
DISHARMONY BETWEEN MAN - ENVIRONMENT RELATIONSHIP: A SERIOUS THREAT TO THE SUNDARBAN'S WILD NATURE

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Abstract

The Sundarban ecosystem is a unique natural wonder of the World & carries a great ecological significance. It has a rich biological diversity of aquatic & terrestrial flora & fauna & the mangrove forests, Sundarban's highly productive ecosystem acts as a natural fish nursery; mangrove acts as a natural shield against the fury of cyclone storm & prevents erosion due to tidal action & checks atmospheric pollution. Millions of people depend on Sundarban ecosystem for their livelihood & sustenance through fishing, collection of honey, fuel wood & timber. But in recent times the various infrastructural development project (like building of dam, embankments, road network & resorts) damages its natural environment & over utilization of natural resources destroys its natural ecosystem, which sends a serious threat to man-environment relationship of Sundarban's natural environment.

Key words: Ecosystem, Mangrove, Biological Diversity, Livelihood.

Introduction

Active delta region of West Bengal includes the South eastern part of the district of South 24 Parganas & the Southern part of North 24 Parganas. The Bhagirathi or Hooghly River which is originated from River Ganges & Other different oceanic inlets has formed this deltaic plain by creating a beautiful drainage pattern.

At present the real active delta is demarcated as the Sundarban-Delta. The name of this region is due to the abundance of the tree 'Sundari' (*Heritiera minor*). But Prof. Shibaprasad Chattopadhyay (1949) bears

the opinion that according to nearness of the sea gave rise to the name 'Samudraban' which later known as Sundarban. Whatever the cause behind, the name Sundarban is now a well known name as it is one of the Hot-spot of environment. Now a day it is considered a one of the important tourist spot of West Bengal, India. That's why the West Bengal Government provide every infrastructural facilities regarding road network, water supply, resort & hotels & sanctuaries to satisfy the tourist & local people according to their needs. But this type of unplanned

infrastructural work damages the nature beyond imagination.

Many research work has done previously on Sundarban's ecology, environment, developmental work and pollution and bio-diversity as well as geological framework of this area. But our study is based on the interdependence between man and environment as well as to find out the causes of disharmony between man environment relationships. Therefore the aim of the study work are to study the Physical & Cultural characteristics as well as man-environment relationship of Sundarban Region.

Objective of the study work are:-

- (1) To preserve the valuable & rare trees like Sudari, Betal, Hogla which are decreasing in number due to unplanted cutting of trees.
- (2) To protect the abandoned animal resource of Sundarban Region.
- (3) To create a sustainable relationship between man & environment.
- (4) To construct a appropriate plan to develop the region in such a way where nature is not affected by anthropogenic intervenes.

Location of the area of Study

The largest silt made deltaic region & mangrove forest area of the world lies in the active delta region of Bengal from where begins the Bay of Bengal, India. The Sundarban region is located between 21⁰32' N and 22⁰40'N latitude & between 88⁰05'E & 89⁰00'E longitude. This region is stretched from the east bank of the river Hooghly to the west bank of the river Meghna in Bangladesh. The total area it covers is 8,00,000 hectares. Only 1/3rd part of this region is situated in West Bengal, India.

Methodology

To fulfill the aim & objective of the study a definite methodology has to be followed. It is divided into three parts:

Pre-field method

This involves mainly the library works to get information on geology, physiology, climate, soil & hydrology of the study area.

Field Method

The field method includes the collection of different maps & data from regional offices of Sundarban. Field method gives an opportunity of a face to face communication with the inhabitants of Sundarban & also collects the views of this people regarding man-environment relation. Field method also gives an opportunity to explore the scenic beauty & unique ecological structure of Sundarban as well as the man-environment relationship of Sundarban by visiting different places like Sajnekhali Bird Sanctuary, Sundnanyakhali watch tower, Tin Kona Island, Holiday Island, Dublarchar, Bharat Sevashram Sangha Temple, Bhagbatpur Crocodile sanctuary, Gosaba island etc. During our field tour from 20th may 2016 to 24th may 2016 we collect data from Sundarban development board office, Gosaba block development office, and land and revenue office.

Post Field Method

This involves mainly the assimilation & interpretation of the different evidences which have been collected in the courses of pre-field and field study.

Physical features of Sundarban

Geological constitution of Sundarban

According to Hover (1854) and Theobald (1881) the area of Sundarban, rather the entire lower Bengal is a region of oceanic inlets. Evidences that have been obtained from different sources confirm that the vast watery land created by high tide extended to

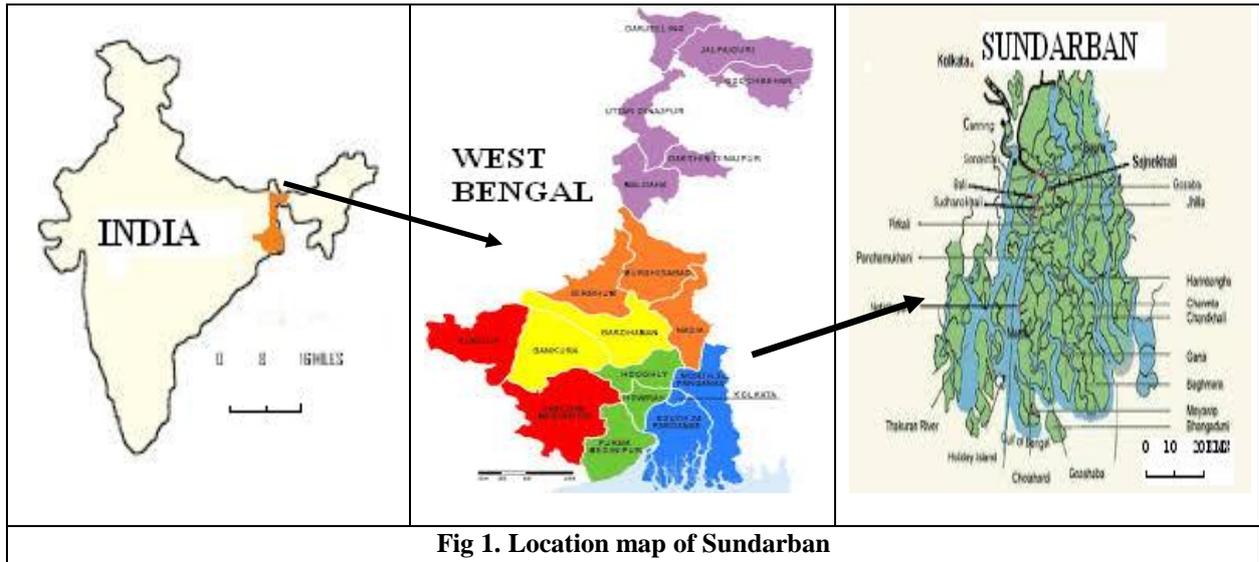


Fig 1. Location map of Sundarban

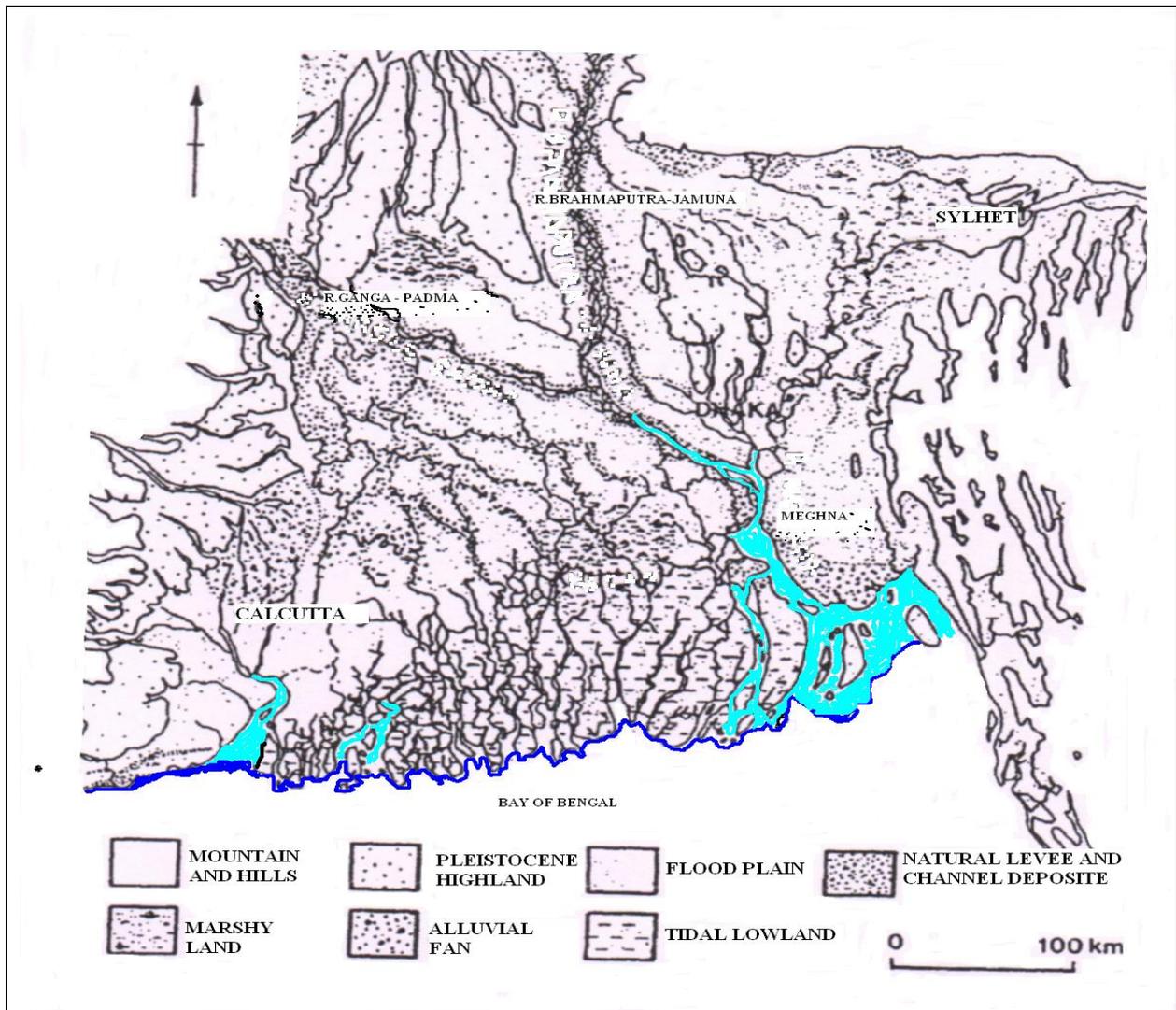


Fig 2. Land form of the Bengal basin (UMITSU, 1993).

the hills of Raj Mahal. In the post Tertiary age (35 million years) this part has been silted up

Fergusson's (1863) opinion is that during the primary Pleistocene age there was a shallow oceanic marshy land in this area. In Pre-Pleistocene age the sea receded. But Oldham (1893) thinks this large deltaic region is the outcome of the deposition of various erosion materials that had been carried by the Ganga, the Brahmaputra and their tributaries. In this region no trace of any oceanic amassment has been observed even at a great depth from the earth crust. But some instances of estuary-type fossils indicate that the earth crust became somewhat depressed by this silt-pressure. From the ancient layer of this region have been discovered instances of the amassment of Pteridophytic Hydrophytic plants, angiosperm-mioflora and the specimens of their leaves, branches etc. Examination of the structure as well as the degree of the presence of carbon in the species of Pila and Indo-planarobis belonging to Molluscan genera reveals that these are not older than 4000 years. All these speak volumes for the mutual co-existence of the Mangrove animals.

Considering the unstable constitution of this area, Geologists like Oldham, Fergusson etc. believe that the regional depression of Sundarban and earthquakes are somehow linked with the deep sea trenches of the Bay of Bengal.

According to the Plate Tectonics theory, the region of South Bengal is one of the active geographical regions of the world that has been timed and depressed as well as raised. Strong presence of sandy highland confirms this finding. Repeated occurrences of earthquakes in recent time prove the instability of this region and this instability is considered to be the main reason for the formation of Sundarban.

by the rivers coming down from the Himalayas in the north.

Rivers of Sundarban

The region of Sundarban is enriched with different rivers, their tributaries and branches, the oceanic inlets and wide river mouth in the form of a tress. Here the islands and land areas are separated from each other by these rivers and oceanic inlets. The flow paths of the rivers are shallow due to the deposition of silt. The rivers Matla, Saptamukhi, Gosaba etc are on the verge of drying, yet the river mouths are fairly wide. To resist the flow of salted water, high dams on the banks of the rivers have been constructed. In the lower region marshy land of saline water is seen that is created by the raising of the water level of the rivers. The notable rivers of the region are Saptamukhi, Gosaba, Raimangal, Matla, Piyali, Vidyadhari etc.

Soil

The Sundarban deltaic alluvium is formed out of the silt brought from the Himalayas. The soil is mainly of fine silt clay in northernmost part. Peaty deposits are found in the middle and in swampy areas, while sandy clay with sand dunes is seen towards the surface. The new alluvium can be subdivided into (i) the area, which annually over flooded and is renewed by the rivers and (ii) the area devoid of inundation. The color of the silt is pale brown, gray to grayish black. The loamy soil, also called as black soil or sodium clay due to the presence of Ferrous Sulphide, it is the adhesive or sticky clay of the area. The upper layer of the soil is gray to grayish black; the subsoil is gray with mixing up of clay with sand. After certain depth, the size of sand grains varies and is gray to bluish gray in color. The soil of the mangrove forest is considered as "young soil", with less oxygen content. Salinity of soil depends upon the

fresh water flow. The torrential rains particularly during monsoon period diminish the surface soil salinity and play a major role in making the soil free of salt. On the basis of salinity the soil can be divided into (i) saline soil, where there is inundation or flashing of brackish-water, and (ii) saline-alkali soil, when the sodium salts flow over fresh lowland enriched with alkali and nitrogen ions. No saline-alkali soil is mainly formed when the rainwater completely washes away the salts. The degraded alkali soil is produced due to decomposition of organic matter lying within the depth of 2 meters. The mangrove soil is soft, peaty, clay or sandy.

Climate

In spite of its close proximity to the Tropic of Cancer, the extreme climate does not prevail here because of its location nearer to the sea as well as due to tidal flushing of innumerable rivers and creeks inside.

Monsoon prevails for almost half of the year with high rate of humidity. It starts from July and usually prolongs up to October, with occasional rain throughout the year. This monsoon is brought about by the Southwest wind. The post-monsoon period is characterized by cold weather from November to February of which December-January months are considered as winter months with low temperature and less precipitation. Wind from Northwest blows in this area from mid October to mid March. The pre-monsoon period is predominantly dry, starting from March to June and accompanied with occasional violent thunder storms, locality known as Kalbaishakhi (Norwester).

The mean maximum temperature 29°C (June-July) and means minimum temperature is 20°C (December-January). The average rainfall of the area is about 180cm. Humidity ranges normally between 70 and 88%.

Natural vegetation of Sundarban

The region of Sundarban has developed its own characteristics by dint of its natural vegetation. One of the main characteristics here is the large Mangrove forest lying at the outlet of the Ganges and Brahmaputra. Here the plants grow and spread in a particular environment and their growth is in conformity with this environment. In general, Mangrove vegetation assumes the form of bush land when viewed from the sea it appears as a dark green dense mass of low trees with numerous aerial roots. This vegetation is also known as 'Coastal Intertidal Vegetation'.

Characteristic of Sundarban

- (A) Ordinary plants cannot grow in the salted water, soil and climate that prevail here.
- (B) The growth of plants depends on high and low tide and such climate condition is not suitable for ordinary plants.
- (C) The major part of this region goes under water at the time of high tide and dearth of solid land occurs. So ordinary plants cannot grow. The typical plants of this area grow in such muddy and salted soil and keep themselves erect with the help of prop and bow-like silt roots.
- (D) The muddy and watery soil does not help the roots of the plants to take in oxygen. So special type of roots come out of the soil and forms a vast thorny area. Such roots are negatively geotropic and are known as 'pneumatophores'. These roots are provided with pores, which are in direct communication with outer atmosphere and tissues inside and have solved the problem of respiration. Example- Rhizophora, Avicennia, Ceriops etc.
- (E) In many cases roots grow from the lowest end of the stem and spread on

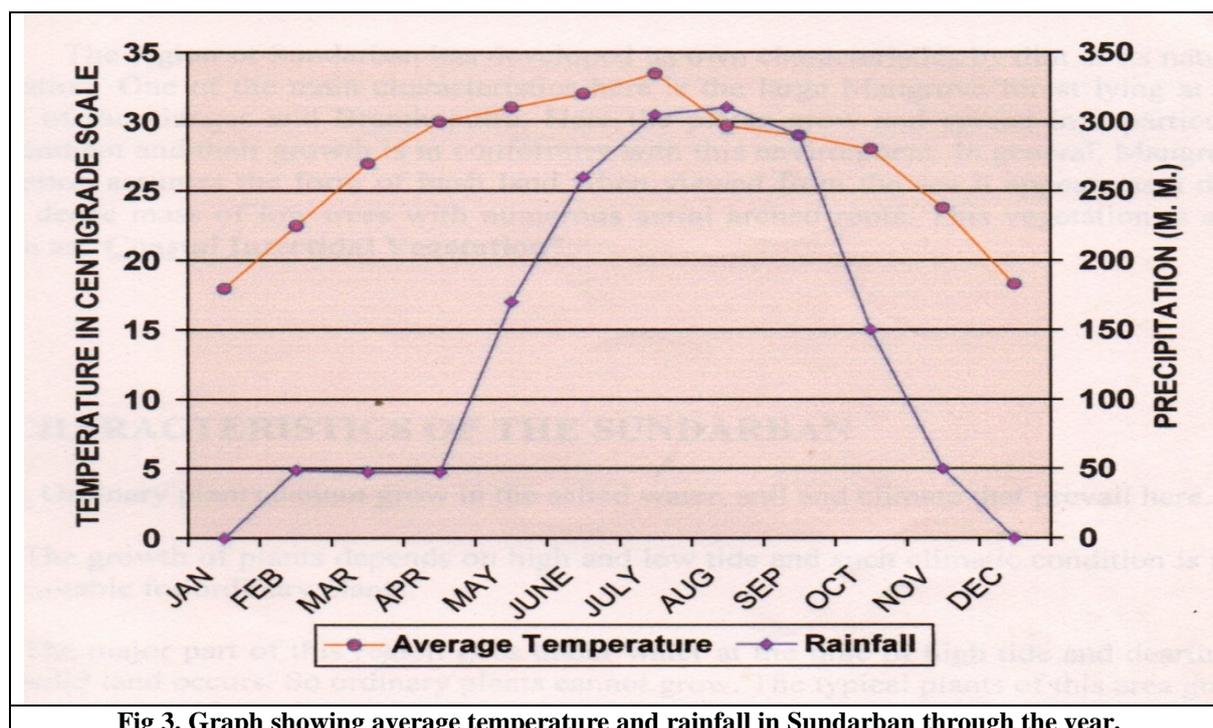


Fig 3. Graph showing average temperature and rainfall in Sundarban through the year.

Table 1. A list of Mangrove (exclusive) plant species available in Sundarban.

Family	Local Name	Scientific Name
Rhizophoraceae	Garjan	<i>Rhizophora mucronata</i>
	Goran	<i>R. apiculata</i>
	Mot goran	<i>Ceriops decandra</i>
	Khagra	<i>C. tagal</i>
		<i>Bruguiera gymnorrhiza</i>
Euphorbiaceae	Goria	<i>B. sexangula</i>
	Gnewa	<i>B. purviflora</i>
Sonneratiaceae	Keora	<i>B. cylindracea</i>
	Ora	<i>Kendelia candel</i>
Verbenaceae	Bean	<i>Excoecaria agallocha</i>
	Kala Bean	<i>S. apetala</i>
Myrsinaceae	Khalshi	<i>S. caseolaris</i>
	Hental	<i>Avicennia officinalis</i>
Palmae	Golpata	<i>A. alba</i>
		<i>A. marina</i>
Plumbaginaceae	Tora or Satari	<i>Aegiceras corniculatum</i>
Meliaceae	Dhundul	<i>Phoenix paludosa</i>
	Passur	<i>Mypa fruticans</i>
	Amur	<i>Aegialitis rotundifolia</i>
Combretaceae	Kripa	<i>Xylocarpus granatum</i>
Tiliaceae	Kedar Sundari	<i>X. mekongensis</i>
Leguminaceae	Singra	<i>Aglaia culcullata</i>
	Koranja	<i>Lumnitzera racemosa</i>
Sterculiaceae	Sundari	<i>Brownlowia tersa</i>
Pandanaeae	Keya	<i>Cynometra iripa</i>
		<i>Pongamia pinnata</i>
		<i>Heritiera fomes</i>
		<i>Pandanus fascicularis</i>



Fig 4. Biodiversity of Sundarban.

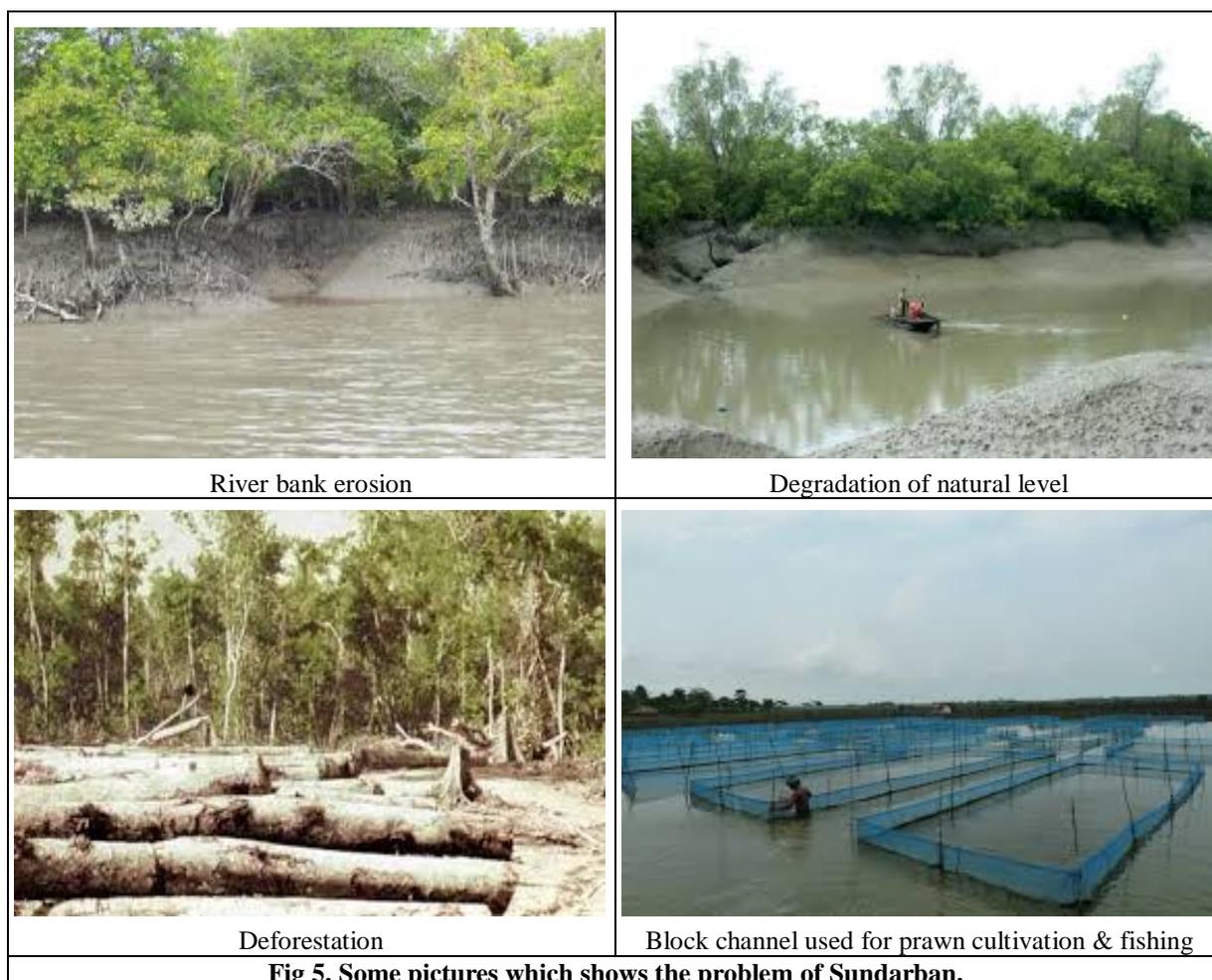


Fig 5. Some pictures which shows the problem of Sundarban.

the land. These roots help the plants to stand stoutly. Example- Screw pine plant.

- (F) The seeds cannot germinate in such saline soil, which is deficient in oxygen. Hence species of Rhizophoraceae show “Vivipary” i.e., the development and growth of embryo in the seed when the fruit is still attached to the plant.

Fauna of Sundarban

Being a very specialized environment mangrove ecosystem supports a wide assemblage of animal communities. Terrestrial, brackish water and marine fauna constitute the major faunal components of this ecosystem. Mangrove fauna occupy in general, 3 different biomes, namely (1) littoral or supra-littoral forest (2) intertidal mudflats and (3) estuary.

Quadrupeds

The animal population of Sundarban is quite varied keeping its environment in mind. This group mainly consists of Royal Bengal Tiger, Fishing Cats, Macaques, Wild Boar, Wild Buffaloes, Common Grey Mongoose, Fox, Jungle Cat, Flying Fox, Indian Pangolin, Chital, Great Horned Deer, Barking Deer, Porcupine, Wild Hog, civets and Rhesus Monkey.

Birds

The environment conditions of Sundarban create an ideal location for residents as well as migratory birds. The locals are common Mynahs, Red Jungle fowl, Woodpecker, Crane, Spotted Dove, Brahminy Ducks, Brahminy Kites, Jungle Crows, Common Kingfisher, common Snipe, Paradise Flycatchers, Crested Lark, Cormorants, Fishing Eagle, March Harrier, Sarus, Cuckoo or Black Bird, Green

Pigeon, Rose Ringed Parakeet, Herring Gull, Jungle Babblers and Water Hens.

Fish

Sundarban creeks are excellent fishing areas. This group includes Saw fish, Butter fish, Electric fish, Silver Carps, Star fish, Common Carp, Indian Trout, Eel, Pomphret, Sly fish, Sting Ray, Gangetic Dolphin, Lobster, Prawn, Shrimp.

Amphibians

This group includes Skipping frog, tree frog and Common Toads.

Reptiles

In this group there are different types of turtles, lizards, crocodiles and snakes, Olive Ridley Turtle, Green Turtle, Hawks Bill Turtle, Hawks Bill Turtle, Tortoise, Chameleon, Mouse, Gecko, Iguana, Salvator Lizard, Monitor Lizard, Estuarine Crocodiles, hard Shelled Batgun Terrapins, Curvier, Common Kraits, Sea Snake, Dog Faced Water Snake, King Cobra, Cobra, Cobra-di-capelo, Russell's Viper, Chequered Killbacks and Rat Snake.

Sanctuaries

There are three wild life sanctuaries in Sundarban. The Sajnakhali Sanctuary in the northern section of Pirkhali block by the Gumari-Sazna river with an area of 362.31 sq km is for birds. The Lothian or Tamluk Island in the Saptamukhi river with an area of 34.89 sq.km. is for tigers, crocodiles, pigs, deer, etc. It also accommodates the water birds in winter (Dec-Feb) along with the other visitors. The Holiday Island in the Matla river covering an area of 5.95 sq. km. is for Tiger and Spotted Deer.

Some problems of Sundarban area which seriously affect man-environment relationship

Problems related with the rivers of Sundarban

- 1) In the area of Sundarban, high tide is feeding all the ever-flowing rivers having strong current. The bed of these rivers is constantly being silted up. As a result the regions on either side become flooded increasing the accumulation of silt. The land is being raised more and more and consequently the rivers are being silted up.
- 2) With the decrease in the supply of fresh water at the source, salinity of the rivers increases.
- 3) As a result of random building the river flow, the flow water cannot rise to the maximum height during high tide and the drainage system fails to act. So the low land by the side of Bidyadhari is becoming unworthy of human habitation. The river inlets are going to moribund as the energy necessary to keep the flow of tidewater properly moving is becoming less and less. The gradual silting up of Matla and Bidyadhari is the outcome of such unplanned river dams.

Problems arising from the river dams

The average height of the river dams in Sundarban is 1 to 2 meters. At the time of Strom or high tide the river dams are over flown and consequently the islands are flooded. So, the heights of the dams are being increased or newer dams are being constructed in an unplanned way. As a result of it further erosion of river flow paths is taking place and along the embankments deposition of silt is accelerated. Such thing is causing change in direction of the river flow and lessening the height of the water level.

Problems related to the collection of prawn juveniles

Recently collection of prawn juveniles has opportunity for earning and a few thousand families depend on it. There is considerable demand of prawn in the international market.

Firstly, the numbers of prawn juveniles are decreasing which endanger the livelihood of thousands of people of this area. Secondly, the juveniles of other varieties of fishes are being destroyed while catching the prawn juveniles. It will hamper the supply of other varieties of fishes. Thirdly, the pressure exerted by thousands of men and women everyday on the riverbank while catching prawn juveniles is resulting in constant displacement of the soil on the bank and it is promoting the breakdown of the embankments. Fourthly, the collectors of prawn juveniles have to work all day long in the water and it is causing skin diseases due to chemical pollution of the water.

Problems related to pollution

The rivers and the oceanic inlets of Sundarban are rapidly being polluted. Various toxic substances used in Kolkata and its suburbs such as Morphine sulphate, DDT, Sodium, Phenobarbital, different pesticides and insecticides (like Chlorodane, Heptachlor, Dieldrin, Dioxin etc.), compounds of Lead and Mercury are passing along the stream of Vidyadhari through various canals and are polluting the water and the soil of Sundarban.

At present the number of vessels carrying tourists even into the interiors of Sundarban is wreaking day by day. The oil (Polynuclear Aromatic Hydrocarbon, PAH) excreted by the vessels is polluting the river water. Such pollution obviously creates the negative impact on the aquatic ecosystem.

Problems regarding the supply of fresh water

At present the flow of fresh water in the rivers and inlets of Sundarban has been less. At different places near the source of the rivers either the process of silting up is taking place to a considerable degree or fisheries have been made. It is changing the mode of natural river flow, increasing the quantity of salted water and breaking down of river dams resulting in flood of saline water. Its ill effects are creating a real crisis for the Flora and Fauna of Sundarban.

Problems regarding land reclamation of Sundarban

- Most of the land reclamation process is done by unscientific way. It caused a huge amount of deforestation.
- This land reclamation process is one of the main causes for destruction of natural forest area of Sundarban.
- Dams or embankments which are created for this purpose is destroying the natural balance.
- Many small river channels are dried up in this procedure.

Problems related to agriculture

During the last few years attempt has been made to increase income from agriculture taking various measures but it has not materialized. The land area has not increased in the last two decades. Other than collection of prawn juveniles, newer opportunities have not been opened regarding the matter of income other than the water and the forest. On the other hand actual increase has occurred only in population and relevant expenses per family unit. Intensive cultivation is not possible in the land of Sundarban due to inadequate supply of fresh water.

The only source of fresh water necessary for the second crop in winter can be rain water, properly stored in ponds and marshes. The period from June to September is generally considered to be the rainy season here. But to dig out ponds or fens or canals means to lessen the area of cultivable land, which is not feasible. That is why random use of fertilizers and pesticides has become the alternative method to increase income from land and the obvious result is gradual decrease of fertility of the land. The harmful pesticides are getting mixed with food and water giving rise to the possibility of-infection of various diseases, which is practically posing a threat for the future generation

How does the problem affect man-environment relationship?

The relationship between the man & the environment has been established in the early periods itself. Human beings live in the kingdom of nature & interact with it constantly. The influence of nature in the form of the air he breathes, the water he drinks, the food he eats & the flow of energy & information. Any change in the environment can not only result in devastating effects, but can also pose a threat to the human race. The proper man-environment relationship is based on sustainable development i.e., a development process that meets the needs of the present without compromising the ability of the future generations to meet their own needs.

But it is very unfortunate to say that some unplanned land reclamation processes & development procedure has violated Sundarban's wild nature in the form of deforestation, building of dam & embankment on every river channels unplanned fishing & prawn cultivation, over population, building of hotels, resorts in the heart of Sundarban's mangrove forest area, causing excessive damage to the precious

plant species. This type of damage to the environment always has consequences like: - repetition of flood, draught & other environment calamities which affects man's daily life & work.

Some steps which are taken to solve the problems

1. SUNDARBAN DEVELOPMENT BOARD

In 1973 Sundarban Development Board was set up under the Development and Planning Department. It was created for a) Formulation of integrated program for effective utilization of the resources placed at its disposal from various sources. b) Co-ordination of execution of plants for development of the region. c) Supervision of the execution of any project for the development of the region as a whole or part of it. d) Review & evaluate the progress of implementation and make adjustment in policies and measures as the review may indicate.

2. PROGRAMME ELEMENATED UNDER IFAD-ASSISTED PROJECT AND STATE PLAN

A. MASTER SLUICE AND CLOSER

These are constructed on diversion channels to provide controlled drainage and irrigation water during the dry season from the stored sweet water of closures.

B. H.P SLUICE

Hume pipe sluice was constructed to provide outlets for excess water into the rivers or tributaries.

C. DERELICT CHANNEL

Derelict channels have been re-excavated for the purpose of storing sweet water for dry season crop.

D. FISHERIES PROGRAMME

The program element "brackish aquaculture" and fish farm activities were introduced by Sundarban Development Board with the launching of IFAD assisted project. The two farms at Jharkhali, Moushuni Island

have been created for prawn and brackish water fish culture.

E. SOCIAL FORESTRY PROGRAM

The social forestry program was introduced by Sundarban Development Board in late 1981-82.

a. MANGROVE PLANTATION

The Sundarban development board had started planting mangrove on an experimental basis this plantation had been initiated in the intertidal regions along the estuaries.

b. STRIP PLANTATION

The strip plantation has been implemented generally on both sides of metalled roads, earthen roads, irrigation canals, and embankments closed to agricultural fields.

c. FARM FORESTRY

Farm forestry is that type of forestry which directly involved the local people in the forestry program.

d. ANIMAL RESOURCES DEVELOPMENT

During 1991-92 necessary fund was provided by the state government for the safety and security of wild animals.

Works to be done to establish a healthy man environment relationship

This is true that problems influence us so slowly that it is not always possible for us to realize the reason and effect of such pollution. What is urgent at present is not to blame anybody but: -

1. To increase the supply of fresh water by digging out ponds and canals at least in 25% of the land in the agricultural area. This will increase the income from agriculture and minimize the dependence on the forest.

(i) At the same time the soil obtained from such digging work can be used to construct river dams in a planned way.

(ii) Avenues of income may be opened by planting fruit trees around the ponds or canals.

(iii) Cultivation of fish in the ponds may be profiteering.

(iv) The pond water may help the second cropping. So, the people should be made conscious about the irrigation water by constant program and propaganda.

2. To determine the right crop rotation after proper testing of the soil. The people of the area should be convinced about the cultivation of proper profit-making crops Suitable for such environment. When the cultivators will earn profit, it will certainly change their outlook.

3. To make the cultivators aware of minimizing the use of chemical fertilizers and pesticides and educating them about the preparation of organic fertilizers and how to use those.

4. To make the people scientifically conscious about the intimate relation between agricultural products and development.

5. To ensure the increase of income from agriculture. The economy of this region is invariably dependent on cultivation. Therefore well-planned program for the development of agriculture should be adopted. This will gradually diminish the dependence on water and the forest. Naturally the profession to collect the prawn seedlings will lose its importance.

6. To construct the river dams in a planned way people must be made conscious about the pernicious effect of recovery of land by silting up river flow paths and construction of unplanned river dams. The inhabitants of Sundarban have bitter experience about the high tide and the breaking down of the dams. They must realize how dangerous it is to find out way for earning by recovering land just beyond the dams by the side of the rivers. The real necessary thing is to create a ring of forest of width 10 to 12 feet from the dam towards the land. Just after this ring another dam is necessary and the necessary soil required to construct this dam may be

obtained from the excavation of soil while making fresh water reserves. The second dam will develop cultivable land and human habitation, otherwise Sundarban cannot be saved. Still it is possible to begin with this program by capitalizing the initiative and toil of the local people if we are ready to bear a bit of sacrifice.

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