Pratidhwani the Echo
A Peer-Reviewed International Journal of Humanities & Social Science
ISSN: 2278-5264 (Online) 2321-9319 (Print)
***Impact Factor: 6.28** (Index Copernicus International)*
Volume-X, Issue-IV, July 2022, Page No.102-119
Published by Dept. of Bengali, Karimganj College, Karimganj, Assam, India
Website: http://www.thecho.in

Socio- Environmental Setup of the Indian Sundarban Region of West Bengal based on 2011 Census Data

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Abstract:

The Sundarbans area is now one of the most densely populated islands in the world and the population is increasing day by day. The Indian Sundarban constrains two districts of West Bengal. Maximum part is under South 24 Parganas and the remaining part is under North 24 Parganas district. There are 19 Community Development blocks within this region. 13 C. D. blocks are under South 24 Parganas administrastion. These are Canning I & II, Mathurapur I & II, Jaynagar I & II, Gosaba, Basanti, Kultali, Kakdwip, Namkhana, Patharpratima and Sagar and 6 C.D. blocks are falls in North 24 Parganas these are Hasnabad, Hingalganj, Sandeshkhali I and II, Haroa and Minakhan. Haribhanga river and Ichhamati river seperates the Indian Sundarban from Bangladesh. The Indian Sundarban region is one of the borders of West Bengal having an area of 4244.83 sq. km., with a population of 4426259 persons (as in 2011). Among which 3309526 persons (74.77%) belongs from South 24 Parganas district and 1116733 persons (25.23%) population belongs from North 24 Parganas district. In 2001 the total population of Indian Sundarban region was 3757359 persons. According to 1951 census data it was 1159653 persons. In 2011 census data population density is 1042 persons/ sq. km. and decadal population growth rate is 17.8%.

Keywords: Indian Sundarban, Socio economy, Census.

Administrative Setup:

West Bengal is one of the constituent States of the Republic of India. The State is divided into 20 districts (zillas) each headed by a Collector/District Magistrate who is a civil servant and by an elected head of the Zilla Parishad (district-level local self-government). The Sundarbans is not a district by itself but parts of it fall under the jurisdiction of the North and South 24-Parganas districts. Independent India has persisted with the administrative structure that the colonial government had devised to administer Sundarbans. As per the British dispensation, the Collectors of the 24- Parganas, Jessore, and Bakarganj districts exercised concurrent jurisdiction with the local Commissioner in revenue matters in the Sundarbans. Practically, it was the Sundarbans Commissioner who performed the revenue work in parts of these districts with the exception that the revenue of all Sundarbans estates

was paid into the abovementioned Collectorates. The office of Commissioner of the Sundarbans was established under Regulation IX of 1816 to ascertain the extent of encroachment by the neighbouring landholders beyond their permanently settled lands so as to bring the encroached land within the revenue-paying estates. Jurisdiction of the Sundarbans Commissioner was enhanced in 1819 to grant leases of forestlands on behalf of the government but land revenue, as before, continued to be paid into the treasuries of the respective districts to the north. The Office of the Sundarbans Commissioner was dissolved in 1905, by which time mapping and resource inventory was more or less complete. Each of the districts in a State is divided into Sub-Divisions (five in case of South 24-Parganas District) headed by a civil servant (Sub-Divisional Officer/Magistrate). The Sub-Divisions are again divided into several Development Blocks (29 including 13 in the Sundarbans) headed by the Block Development Officer and an elected head of the Panchayat Samiti (block-level local self-government). The Block Development Office is the last administrative wing of the State Government. The last level of the elected local self-government is the Gram Panchayat (312 in the South 24-Parganas District including 89 in the Sundarbans) headed by an elected Pradhan (chief). The South 24-Parganas Zilla Parishad is empowered to initiate and implement development activities within the District through the Panchayat Samitis and in turn the Gram Panchayats which are composed of four to five mouzas (revenue villages) with a total population of about 25,000. This structure pertains to settled areas; forests come under the jurisdiction of the Directorate of Forest (Forest Department) of the State Government. In addition to the above, backward areas like the Sundarbans also have specialised organisations like Sundarban Development Board (SDB) for bringing about socio-economic development of the area. However, the new specialised organisation has remained ineffective for a number of reasons such as relatively junior or weaker government minister in charge of the new organisation, the new organisation has to compete for resources and space with larger and older line departments, as well as the eco-region being of little consequence in electoral terms though representation in national and State legislatures is representative. For example, out of 546 Members of the National Parliament (Lower House) just three members are from the Sundarbans, and in West Bengal Legislative Assembly, 13 out of 295 of the members represent different parts of Sundarbans. As a consequence of the process of decentralisation ushered in by the 73rd amendment of the Indian Constitution14, administration is now carried out along two parallel channels throwing up new challenges that need to be resolved to attain the objectives of decentralisation. The local self-government institutions have become responsible for provisioning of public goods and services for which as of now they are not equipped due to a mismatch of responsibilities and personnel, and misalignment of organisations. For example, it is now the responsibility of the Panchayat Samiti (middle-tier of local self-government) to repair embankments but the personnel continue to be with the Irrigation Department of the State Government. For a place like the Sundarbans and its people, this is a major handicap because the public good in question is life sustaining. During the late 1960s and early 1970s, State governments had thought it prudent to create specialised agencies catering to socio-economically backward areas like the Sundarbans,

but with democratic decentralisation their roles have become ambiguous and multiplicity of organisations/agencies leads to duplication and turf wars, not helping the cause of the region and its people (Danda, 2007).

Reclaiming Wetlands and Ecological Change:

In the book "*The Revenuer History of the Sundarbans"* by Kumud Ranjan Biswas observes that the Bengal delta that now includes the metropolitan city of Kolkata (Calcutta), during the early 18th century was three tiny villages lying on the outskirts of a wild country called the Sundarbans. It was covered with dense jungles composed of Sundari trees and the coastal mangrove forest. Their jungles were the habitat of reptiles, Bengal tigers and dangerous amphibians. The only people who inhabited these islands were sea pirates, salt makers and outcaste tribesman. It remained more or less inaccessible and hence unsettled.

However this may present a romantic view of the pre-colonial past. Not much was done in terms of permanent settlement until the British Indian government transformed the landscape for its imperial needs - freeing the region of its bandits and tigers that were later controlled by forest and land revenue generation programmes. It must be noted that the Sundarbans in the pre-colonial period were under the control of Hindu landlords locally known as 'twelve bhuyas' who were later crushed by the Mughals (Roychaudhuri 1953). They were replaced by more amenable zamindars and talukdars who were regarded by theoreticians of Mughal statecraft as officials appointed for collecting the revenue and administering the territory of the Parganas and Sarkars recorded in the manuals of Mughal administration (Ray 1979).

From 1756, the East India Company, and later the British raj, developed a keen interest in Bengal and its maritime waterways. This led to the construction of many canals, sewage gates and levees over the Ganges and its tributaries to harness hydropower, enable irrigation, build railways, and to help facilitate inland navigation and river port facilities. The Sundarbans on the other hand was a wasteland that needed protection for mangrove afforestation and land reclamation to fulfil colonial revenue demand under the Bengal Presidency. Several experiments were carried out by pioneering British officials like Collector General Claud Russell (1770-1773) and Tilman Hanckell, who was the Judge and Magistrate of Murli, Jessore (1788-1790). But all of these early experiments failed to gain popularity on a mass scale until the British Indian government took power and started granting leases in the early 19th century to Bengali zamindars who worked as local magnate-landlords and acted as intermediaries in revenue collection. To this end the colonial government had to define the rights of the tillers and owners. An elaborate chain of rent-seeking patrons (zamindars, talukdars) and their clients (sharecroppers, landless labourers) were settled and regulated by the administration as migrant landless labourers flocked to take advantage of the land reclamation programme initiated by the native zamindars and European investors and speculators, who were granted land on a lease basis. The Port Canning Company became a lead player in the land reclamation programme along with

other zamindars who wished to make windfall profits from wasteland reclamation and revenue settlement in mouzas (villages).

In the South 24 Parganas of present day West Bengal it became increasingly risky to clear and settle the Sundarban forest and mangrove swamp as the region, unlike Bakargang and Khulna, has developed from south to north and the seaward side was more elevated than the interior. F.D. Ascoli in his book *The Revenue History of the Sundarbans* observes, "The problems of the 24-Parganas Sundarbans are probably more complex than those of Khulna and Bakarganj" (1921:p 187).

This was primarily because in this part of the Sundarbans the embankment and land reclamation programme began at a rapid pace without an understanding of the geomorphology and fluvial pattern of the delta. As such the islands were unable to mature and attain the required height so that tidal waves could not make easy inroads into them. According to the Ascoli report of 1921, land reclamation in the South 24 Parganas was an 'unnatural development' (Ascoli 1921: 188). According to Ascoli it should be the policy of the state to arrest land reclamation in that area until the tidal spill has done its work, in order to avoid heavy embankment costs and the dangers of embankment failure.

In light of confrontation with the natural ebb and flow of tidal backwaters in the Sundarbans there has been a rival claim over nature between the colonial policy of land reclamation and the zamindars of the Sundarbans. Colonial revenue concerns and policies of extraction blinded the colonial government to the geomorphology and geography of island formation in the delta region. That rivers and tides played an important role in the ecological stability of the region was underemphasised within the policy of land reclamation.

Similar narratives of land reclamation and settlement in Gosaba - land leased to Hamilton zamindari in the Sundarbans. The Hamilton Public Records contain zamindari files that record in detail the money spent on maintaining the embankments that were annually damaged by seawater storm surges, tidal waves and bank erosion in the active delta islands.

In fact Fredrick Mackkinon Hamilton, the patron of Gosaba, writes in his articles and speeches that maintaining the embankment was the prime duty of the estate officials. Mukunda Gayen, a local poet and writer in his mid-sixties, observes that since his childhood he has been noting the ebb and flow of the rivers on Dayapur Island. When Sir Daniel Hamilton started his land reclamation programme in Gosaba it was an immature island. The need for heavy embankment arose because the islands were much lower in height than the mean sea level, but sediment deposition was stopped once land reclamation started. The Aila cyclone of 2009 damaged these fortified embankments and led to the large-scale devastation of farmlands and homesteads in the Sundarbans. Villages like Gosab and Dayapur, as well as other islands of the Sundarbans, continue to be part of the active delta in South 24 Parganas. Colonial policy has determined the fate of these islands and later post-colonial programmes of land reclamation, the extension of railway and road networks in these islands and the building of ports like Canning were later abandoned.

In the late 19th century it became clear that the Port Canning project had failed, and Governor-general Lord Canning ultimately abandoned it partly because of the river regime in the Matla that constrained the prospects of navigation, coupled with several shipwrecks that dampened the interest of investors. Portraitist Khitish Bishal, a resident of Canning, showed me his private museum collection that contains rare artefacts of the Sundarbans. In his repository he had the bricks used by the Port Canning Company to build the Port that could not be operationalized because of problems caused by siltation and strong gale in the Matla. The fate of Diamond Harbour in the mouth of the Hooghly river has turned out to be the same. Subsequently there are now plans to move the Kolkata port to Haldia, away from the mouth of the delta.

These colonial experiments to facilitate trade and to maximise the production of capital in colonial Bengal brought the Empire's subjects and their go-between zamindars into intimate confrontation with coastal calamities. Most affected communities were the most vulnerable social groups, the Schedule Caste of Bengal (Namasurdras, Pods, Mahisyas and Poundro Katriyas)iv who worked as tenants, share croppers, and bonded labourers of the zamindars. The vulnerability of schedule caste agrarian peasants was historically constituted by their social position in Bengal *Samaj*. The high caste Hindus of Bengal settled mainly along the banks of the ancient active rivers, while the agricultural castes lived mainly in the intervening marshes and jungles. As successive groups invaded Bengal and occupied the comparatively high lands on the fringes of the rivers, the descendants of the aboriginal races gradually extended the frontiers of cultivation to the southern and eastern swamps and forests, and today these represent the majority of the lower delta (Mukherjee, 1938).

In order to reclaim the wastelands priority was conferred on embankment construction and accomplished efficiently by a strong monitoring incentive executed by the zamindars through their deputies, locally known as *nayabs* (zamindar henchmen, managers). Up until the zamindari was abolished in Bengal in 1950, the Hamilton estate employed six *nayabs* who were responsible for the protection of the embankments. For philanthropist Sir Daniel Hamilton this was a project that would make his cooperative dream for Bengal a reality. But soon after his death in 1939 things changed, as revenue concerns overtook concerns of human welfare. The freed man of Gosaba again became a bondsman and sharecroppers worked under the administration of the greedy manager of the estate, who managed Gosaba like exploitative zamindars had done. After the abolition of zamindari in 1950 the Indian federal government was bestowed with the responsibility of protecting the embankments all over the Sundarbans. The elected government represented by upper caste Hindus was not interested in the welfare of its citizens who lived in marginal littoral spaces on the coastal seaboard. They were socially denigrated as uncultured people who survived on inland fishing and agriculture, and who contributed nothing to the intellectual activity carried out by the upper caste *bhadralok* gentry of Bengal. These people were the subaltern underclass, the untouchables - fishermen, honey collectors, seafarers, wood cutters, manual labourers and peasants, who were, up until recently, share croppers and tenants of the *bhadralok* landed gentry in Bengal.

Embankment Measures:

In order to protect the reclaimed land for farming, embankment construction was pivotal in the success of settled agriculture in the Sundarban delta. Unlike the Law of Stormv that was developed by the colonial administration to help shipping and navigation with the financial support and assistance of British mercantile capital, the
embankment projects were unplanned and 'complicated by lack of information on customary rights, diversity of interests and capacities of the private partners, and free riding' (Roy, 2010).

This not only hindered colonial revenue maximization efforts but also posed a larger threat to the defence of newly carved out settlements and agricultural fields in the delta region that were progressively salinized by saline water inundation during tropical storms. The lives of tenants who ploughed these fields were made vulnerable by greedy moneylenders in the aftermath of cyclones as peasants fell into further indebtedness. The expansion of the agrarian frontier in the Sundarban delta thus produced risks to life and property, and posed social, economic and physical vulnerability. All of these were not solely 'acts of god' or triggered by 'climate change' events. Rather the ecological changes in the Bengal delta brought about by colonial policies of land reclamation and weak embankment programmes made the landscape vulnerable to tropical storms.

Several protagonists of the environmentalist discourse pay particular attention to the period 1880–1950, painting a dismal picture of public works on embankments (D'souza, 2006, Singh, 2008). Embankment construction in riparian Indo-Gangetic plains is seen to be mainly a state responsibility, and it is suggested that the colonial state embarked on this project on a larger scale than in earlier times. The motivation for doing so was partly economic; increasing tax income by reclaiming land. A riverbank became a potential source of government income also by making it possible to draw out river water for irrigation. A further reason to build embankments was added when railway construction began. In the main, however, the motive to spend public money on embankments was a political one; the desire to control peasant societies. In this respect, the embankment form of public works was no different from many other kinds of technologies for mass use that became 'tools of empire'.

Public works in this sphere gave rise to four kinds of social cost. First, they degraded land. When the dykes protected cultivated land on the flood plains of a river, they prevented alluvial deposit formation and the natural cycle of soil enrichment in the flood plains. Second, embankments, in the long run, made floods more likely rather than less likely, by hastening deposit formation on the riverbed. Third, embankments, by causing waterlogging, helped malaria spread in Bengal. Fourth, the railway embankments, which usually followed the course of rivers, often acted as an obstacle to the natural drainage of floodwater. The environmentalist discourse further suggests that, in the presence of these damages, 'in the last quarter of that century [the state's] role in controlling flood began to be critically examined' (Hill 1997, Iqbal 2007).

In the Sundarbans the construction and management of embankments was not always in the hands of the Public Words Department. It oscillated between the zamindars and the colonial state. The zamindars, who were granted land by the colonial government, took responsibility for embankment and dyke construction as a prerequisite for land reclamation.

However, they often neglected embankment repairs and protection, thus compelling the colonial local administration to share the responsibility. The future of these zamindaries depended on the robustness of embankments that blocked exceptionally high tides. However the opening up of these marshy wetlands for agriculture posed a new problem, exposing the peasants to the vagaries of tropical storms that intermittently ravaged settlements and farmlands. On a wider scale the state created a contractual setup of embankment management. Regulation 33 and two sections of Regulation 8 of the Code of 1793 divided all embankments in principle into two classes, one being 'public works' overseen by the Collector, and all others being managed by the zamindar (Roy, 2010).

In order to entice the local zamindars in the Sundarbans the colonial government gave many incentives, but the intermediaries showed no interest in embankment measures of their own accord, and instead depended upon state subsidies and concessions as free riders. The burden was borne by the tenants (share croppers, bonded labourers and small peasants) who occupied the lowest ladder in the chain of land revenue arrangements. Cyclones and salt-water inundation affected these social groups who belonged to the lower classes of Bengal.

Wetlands:

The Indian Sunderban is the largest coastal wetlands in India. Lothian Island Wildlife Sanctuary and Sajanakhali Wildlife Sanctuary in SBR are designated as wetlands in 2003 under National Wetland Conservation Programmes and are in advanced stage for inclusion of these sites under the Ramsar Convention on Wetlands.

Mud Flats:

The fertile mud flats in SBR resulted from self dynamic erosion and accretion process, are being stabilised by raising mangrove plantations for acting as bio shield against tidal waves and natural calamities like storms and cyclones. It is not only protecting wild fauna like mud skippers, estuarine crocodiles, and varieties of crabs, but also provide alternative livelihood for the fringe population.

Coastal Sand Dunes:

The SBR facing towards Bay of Bengal has stretches of sand dune formations of about 100 Km2 in which Casuarinas plantations are raised regularly and maintained. It also serves as nesting ground for the endangered fauna such as Olive Ridley turtles, Horse Shoe-crabs.

Climate:

As per the Köppen–Geiger climate classification system, the climate of SBR is sub-tropical. The SBR is characterised by 3 seasons: (i) Winter (November-February), (ii) Summer (March–June) and (iii) Rainy season (June- September) with Nor'wester storms locally called as "Kal-baisakhi" or the 'fateful thing' of the month of Baishakh (April 15-May 15). Annual average rainfall is 1920 mm and average humidity is 82% as per the data recorded for the last 50 years. The average annual maximum and minimum temperatures are 35°C and 17°C respectively. The SBR is the largest coastal marine eco-system of India prone to frequent cyclones, storms and other natural calamities. The physical development processes along the coast are influenced by a multitude of factors, comprising wave motions, micro and macro tidal-cycles and long shore currents typical to the coastal track. The shore currents vary greatly along the monsoon. These are also affected by cyclonic action. Erosion and accretion through these forces maintaining varying levels, as yet not properly measured, of physiographic change whilst the mangrove vegetation itself provides a remarkable stability to entire system. During each monsoon season almost all the Bengal delta is submerged, much of it for half a year. The sediment of the lower delta plain is primarily adverted inland by monsoonal coastal set up and cyclonic events. One of the greatest challenges peoples living on the Ganga Delta may face in coming years in the threat of rising sea levels caused mostly by subsidence in the region and partly by climate change.

In a study conducted in 2012, the Zoological Society of London (ZSL) found out that the Sundarban coast was retreating up to 200 meters in a year. Agricultural activities had destroyed around 17179 hectares of mangroves within three decades (1975-2010). Shrimp cultivation had destroyed another 7554 hectares.

Researches from the School of Oceanographic Studies, Jadavpur University, estimated the annual rise in sea level to be 8mm in 2010. It had doubled from 3.14mm recorded in 2000. The rising sea levels had also submerged around 7500ha of forest areas. This coupled with around 105^0 C rises in surface water temperatures and increased levels of salinity have posed a problem for the survival of the indigenous flora and fauna. The Sundari trees are exceptionally sensitive to salinity and are being threatened with extinction.

Geology, Geomorphology and Soils:

(a) Land Formation:

Geologically, the Sunderban, the largest delta of the world, is formed with quaternary sediments carried and deposited by the river Ganges, Matla and Bidyadhari and depositions of detritus layers for more than 6000 years. During 16th century, the flow Ganges shifted almost Eastwards into river Padma, as a result of tectonic plate movement towards East. This has resulted in cutting off the Matla and Bidyadhari river systems from the sweet water source and is presently fed by the backwater of the sea and thereby salinity of the Indian part of Sunderban is more when compared to the Bangladesh part. The higher salinity has

affected the mangrove diversity in the Indian SBR and the 'Sundari' tree has become endangered due to increased water salinity.

(b) Soil:

The Sunderban delta is mostly saline. The salt crusts are very often visible on the soil surface. The salt is mostly composed of Chlorides and Sulphates of Sodium, Magnesium and Calcium with traces of bi-carbonates. On the basis of parent materials of the existing soil, it is categorised into (a) clay soil, (b) heavy soil, (c) sandy loam, (d) sandy soil; and (e) silty soil.

Main Species

(a) Flora:

From Indian part of Sunderban, about 964 species of flowering plants including 81 mangrove species; and 150 species of algae have been recorded. Main species of flora occurring in SBR are *Acanthus volubilis*, *Amoora cucullata*, *Bruguiera parviflora*, *Heritiera fomes, Kandelia candel, Nypa fruiticans, Rhizophora apiculata, Scyphiphora hydrophyllacea* and *Sonneratia caseolaris*.

A total 245 genera and 334 plant species were recorded by David Prain in 1903. While most of the mangroves in other parts of the world are characterised by member of the Rhiophoraceae, Avicenneaceae or Combretaceae, the mangroves of Bangladesh are dominated by the Malvaceae and Euphorbiaceae.

The Sundarban flora is characterised by the abundance of Sundari (*Heritiera fomes*), gewa (*Excoecaria anallocha*), goran (*Ceriops decandra*) and keora (*Sonneratia apetala*) all of which occur prominently throughout the area. The characteristics tree of the forest is the Sundari, from which the name of the forest had probably been derived. It yields a hard wood used for building houses and making boats, furniture and other things. New forest accretions are often conspicuously dominated by keora and tidal forest. It is an indicator species for newly accreted mudbanks and is an important species for wild life, especially spotted deer (*Axis axis*).

There is abundance of dhundul or passur (*Xylocarpus granatum*) and kankra (*Bruguiera gymnorrhiza*) through distribution is discontinuous. Among palms, *Poresia coaractata*, *Myriostachya wightiana* and goalpata (*Nypa fruticans*), and among grasses spear grass (*Imperata cyclindrica*) and khagra (*Phragmites karka*) are well distributed.

The varieties of the forests that exist in Sundarbans include mangrove scrub, littoral forest, salt water mixed forest, brackish water mixed forest and swamp forest. Beside the forest, there are extensive areas of brackish water and fresh water marshes, intertidal mudflats, sand flats, sand dunes with typical dune vegetation, open grassland on sandy soils and raised areas supporting a variety of terrestrial shrubs and trees. Since Prain's report there have been considerable changes in the status of various mangroves species and

taxonomic revision of the mangrove flora. However, very little exploration of botanical nature of the Sundarbans has been made to keep up with these changes. Differences in vegetation have been explained in terms of fresh water and low salinity influences in the north east and variations in drainage and siltation. The Sundarbans has been classified as a moist tropical forest demonstrating a whole mosaic of seers, comprising primary colonisation on new accretions to more mature beach forests. Historically vegetations types have been recognised in broad correlation with varying degrees of water salinity, fresh water flushing and physiographic.

(b) Fauna:

Tiger is the flagship species inhabitated in the mangrove ecosystem of SBR, known as 'Royal Bengal Tiger' world over. More than 40 species of mammals, 163 species of birds, 56 species of reptiles, 165 species of fish, 23 species of molluscs, 15 species of prawns, 67 species of crabs have so far been reported in SBR.

The Sundarban provides a unique ecosystem and rich wild life habitat. According to the 2011 tiger census, the Sundarbans have about 270 tigers. Although previous rough estimates had suggested much higher figures close to 300, the 2011 census provided the first ever scientific estimate of tigers from the area. Tiger attacks are frequent in the Sundarbans. Between 0 and 50 people are killed each year. There is much wilder life here than just the endangered Royal Bengal Tiger (*Panthera tigris tigris*). Most importantly, mangroves are a transition from the marine to fresh water and terriestrial 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. Fishing cats, macaques, wild bears, common grey mongooses, foxes, jungle cats, flying foxes, pangolins and spotted deer are also found in abundance in the Sundarbans.

The management of wild life is restricted to, firstly, the protection of fauna from poaching and secondly, designation of some areas as wild life sanctuaries where no extraction of forest produce is allowed and where the wild life face few disturbances.

Although the fauna of Bangladesh have diminished in recent times and the Sundarbans has not been spared from this decline, the mangrove forest retains several good wildlife habitats and their associated fauna. Of these, the tiger and dolphin are target species for planning wildlife management and tourism development. There is high profile and vulnerable mammals living in two contrasting environments, and their statuses and management are strong indicators of the general condition and management of wild life. Some of the species are protected by legislation.

(i) Mammals:

Panthera tigris tigris, Prionailurus bengalensis, Platanista viverrina, Platanista gangetica, Neomeris phocaenoides, Orcaella brevirostris, Manis pentadactyla.

(ii) Birds:

Ardea goliath, Haliaeetus leucogaster, Leptoptilos dubius, Leptoptilos javanicus, Pandion haliaetus, Ichthyophaga ichthyaetus, *Nisaetus Sps. (*Hawk Eagle*), Haliastur indus*.

(iii) Reptiles:

Batagur baska, Crocodylus porosus, Chelonia mydas, Chitra indica, Eretmochelys imbricata, Kachuga tecta, Lepidochelys olivacea, Lissemys punctata, Python molurus, Trionyx bengalensis, Varanus salvator, Varanus flavescens, Varanus bengalensis.

Names of the Different Areas

Core Area: Sunderban National Park.

Buffer Area**:** In addition to the existing 3 Wildlife Sanctuaries i.e. Sajanakhali (362 km2), Lothian Island (38 km2) and Haliday Island (6 km2); one more wild life sanctuary, viz. West Sunderban Sanctuary is under active phase of notification by the Government in accordance with the recommendations of the West Bengal State Wildlife Advisory Board.

Size of Core Area(s): 1, 69, 200 ha (1692 Km2)
Size of Buffer Zone(s): 2, 23, 300 ha (2233 Km2)
Size of Transition Area(s): 5, 70, 500 ha (5705 Km2)
Total Area: 9, 63, 000 ha (9630 Km2)

The Biosphere Reserve has adequate area to serve its three functions – Conservation, Development and Logistics Support.

Core zone is strictly protected from all developmental activities and inspections are made regularly. Notified tiger reserve and National park are with in this area.

Buffer zone excluding 3 wildlife sanctuaries is being used for developmental activities by the local inhabitants for agriculture, honey, timber, and fish, prawn and crab collection.

Transition zone: With an estimated 4.2 million people are inhabitation the vast saline tracts composed of low lying islands, interconnected through tidal rivers, creeks and marshes of SBR. People are poor, and about 95% are subsisting mainly by rain fed agriculture of single crop which is made possible by way of construction of earthen embankments to keep brackish tidal water at bay (UNESCO, 2011).

Land Tenure of Each Zone:

The Core zone is fully protected by the Indian Forest Act, 1927; The Wildlife (Protection) Act, 1972; The forest (Conservation) Act, 1980; The Environment (protection) Act, 1986 and The Biological Diversity Act, 2002. The core areas are owned by the West Bengal State Government.

The forest in the Buffer zones is fully protected by the Forest (Conservation) Act, 1980 and owned by the West Bengal State Government and private owners.

The Transition areas are owned mostly by private owners and partly by the West Bengal state Government.

Use of Resources by Local Populations

(i) Uses or activities in the Core Area(s): The Core area is strictly protected from all developmental activities. Patrolling on foot as well as by boats is done regularly for anti-poaching activities & surveillance. Waterholes have been created in the core area to facilitate drinking water to the wild animals.

(ii) Main land uses and economic activities in the buffer zone(s): Agriculture is the main economic activities of the people. Honey gathering, timber, fish, prawn and crab collection is other economic activities. Besides agriculture, the fringe communities are involved in restoration of mangrove vegetation, silviculture, pisciculture, apiculture, prawn culture activities of SBR for securing alternative livelihood.

(iii) Main land uses and major economic activities in the Transition Area(s): Agriculture is the main land use which is the primary economic activity. Fish, prawn, crab, timber and honey collection are secondary economic activities.

Socio-Economic Setup:

The Indian Sundarban region is one of the borders of West Bengal having an area of 4244.83 sq. km., with a population of 4426259 persons (as in 2011). Among which 3309526 persons (74.77%) belongs from South 24 Parganas district and 1116733 persons (25.23%) population belongs from North 24 Parganas district. In 2001 the total population of Indian Sundarban region was 3757359 persons. According to 1951 census data it was 1159653 persons. In 2011 census data population density is 1042 persons/ sq. km. and decadal population growth rate is 17.8%.

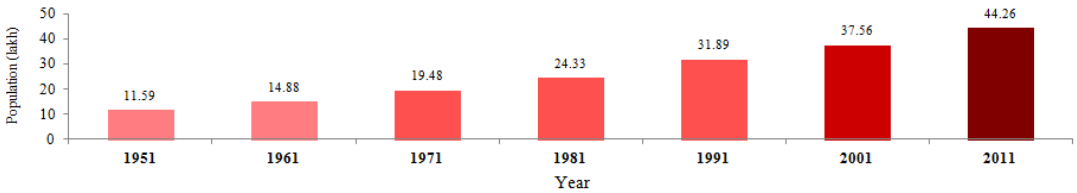
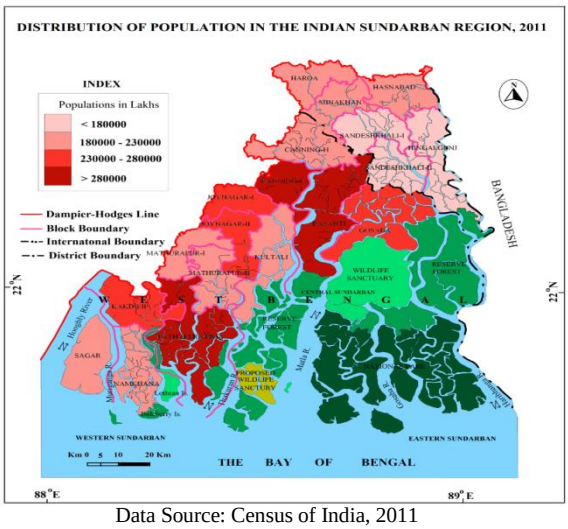


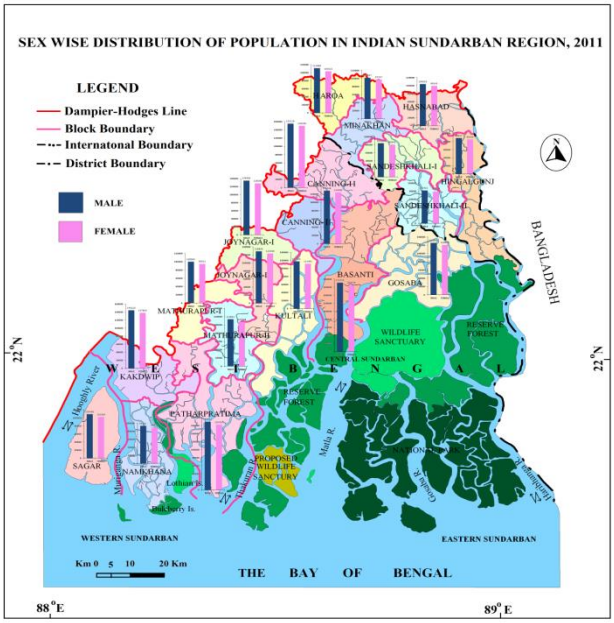
Fig: 4.2 Growth of Population in the Indian Sundarban Region, 1951-2011

According to 2011 census data Basanti C.D. block has experiences maximum number of population (336717) and Sandeshkhali II C. D. block has minimum number of population (160976). 35.56% population of the Indian Sundarban region belongs from SC category and 4.79% population belongs from ST category. Maximum SC population observed in Hingalgunj C.D block (66.01%), followed by Gosaba C.D block (62.69%) and minimum in Canning-II C.D block (20.93%). In case of ST category, maximum population observed in Sandeshkhali-I (25.95%), followed by Sandeshkhali-II C.D block (23.42%) and minimum population observed in Joynagar-I C.D. block (0.03%). According to 2011 census data, the number of females per thousand males of this region stands around 946.

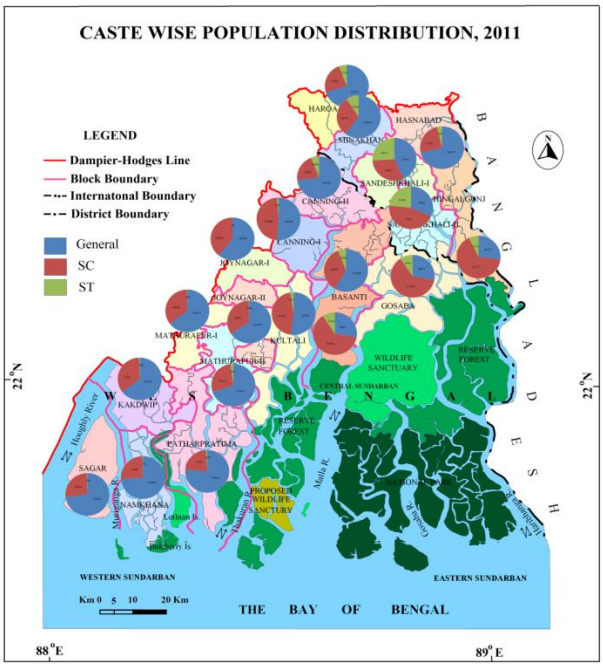


Data Source: Census of India, 2011

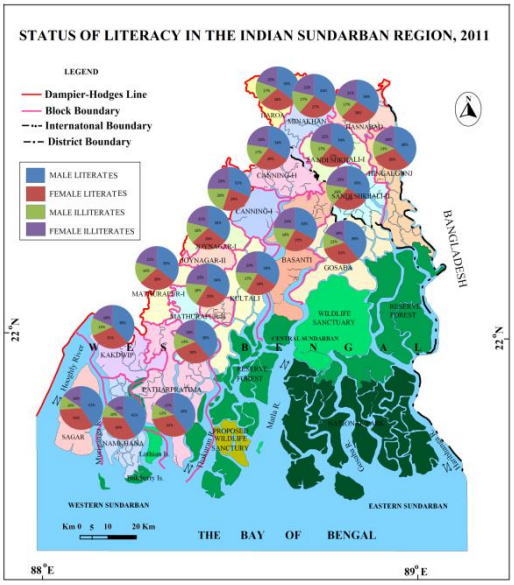
In case of literacy, literacy rate is greater among the males in every block. According to 2011 census data literacy rate of the Indian Sundarban region is 65.96%. Maximum literate population lives in Hingalgunj C.D block (68.54%), followed by Kakdwip C.D block (68.34%) and minimum literacy observed in Canning-II C.D block (55.06%). Maximum literacy rate among the male population observed in Namkhana C. D. block (41%) and female literacy rate is also maximum in this block (34%).



Data Source: Census of India, 2011



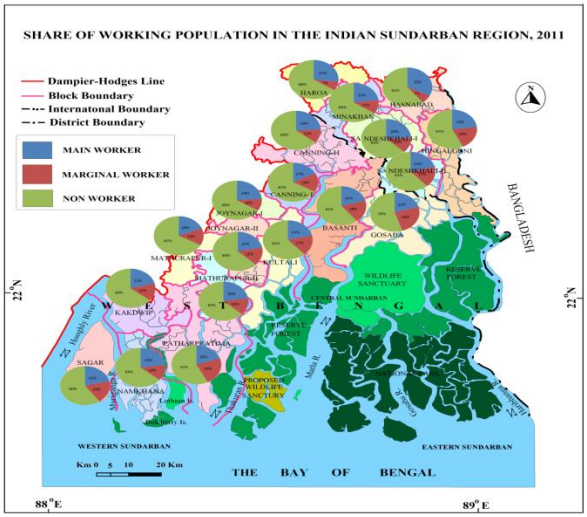
Data Source: Census of India, 2011



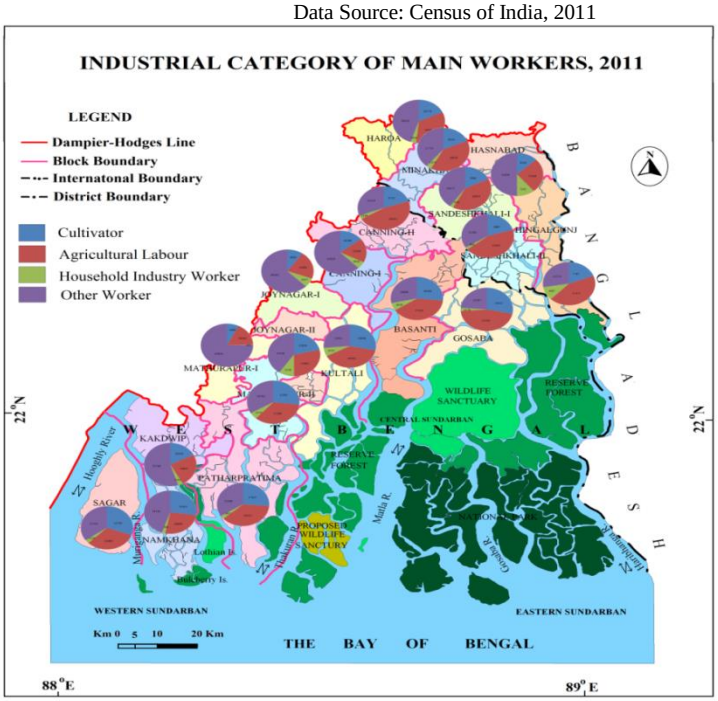
Data Source: Census of India, 2011

According to 2011 census data maximum number of main worker lives in Hasnabad C. D block. 32% of total population is under main working category of this block and in Canning I C. D. block minimum number of population is under main working category. It is 17%.In Gosaba C. D. block maximum number marginal worker lives. 24% of total population of

this block are marginal worker and Haroa and Hasnabad C. D. block experiences minimum number of marginal workers. It is 7% among the total population. In case of non-working category maximum population lives in Canning I C. D block. 7% of total population in this block are non-worker and in Gosaba C. D block minimum number of non-working population lives. It is 55% of total population.



Data Source: Census of India, 2011



Data Source: Census of India, 2011

In case of industrial category of workers, maximum cultivators' lives in Sagar C.D block (30.52%) and minimum in Mathurapur-I C.D. block (7.40%). In case of agricultural labour, 46.50% population of the Canning-II C.D block belongs in agricultural labour category and minimum population (20.89%) of Joynagar-I C.D block engaged in this category. A maximum household industry worker lives in Hasnabad C.D block (11.02%) and minimum in Mathurapur-I C.D block (0.31%).

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