Ganges river has resulted in the high saline water in upstream areas. The high salinity zone is situated in the South-Western corner of the Sundarban.
- Climate change – Along with the temperature, precipitation is also showing an increasing trend in the Sundarban region. Variability in the climatic parameters has increased in the past few years.
- Oil Spill – Around 350 tonne of oil was spilled in the river of Sundarban on December 9, 2014. The oil spill disturbed the aquatic life and resulted in the death of certain aquatic animals especially the dolphins.
- Cyclones – Despite Sundarbans being a cyclone prone area, there is a lack of disaster shelters. There has been an increase in the cyclonic storms hitting the Sundarban in the past few years.
- Pollution – Due to a heavy disposal of solid waste from the nearby cities, the Ganges river does not carry fresh water to the Sundarbans. A huge amount of domestic and industrial effluents are carried by the tributary rivers. Loads of mud disposals from the harbors also causes pollution. The emergence of Haldia Port Complex is a great foil disembarkment in East of India.

- Man made disasters – Oil spills are one of the biggest man made disasters that affect the people as well as the environment of Sundarbans. Earlier traditional agricultural methods were practiced. But today, people are adopting the techniques of using pesticide and chemicals which are affecting the flora and fauna of the region. The dumping of various industrial and domestic waste into the river systems are also possessing a threat to the environment.
- Fishing – The issue of over fishing has put the environment under great pressure. The stock of the fish is decreasing due to the combination of overexploitation and climatic changes.
- Wood cutting – There is an illegal increase in the cutting down of trees and woods in the Sundarbans. People living nearby the forests in the South 24 – Paraganas are directly involved in the trading of the wood. Deforestation is taking a rise in most of the areas of Sundarban which will ultimately lead into the loss of the biodiversity.

Problems:- Sundarban area is known as remote rural area. This district is counted among the backward and geographically disadvantageous district of West Bengal.

- Very crisis of the safe drinking water.
- Shortage of ground water
- Saline of surfers and river water
- Acute poverty
- Poor health management
- Poor sanitation practices
- Gender discrimination
- Inadequate transport facilities are the main constraints in this region.
- People in Sundarban suffer badly every year due to its typical geographical condition and frequent natural calamities.
- Maximum areas of this district are water-lodging areas.
- Limited livelihood options
- Ignorance of Government services.
- Lack of access to potable water
- Sanitary disposal of human excreta are very common.
- Sanitation disposal's contamination rate is very high.
- Communicable and water borne diseases are rampant in the area.
- People do try to collect their drinking water from tube wells, but even these are placed so far apart, that women have to walk great distances often more than a kilometre to collect water.
- As available surface and underground water is saline
- The cost of installing hand pump is very high.
- Most families resort to ponds for washing clothes and utensils, bathing and other domestic purposes.
- As this is a remote region and often people need to travel by boat or cycle van,
- It becomes difficult for people while approaching any health centre.
- The tube wells do not function as per Government regulations.
- People lacking education and awareness.
- They don't have access to civic amenities & Govt. facilities.
- People can't find alternative avenues for earning,

- The inhabitants have least information about the outer world.
- Dire poverty is the norm in Sunderban.
- Meagre and seasonal earnings from tourism.
- Millions at risk from rapid sea rise in swampy Sundarban.
- Seas are rising more than twice as fast as the global average here in the Sundarbans.
- The Sundarbans is home to a large human population which is riddled with poverty.
- They are heavily dependent on forest resources such as fish and crab, as their source of livelihood.
- This biotic pressure and unsustainable exploitation of forest resources leads to degradation of the natural habitat, resulting in loss of biodiversity.
- Human-wildlife conflict:- Due to their proximity to the mangrove forests, they are exposed to a unique set of biotic hazards, ranging from snakebites to tiger attacks.
- Incidents of wildlife straying into the villages are also on the rise.
- Subdivision and fragmentation of landholdings through property division or land erosion, high percentage of landless labourers
- Frequent seasonal variations
- Climatic incidents leading to crop failure
- Inducing increased migration from the region to nearby cities.
- Low agriculture yield due to erratic rain fall.
- Pollution, toxic silt and untreated domestic and industry effluents carried by the rivers downstream has restricted the fresh water supply, causing further loss in the biodiversity of the region.
- The region also generates considerable amount of waste internally, and in the absence of efficient recycling mechanisms the burden is further increased.
- Soil infertility.
- In the context of increasingly degraded environments and natural resources, women must travel farther and spend longer on the gathering of water, fuel, fodder and forest produces, in addition to livestock and agricultural production.
- Both siltation and salinity have increased in the Sundarban which is threatening the Sundarban ecosystems.
- The dominant Sundari and Goran are affected by top-dying disease which is recognized as a key management concern.
- To address the region's conservation challenges, internalisation of a development plan with strong components on land management, sustainability of natural resource base, disaster management and livelihood management in the context of climate change is imperative.
- Substantial focus must be placed on relocating and rehabilitating the population living in critically vulnerable areas of the islands.
- Given the significance of embankments on the living conditions of people, the government will need to take initiatives to reconstruct embankments.
- Further, efforts in the direction of strengthening already existing capacity building initiatives to reduce dependence on the land and forest, in collaboration with civil society organisations and regional stakeholders, can support internalisation of alternative livelihood opportunities.
- Given the region's aesthetic value, community-based tourism can be encouraged as an alternative livelihood measure.
- Building capacity of the population for the same would require a renewed effort towards education on the relation between population, environment and development to inculcate the notion of ecologically sustainable development in comparison to merely economic growth.
- The interventions for poverty reduction and development, pressing the need for new investments across sectors.
- The region has received 38 billion dollars for disaster relief and recovery over the last two decades. It is good for chronicle development of the region.
- It is urgent to develop a master plan for conservation of the region and this will be made by the collaboration of both the State govt. and Central govt.
- In addition, converging on the larger picture, a higher level organisational transboundary collaboration is sought to achieve effective conservation and restoration of the mangrove ecosystem. In this case, both the Indian and Bangladeshi government will require an integrated vision for approaching human well-being and ecological sustainability in the Sundarban.

Solutions

- It has been reiterated that while ecosystem and biodiversity is conserved, it is important that the governance system is redesigned to improve the natural resource base legally accessible to the population,
- Supporting them in uplifting their income generation capacity and reducing their dependence on the conserved area.
- The planning process will need to include integrated efforts for restricting growth of population in the region.
- Policies targeted at universal education
- Eradication of gender bias and women empowerment will need to be strengthened to curb the growing pressure on the ecosystem.

Sundarban Social Development Centre (SDDC):-It was formed in 1986 after the occurrence of massive flood devastated entire Patharpratima and MandirBazar Blocks apart from adjoining areas. During that disaster situation some large-hearted magnanimous youth with their own inherent leadership rushed to the flood victims and carried out rescue & relief operation as much as they could. Later these sympathetic people felt the need of organized effort to decide and act in both disaster time and in normalcy for community development, thus they came under a common umbrella to form an organization and achieve desired goal. The organization officially got registration in the year 1989-90 under West Bengal Society Registration Act 1961. In the beginning, the organization started with some welfare activities on ad hoc basis and was done through charity mode only in three villages of Patharpratima Block. Gradually SDDC realized that, the way it was functioning not the proper approach to make sustainable changes in people's life. The persons involved directly or indirectly with the organization had gone through self-evaluation process and comprehended

the concept of people oriented development process. SSDC took up the policy to initiate actions for community development ensuring people's involvement and participation of other institutions like local self Government, youth association, external support agencies and others. In fact, up to 1995 the approach of SSDC was that of welfare and complete service delivery and the year 1995 marked as the beginning of a new era as it saw the expansion of education programmes and also for the first time concepts of women's rights and child rights gained ground. This was followed by the initiation of work with youth groups that enabled the creation of a critical mass base and gradually with the expansion of this mass base the programmes of SSDC gained the colour of movement and pace. The organization's role in ensuring child and women's rights was appreciated and awarded by the 'Eastern Regional Children Welfare Society' in 1996, which marked the opening of new avenues. Thus, the period between the years 1995-2000 was the transition phase of SSDC's approach towards development and shifted from the Service Mode of Approach to that of Rights Based. During 1999-2000 there was paradigm shift in organizational approach as it initiated efforts to establish strong linkage with the government departments, namely Health, Education and Rural Development. That period onwards it received affiliation as a nodal agency as Panchayati Raj Training Institute. Its active initiatives for networking and advocacy produced positive results in forming Mandir Bazar Block Education Network comprising Community based organizations, individuals and NGOs to ensure child rights. Efforts initiated in forming Village Development Committees in 2000 onwards, which occupy a place of central importance vis-à-vis all the developmental initiatives in the villages. 2001 onwards, an additional focus of the Organization was to address the issue of under employment and unemployment by opening avenues of through imparting vocational training in the area of sustainable agriculture, animal husbandry, electrician, carpentry, cycle van repairing and handicrafts. While working down the years, SSDC found out that due to unsustainable livelihood and food insecurity prevailing in the area, there has also been increasing cases of Child Labour and Child Trafficking apart from Child Marriages prevailing in the area. SSDC started addressing these issues through Networking and Advocacy, especially for eradication of Child Trafficking.

CONCLUSION

The Sundarban delta in India has been a priority region for WWF (World Wildlife Fund)-India since 1973 due to its unique biodiversity. While it supports a sizeable population of wild tigers and other wildlife, it is also an ecologically fragile and climatically vulnerable region that is home to over 4.5 million people. Securing the future of the Sundarbans, its biodiversity and people requires a long term vision that can integrate climate adaptation and conservation strategies along with shorter term interventions such as ensuring sustainable livelihoods, access to clean and sustainable energy and effective human wildlife conflict management. The vast wildlife territory of India has had a sober impact on the surroundings and culture. To preserve and protect these natural resources - government of India has established many dedicated national parks and wildlife sanctuary where they can live and flourish without affecting us. Sundarbans National Park is among them. At least once we should visit this natural heaven.

The excursion to the Sundarbans National Park is a perfect fusion of wildlife, dense forest, bird watching. Apart from this one can learn the varied custom and culture of the local people. The Sundarban wetlands act as a natural shield that protects the coastal area from storm surges and cyclones in pre and post monsoon periods. To make a contribution towards the development and implementation of management plan for mangrove wetlands resources and to ensure that fresh water is supplied to the Sundarban by the Ganges. Water salinity simulation and modeling would be a proper tool for decision making and allow planners to protect the Sundarban ecosystems in future.

"Trees give peace to the souls of men."....Nova Wala.

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