

Sundarbans and the remote Islanders

9.1 Introduction

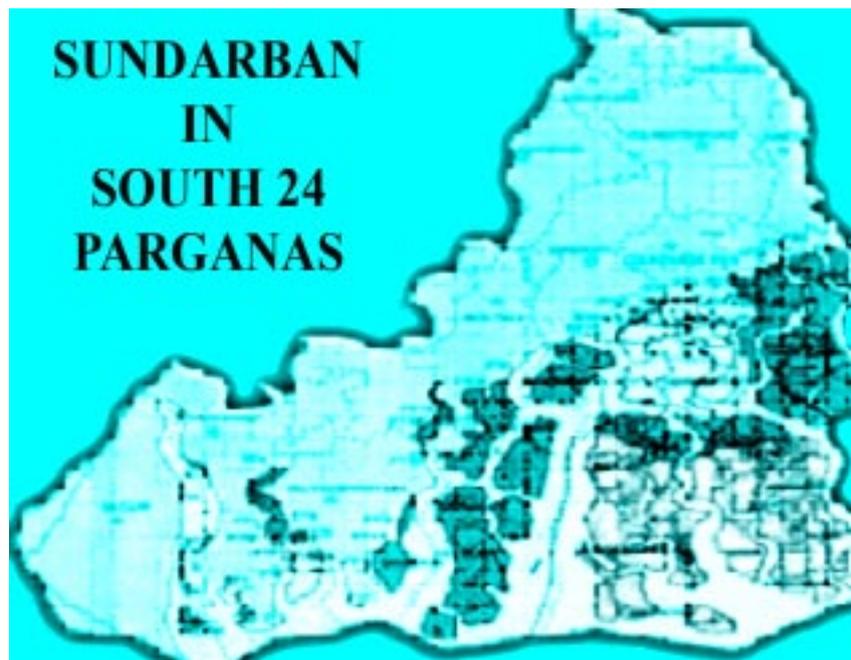
The present day is seeing economic integration on an unprecedented scale. Regional economic activity is being largely driven by markets outside and national economies are being increasingly dovetailed into the world market. Such rapid integration is undoubtedly helped by the revolution in information technology which drastically

reduced the transaction costs that till recently had prevented high degree of local specialization. In recognition of the potential of such integration towards reducing world poverty, the World Development Report (WDR 2008) has advocated the integration of local agriculture with

world market. This can enable subsistence farming to diversify into High Value Crops (HVC) which are often labour-intensive in production and remunerative to poor farmers. But being perishable in nature, such diversification requires establishment

of modern supply chain as a precondition.

Realization of this potential is being fostered by a concerted effort of various agencies, led mostly by the government. The provision of infrastructure like transport, power, irrigation as well as education and health are essential for such integration of local economies into the



broader outside market that brings changes in local production pattern and throws up new earning opportunities for the local stakeholders.

India, making strides in the economic front today, is experiencing such changes

in many of its parts. Rural life is breaking its inertia and coming to terms with the pace of urban life. The changes are brought about by increased interaction with urban centers through improved transportation and communication, and penetration of media into rural corners. Rural India is aspiring for more entitlements - aspirations that may not be distant dreams.

Yet some pockets of isolation remain. For some of them, the main cause of isolation is geographic. Most part of the Indian archipelago named Sundarbans, though situated close to Kolkata – the largest metropolitan city and commercial hub in eastern India – is remote and largely isolated. Due to the topographical specificities of the region – part of world’s largest mangrove delta region – Sundarbans is not holding a promise of bridging this distance in the near future even with today’s technology and engineering

progress. The region consists of 102 islands out of which 54 are inhabited. The remoteness of the area is amply understood by the fact that in 4500 sq.km. inhabited areas, there is only 42 km. of railway line and about 300 km. of *pucca* road network. The only means of communication between the islands is through the waterways which is poorly organized and people have to depend on mechanized private boats.

Still the area is home to over 3.9 million people. It is spread over 13 administrative blocks out of 29 in the district of South 24 Parganas. Human development of the district loses its relevance if these islanders are left out. But a model of rural development successfully executed elsewhere, might not be applicable in Sundarbans due to problems specific to this region with special geo-climatic characteristics. It calls for a deeper insight of the social and economic life of the people of Sundarbans – and this chapter tries to capture a glimpse of that.

9.2 Sundarbans and the District

Sundarbans is the world’s largest prograding delta region that spreads over India and Bangladesh covering around 25,500 sq. k.m. The Indian part is approximately 9,630 sq. k.m. The

Indian part of Sundarbans is not confined to one single district. Sundarbans also covers 6 administrative blocks of the adjacent North 24 Parganas district, besides 13 blocks in South 24 Parganas

The socio-economic profile of Sundarban's inhabitants and the bottlenecks to their development are very similar across the two districts. In recognition of it, the Government of West Bengal had set up the Sundarban Development Board in 1973 under the administrative control of Development & Planning Department for a comprehensive development of the region. With further emphasis on the development of this region, a new Department of

Sundarban Affairs was created in 1994 and Sundarban Development Board was placed under its administrative control. With such a focused administrative approach towards overall developmental needs and specific problems of the region, it is difficult and often unwarranted to discuss Sundarbans only partially, confining within the administrative boundaries of South 24 Parganas. The introduction to Sundarbans – its climate, ecology and history cannot be

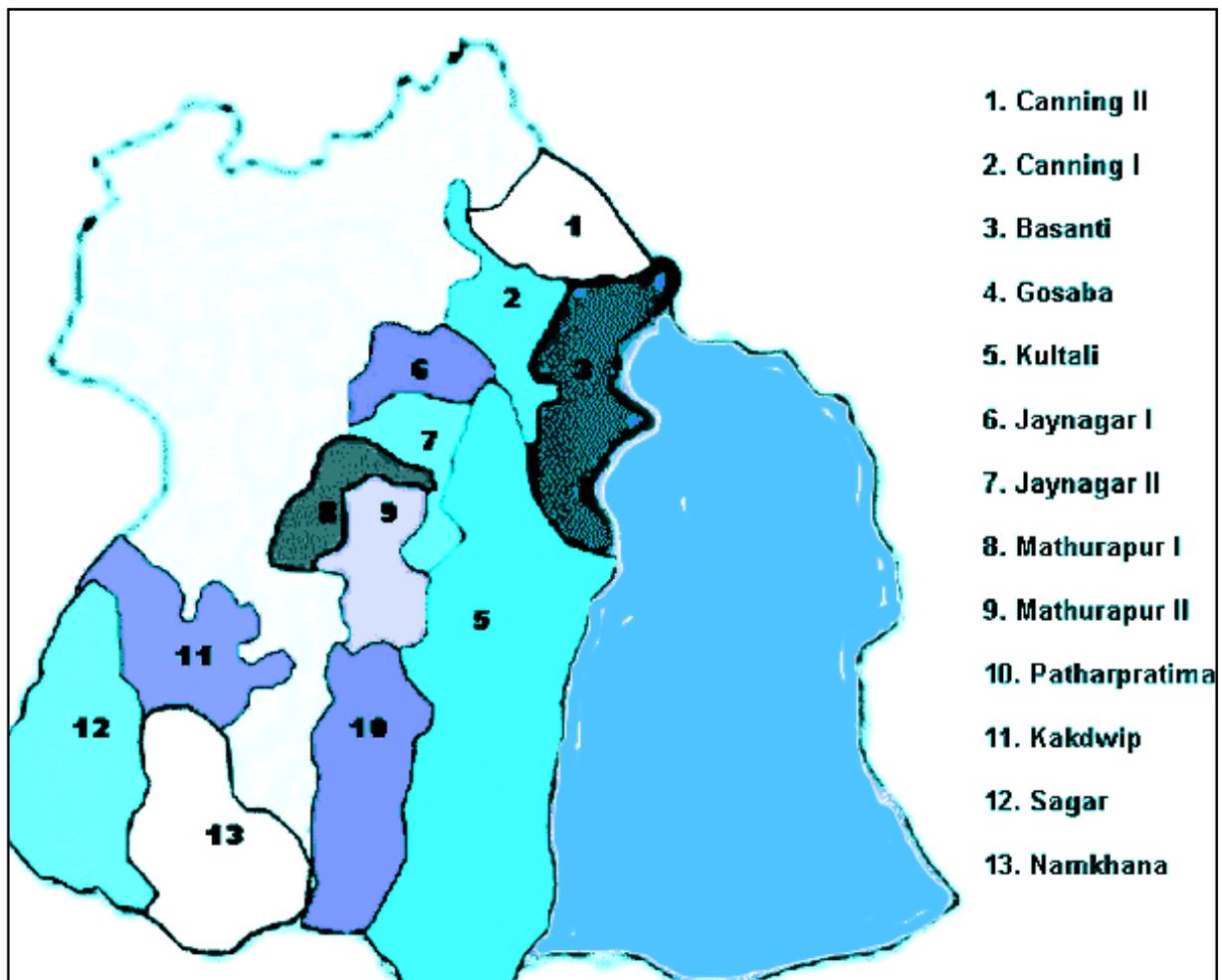


Figure 9.1 Administrative Blocks of Sundarban area within the District of South 24 Parganas

described within this district limit. However, being part of the District Human Development Report, the data regarding the socio-economic profile of the region, as reported in this chapter, are based on this district's share of Sundarbans.

Presently Sundarbans has a forest cover of 10,200 sq. km. shared between India and Bangladesh. India's share of this forest area is around 4,200 sq. km.

Indian Sundarban also includes around 5,400 sq. km. area outside the forest cover that includes inhabited lands along the north and north-western boundary of the forest

9.3 The Location and Physiography

The Indian Sundarbans is formally demarcated by River Hooghly in the west, Bay of Bengal in the south, Rivers Harinbhanga and Raimangal in the east (marking the international border between India and Bangladesh) and the Dampier-Hodges line in the north. The last one is an imaginary line, passing through 24

Meghna and their numerous distributaries. The building up of this estuarine area is consequently not complete. The mangrove-dominated delta is a complex ecosystem comprising one of the three largest single tract of mangrove forests of the world. The physiography is dominated by deltaic formations that include innumerable drainage lines. The

Sundarbans' floor varies from 0.9 m to 2.11 m above sea level. Tidal saline water, pushed into from the Bay of Bengal, alternately drowns and exposes the islets twice a day

Parganas South and North districts, which indicates the northern-most limits of estuarine zone affected by tidal fluctuations.

The Sundarbans along the Bay of Bengal has evolved through quaternary (began about 2 million years ago and extends to the present) sediments deposited mainly by the mighty river Ganges, Brahmaputra,

throughout the year. The average tidal amplitude in the estuaries of the Sundarbans ranges from 3.5 m to 4.0 m. The highest fluctuations in the water level are generally experienced in August - September when the highest tide level attained is in excess of 4.0 m. Most of the low-lying inhabited island sections are lower than the average tide level of the surrounding rivers.

Climate of Sundarban

- Annual average Maximum Temperature 35°C.
- Average humidity is about 82% which remains more or less constant due the region's proximity to the sea.
- Average annual rainfall 192 cm out of which 75% is received during June to September.

9.4 Ecological Significance and Biodiversity

The Sundarbans is rich in biodiversity and the biotic factors here play a significant role in physical coastal evolution and for wildlife. It has significant ecological implication for marine life and livelihood of coastal communities for a large part of south-east Asia. The mangrove vegetation itself assists in the formation of new landmass and the intertidal vegetation plays an important role in swamp morphology. The Sundarbans includes 26 true mangrove species, 29 mangrove associates, and 29 back mangrove species of 40 families and 60 genera.

In terms of faunal endowment Sundarban is famous for Royal Bengal Tigers. It is the only mangrove forest in the world that hosts tigers. It is also the single forest tract where the largest number of tigers is found. As per December 2001 census, the number of

tigers in Indian Sundarban is 271. It is also home to a good number of globally endangered animals like estuarine crocodile, fishing cat, Gangetic dolphin, olive ridley and green sea turtles etc. Several bird species are found including a large number of migrants from the higher latitudes that visit the area in winter. Numerous species of phytoplankton, fungi, bacteria, zooplankton, invertebrates, molluscs, reptiles, amphibians and mammals are also found here. Species composition and community structure vary from east to west, and along the hydrological and salinity gradients. All these make Sundarban a biodiversity hotspot and its conservation is a global concern. Its conservation is closely monitored by the Government of India and that of the state of West Bengal.

Faunal Diversity in Sundarban

Vertebrate Species = 481
Hemichordate Species = 1
Invertebrate Species = 1104
Protozoan Species = 106
Mammals = 58
Birds = 248
Reptiles = 55

Species that gone extinct in the last hundred years with human invasion

Javan Rhino
Wild Buffalo
Barking Deer
Swamp Deer

9.5 History of Human Settlement

An understanding of the region's social fabric is necessary for an optimal development strategy. This calls for a brief introduction to the history of human settlements in the region. The present population influx in the region is fairly recent and does not involve a long tradition of rulers, landlords, intermediaries and class exploitation on the scale that mainland India had witnessed for thousands of years.

Some scattered historical findings in the region bear solid evidence that the area had been populated even at the time of Asoka (273-232 BC), though the evidences so far fail to add up to a comprehensive account of continued civilization in this delta region. However, it is well established that due to a series of natural calamities the region was gradually losing its population during the Middle Ages. Eventually, after the invasion of Portuguese and Arakan pirates in the waters of the delta, the area was depopulated for all practical purposes. The forest reclaimed the previously inhabited area and when the British East India Company set up their headquarters at Calcutta in 1757, it was at the edge of the forest.

9.5.1 Recent History

The recent history of human settlement in the Sundarbans dates from the treaty of 1757 signed by Mir Jafar, through which the lands of undivided 24 Parganas, then practically depopulated, were ceded to the East India Company. Clearing the forest and introducing human settlement in the area was done in a planned way under the British rule where the motivation solely was increasing revenue collection. The present settlements originate from the plan conceived by Clod Russell, then Collector General in 1771, whereby the forest land had been divided into plots to be leased out to prospective landlords.

Clearing of forest effectively started from 1781 by Tillman Henkel, then magistrate of Jessore district. Thereafter the forest line was being continuously pushed back from its western and northern fronts. Initially forest was cleared mostly in its northern part and by 1873 the blocks of Hasnabad, Bhangar, Haroa, Hingalgunj, Minakhan (N 24 Parganas) and Canning, Joynagar, Mathurapur and Sagar (S 24 Parganas) had been fully or substantially cleared of forest. In this first phase of unregulated deforestation, much of the

revenue came from forest products including timber. However, it was gradually declining and the need for conservation was voiced from within the administration. Consequently, the first initiative for conservation was also mooted under the British rule.

In 1875-1876 the government declared the un-leased forest area as reserved, and placed them under the jurisdiction of the

Forest Department. Still, the area which was already leased out by that time continued to attract population at the cost of the forest. Between 1873 to 1939, much of the interior blocks of Sandeshkhali, Kakdwip, Patharpratima, Basanti, Kultali and Gosaba (all under S 24 Parganas) had been cleared of forest to make room for human settlements.

The forest boundary took a further

Sir Daniel Hamilton and his Island Experiment

The forested islands of Sundarban could be populated in the early days only by successful community cooperation. This was pioneered by Sir Daniel M. Hamilton who is a legendary figure among these islanders even today. Hamilton was a Scottish businessman and made a good fortune out of his shipping business in Calcutta. After retiring from the business, he wished to implement his idea of cooperative community living in a self-sustained way in the deltaic islands of Sundarbans. In this pursuit he took lease of three uninhabited islands Gosaba, Rangabelia and Satjelia (now under Gosaba Block) in 1903. He then formed *Bengal Young Mens Zamindari Co-operative Society* which also had support from the government. To make these mud-flats and forest land habitable, a huge labour-input was required. Sir Hamilton brought labourers from the mainland who were given reasonable provisions for livelihood for an initial period. They were required to erect embankments all around the islands to protect the land from saline water before agriculture could be started. Besides, he established free schools and dispensaries and built freshwater ponds for rainwater harvesting.

All these efforts were directed towards establishing a self-sufficient island economy with exchange between the islanders. To finance the developmental activities and facilitate the local commerce, he introduced what came to be known as *Gosaba Currency*. The Estate Office of the Society acted as the central bank in this respect. Hamilton's own money of eleven hundred rupees (coins – legal tender) acted as the base on which he issued his own notes. It is interesting to note the words which appeared on his note issue. On one side it stated:

“Sir Daniel Mckinnon Hamilton promises to pay the Bearer, on demand, at the Co-operative Bhundar. in exchange for value received, one rupee's worth of rice. cloth, oil or other goods.” (Signed) D. M. Hamilton.

Written on the back of the notes were more interesting words – which reflects his philosophy behind this island-experiment:

“The value received in exchange for this Note may be given in the form of bunds constructed, or tanks excavated, or land reclaimed or buildings erected or in medical or educational service. The Note may be exchanged for coin, if necessary, at the Estate Office. The Note is made good, not by the coin, which makes nothing, but by the assets created and the services rendered. The Note is based on the living man, not on the dead coin. It costs practically nothing, and yields a dividend of One Hundred percent in land reclaimed, tanks excavated, houses built, etc. and in a more healthy and abundant LIFE.”

These notes were willingly accepted by the workers on the island and villages were built, each with its school, and eventually what was formerly an uninhabited area achieved a considerable population which could sustain itself on those remote islands.

beating after India's independence due to the Partition of Bengal. Between 1951 to 1971, this area was forced to accommodate a huge influx of refugees from East Pakistan (Bangladesh) and some forested islands were cleared for human settlement. Presently, out of 102 islands in the delta region, 54 are populated while the remaining 48 are reserved with forest cover.

In the initial years of settlement, clearing the marshy mud-flats and making them habitable was an act of extreme hardship in a hostile environment. The lease-holders, who were mostly upper caste moneyed

Hindus, had lured the poorest tribal people from Chhottanagpur, Ranchi and Hazaribag region in the Indian mainland to settle in their area. They were lured through packages of initial provisions and some cultivable land for their own. Also the area experienced migration of poor people from the adjoining district of Midnapur in the west, which is a coastal district with a history of repeated cyclone disasters. Finally, a significant section of local population consisted of migrants from neighbouring districts of Bangladesh in the east.

9.6 Sundarban Administration

The developmental activities of around 5400 sq. km of populated area within Sundarban is financed and supervised by the Sundarban Development Board under the Department of Sundarban Affairs in the state administration (Government of West Bengal). However, for reaching a harmony between development and conservation, the Government of India constituted the Sundarban Biosphere Reserve (SBR) in 1989 which includes the human settlements as well as 4200 sq. km. of reserve forest area headed by Chief Conservator of Forest

(South). The reserve forest area includes the Tiger Reserve under the direct control of Field Director, Project Tiger and the

Composition of Protected Area

Nearly 40 per cent of the reserved forest area has been brought under Protected Area network that includes:

Sundarban National Park (1330 sq.km);
Sajnekhali Wildlife Sanctuary (362 sq.km);
Lothian Wildlife Sanctuary (38 sq.km); and
Haliday Wildlife Sanctuary (6 sq.km).

Out of this total recorded forest area, 55 per cent is under land vegetation cover and the remaining 45 per cent is under water body/ inter-tidal zone.

Divisional Forest Officer (South 24 Parganas) who is in-charge of the rest of the reserve.

9.7 Demography

In Sundarbans, the coexistence of human settlements and reserve forest is unique in the sense that unlike other forests, there is no human settlement within the reserve forest area. The human habitat and the forest are always separated by rivers. Along the north and western boundaries of the reserve forest, under the Biosphere Reserve, human settlements can be classified into two parts depending on their geographic location. Some of them are now parts of the mainland which are connected by roads and having other infrastructural facilities typical of their rural counterparts in India. Under South 24 Parganas, the areas under the Administrative Blocks of Canning, Joynagar, Mathurapur, Kakdwip and Namkhana fall almost entirely in this category. The people living in these areas are not in close proximity with the forest and their living conditions and livelihood options are similar to that of other areas in the district.

But the Blocks of Basanti, Gosaba, Kultali, Patharpratima and Sagar, together accounting for around 40% of total area in the district, call for a special understanding of the people, their livelihood and threat perceptions. They are almost entirely detached from the mainland and live under

much different conditions unmatched in the rest of India.

These are people living in islands on the fringes of Reserve Forest. The islands often face the forest on the other side of the separating river. The history of these island settlements does not date back to more than hundred years. Almost none of these islands has any electricity connection and other infrastructural facilities like transport and communication. The settlers initially lived mostly on agriculture with some viable amount of reclaimed cultivable land for each household.

After independence, these islands saw a steady influx of migrants from adjoining districts in mainland. Specially, the

History of Forest Conservation in Sundarban

1875-1876: The British government rolled back the policy of leasing out forest land and brought the remaining forest under the jurisdiction of Forest Department.

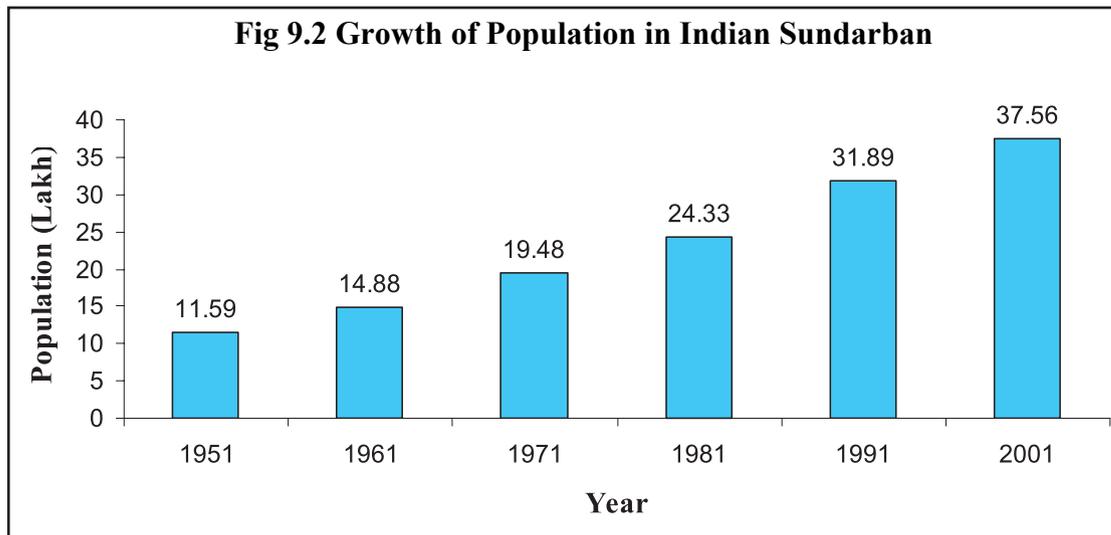
1926: The remaining forest was declared as Reserve Forest, boundaries of the Reserve were fixed.

1973: Sunderban Tiger Reserve was constituted by GoI under Project Tiger scheme

1987: Sunderban National Park, forming the core area of Sunderban Tiger Reserve, received recognition as World Heritage Site, by UNESCO

1989: Sunderban Biosphere Reserve was constituted by Government of India (GoI) to establish a formal mechanism for coordinating and integrating diverse activities of conservation and harmony between man and environment. Sunderban Tiger Reserve became a part of it.

2001: Received the recognition of UNESCO, under its Man and Biosphere (MAB) programme.



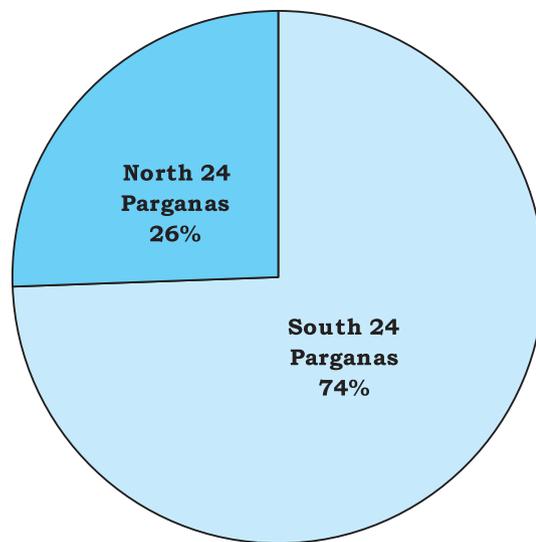
partition of Bengal resulted in an influx of refugees from erstwhile East Pakistan (now Bangladesh). The late-comers were left with little or no landholding and fell back on the forest for its products and on the rivers for fish and crab. Also, with subdivision and fragmentation of landholding through generations, the landed households gradually turned marginal and could hardly sustain with agriculture alone. Consequently, fishing became the second most important occupation for these islanders. The heavy dependence on forest for the landless or marginal households is also perceptible in absence of any power-driven industry in these islands. This background also explains the spatial distribution of population within these islands. Households which directly depend on forest and rivers (mostly landless and marginal), are concentrated on the banks of the rivers bordering the forest. The landed

households are mostly placed in the interiors or towards the mainland.

Overexploitation of forest and river (fish) resources is already showing in terms of decreasing yield. For islands in the periphery of the reserve forest, there is no urban centre nearby to market their product through crop diversification. These isolated island settlements are brimming over their sustainable level of population with limited livelihood options. As a result, recent years have seen an increasing flow of out-migration of local youth from these islands into different parts of India. Almost three quarters of total Sundarban population of 3.76 million (Census 2001) live within the South 24 Parganas district. Also, out of the district's total 6.9 million people (Census 2001), 40% belong to Sundarbans. The population intersection between Sundarban and South 24 Parganas is around 2.8 million spread over 730 villages, out of which

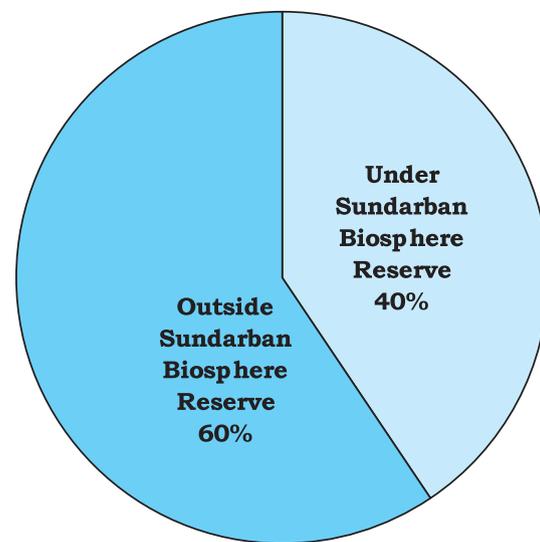
nearly 30% belong to the isolated islands. Going by the Census estimates (2001) for the district, the population density in Sundarban is approximately 934 per sq. km and the number of females per thousand males stands around 946.

Fig 9.3 Distribution of Sundarban Population Between Two Districts (Census 2001)



The settlement history in Sundarbans explains the presence of a relatively larger proportion of lower-caste people in this region. Nearly 36.5% of its population belong to SC/ST category compared to the state average of 25.6%.

Fig 9.4 Distribution of South 24 Parganas Population Between Sundarban Area and Outside



9.8 Infrastructure

The remoteness and isolation of most parts of Sundarban left the region crippled in terms of infrastructural provisions. The development potential for a region is closely linked with such provisions. The relative underdevelopment of Sundarbans can largely be explained by its poor infrastructure. In the 4,500 sq.km of inhabited area, there are only 42 km of railway line and about 300 km. of metalled road network. Almost all the islands are

devoid of any conventional electricity supply. Governmental effort to provide solar energy systems at subsidized rate has also not been much successful because of the very little purchasing power of the islanders.

At least five of the thirteen Sundarban blocks are entirely or mostly constituted by islands which do not have a direct road-link with the mainland. These are Gosaba, Basanti, Kultali, Patharpratima and Sagar.

Table 9.1: Intra-district Divergence in Infrastructural Provisions

Infrastructural provisions	Island-blocks around forest boundary	Other Sundarban Blocks	Rest of South 24 Parganas
% of households with access to electricity	0.70	9.18	29.34
Length of surfaced road (in km.) per sq. km. area	0.36	0.95	2.59
No. of bank branches per 10000 population	0.26	0.30	0.49
Irrigated area as % of net area under cultivation	21.13	15.99	48.42

Sources: BAES, GoWB; Census of India, 2001.

Among them, the first four are on the boundary of the reserve forest. For these blocks the only means of communication with the mainland as well as with other islands is through long journeys through river channels. Such transport is not well-organized and people have to depend on the private mechanized boats which are often overloaded while negotiating treacherous waters. Few islands have pucca/well-maintained jetties. Few islands have inland transport in the form of cycle-van, while others do not have any mode of transport at all.

Sagar, though itself an island, is somewhat different from the other four island blocks. While other island blocks are close to the forest and surrounded by rivers carrying saline water, Sagar is located at the mouth of the mighty river Hoogly which carries freshwater. So, the livelihood options are marginally different in Sagar.

Directly forest-dependent poor people are not seen in Sagar. Also, this island is visited by over a million pilgrims from all around India for the annual occasion of Sagar-Mela. This religious tourism had helped Sagar to develop some infrastructure on the island over time.

Other Sundarban blocks have been gradually linked with the mainland over time and the infrastructural provisions improved. This resulted in more livelihood options for the population of these blocks. But even these not-so-remote Sundarban blocks compare very unfavourably in terms of various infrastructural indicators when compared to the rest of the blocks in the district.

The relative disparity in infrastructural provisions in Sundarbans can be amply seen from Table 9.1 which directly compares the island blocks with the rest of Sundarban and with the rest of the district in terms of four basic indicators

of infrastructure. It shows the sharp deficit in infrastructural provisions in Sundarban region and even across blocks within it. It undoubtedly explains the region's relative

impoverishment. It also points out the priorities towards which any planned effort towards the region's development should be directed to.

9.9 Livelihood

Part of Sundarban population lives within the mainland and their livelihood pattern are similar to the rest of the rural population in the district. It is the island villagers whose way of living and entitlements are considerably different from that of their mainland counterparts. The livelihood options in these remote islands are indeed very limited till date.

Typically in the delta region rain-fed, single-crop agriculture and fishing are the two main sources of livelihood. Nearly 95 per cent of the population primarily depend on agriculture. About 50 per cent of agriculturists are landless labourers. For the blocks bordering the reserve forest, during agricultural lean season, substantial part of the population depends on forest and river resources. During April - May, some people enter the forests with permits for collection of honey and bee-wax which is partly purchased back by Forest Department. Besides, some households entirely and some partially engage in catching fish and crab in the rivers and creeks. Both of these operations are

perceived to involve considerable danger due to tigers in the forest and crocodiles in the rivers. It can be perceived that these people directly depend on the forest as a last resort for their livelihood and are almost always very poor with nil or unsustainable landholding.

Income from these occupations is often supplemented by catching "meen", the local term for shrimp seedlings. The spawns of tiger prawn, which are hatched in these saline waters are much in demand by the inland prawn farms and fetch hard cash for the poor. A large section of women and children from poor households catch these tiny prawn seedlings with fine nets, which are then sold to 'bheries' (water bodies for growing fish) to grow in brackish water. The estimated value of shrimp trade from the delta, including exports, is worth over Rs.100 crores. However, the real beneficiaries are mostly the middlemen and exporters.

Cultivation of crops, mainly paddy, is mostly for self consumption. This applies even for vegetables. The remoteness of

island blocks and absence of any urban market within a viable distance explains this feature.

Though barter exchange is not very predominant in the village, the majority of intra-village transactions are carried out by informal credit system. Discussion with local traders suggests that the island-villages are net importers of agricultural commodities while the major means of net cash inflow are fishing, prawn-fry collection and remittances from outside.

It is recognized that nature-based tourism in Sundarban has a great potential to generate local earning opportunities. However that potential is yet to be realized to any significant extent. This is mostly because of the lack of infrastructure such as proper transport facilities and electricity. Tourist arrival in Sundarban is presently concentrated almost entirely during three winter months. Moreover, lack of information dissemination and shortage of good accommodation facilities force most of the visitors to avail some 'package tours' which are mostly operated by outside agencies. The residents of the island

villages have little opportunity to take part in such tourism-related business. It should be noted in this connection that big corporate investment has been proposed to develop tourism in Sundarban, but this is aimed at catering to the wealthy visitors with all modern hospitality provisions. Apart from its questionable impact on the fragile mangrove ecosystem, such initiatives will not have the support from the local villagers in these islands as they could see little scope to become stakeholders in such big corporate initiatives. What is required is a comprehensive plan for a spatially dispersed eco-tourism development which necessarily integrates the island villagers as stakeholders.

Empirical analysis of available secondary data (Census 2001; Rural Household Survey 2005, Office of the District Magistrate of South 24 Parganas) underscores the point that the people living in the island blocks have significantly lesser livelihood options compared to the rest of Sundarban blocks. Some interesting findings are as follows

Table 9.2: Intra-region Disparity in Landholding

Landholding pattern	Island-blocks around forest boundary	Other Sundarban Blocks
% of households which are landless	35	56
% of households having Irrigated land less than one acre or non-irrigated land less than two acres	51	35

Source: Rural Household Survey 2005, Office of the District Magistrate, South 24 Parganas



This reversal of distribution of households across the two types of blocks for the two lowest-ranking rural asset holding class is not paradoxical and indeed tells something about the local livelihood opportunities in the two sub-regions within Sundarban. The islands came up with settlers practising agriculture which was practically the only livelihood in the initial phase. Later on, fishing and more lately shrimp-farming and prawn-fry collection emerged as significant alternative livelihood options. However, lack of transport and electricity resulted in very little scope for development of commerce or rural informal manufacturing sector. Whatever little scope of non-farm livelihood exists in these islands cannot sustain a large landless population. On the other hand, Sundarban blocks which are connected to the mainland with improved infrastructure could accommodate a larger share of landless population through many more

non-farm livelihood options. It is perceivable that most of the landless refugees who took shelter in Sundarban blocks in later days, located themselves in the connected blocks rather than in the isolated remote islands.

Also, in the absence of alternative livelihood options, agricultural land is held by rural households as valuable assets – even if its size became economically non-viable. With subdivision of landholdings through generations, all of the agricultural households in the region must have experienced dwindling size of average landholding. However, in a mostly rain-fed agricultural region producing a single crop, irrigated land of less than one acre or non-irrigated land of less than two acres can hardly sustain a household. With alternative earning opportunities, such non-viable landholdings are expected to be sold off and the household is expected to shift to other non-farm activities. But in the island-

Table 9.3: Occupational Distributions in two regions of Sundarban

Main Occupation (as % of total workers)	Island-blocks around forest boundary	Other Sundarban Blocks
Cultivators (own + leased land)	34	20
Agricultural and other daily physical labour	48	55
Self-employed rural artisans / hawkers (those who do not employ others)	5	8
Labour oriented regular job in rural unorganized sector	5	7
Other occupations	8	10
Total	100	100

Source: Rural Household Survey 2005, Office of the District Magistrate, South 24 Parganas.

blocks of Sundarban, very limited alternative earning opportunities must have prompted a large percentage of households to retain their non-viable marginal land. Clearly, these households sustain themselves by supplementing their earning from other locally available part-time occupations – which often involves prawn-fry collection and fishing. These are in turn gradually reducing the sustainability of this

delicate mangrove ecosystem.

The conjecture can be substantiated by empirical observation if we look at the occupational pattern of households across the two categories of blocks in Sundaban. Looking at Table 9.3, it is evident that in blocks which are connected to the mainland, larger percentage of the total local workforce is sustained by all types of non-farm livelihood options.

9.10 HDI in Sundarban

Earlier chapters in this report had dealt with the components of Human Development Index (Standard of living, Health and Education) in details at block level and the Sundarban blocks were together considered as Region III in that analysis. It was already noted that Sundarban, as a region in that three-region segmentation of the district, is the most backward in terms of most of the components and the overall HDI. It will

be redundant to repeat the component-wise analysis of HDI for all the Sundarban blocks again. Instead, a brief introspection into the pattern of intra-regional disparity within Sundarban would be meaningful, based on the block-wise indicators already reported in earlier chapters. It would drive home the relative deprivation of island blocks, a point that has also been underscored in the previous sections of this chapter. However, it is interesting to note that the five island

Table 9.4: Inter-regional Disparity in Provisions regarding Primary Education Infrastructure

Provisions for primary education	Island-blocks around forest boundary	Other Sundarban Blocks
Average population served per primary school	1688	1878
Average distance covered by students to reach the school (km)	3	2
% of schools not having drinking water facility	22	24
% of schools not having sanitation facility	33	34

Source: Office of the District Project Officer, Sarva Siksha Abhijan

Table 9.5: Inter-regional Disparity in Provisions of primary health care

Provisions for primary health care (Rural Hospitals + Block Primary Health Centres + Primary Health Centres)	Island-blocks around forest boundary	Other Sundarban Blocks
Number of beds per thousand population	0.232	0.299
Number of Medical Officers per thousand population	0.030	0.052
Number of Health Assistants (male + female) per thousand population	0.227	0.285

Source: Office of CMOH; Health on the March, 2006

blocks in Sundarban compare favourably with the rest of the region in terms of some basic provisions for primary education. This is evident in Table 9.4

At least part of this favourable score of the island blocks in terms of educational achievement can be related with their history which saw Christian missionary activity in blocks like Gosaba. Also, establishing primary education centres that cater to local population in an island is a more economically feasible social investment than building road-links with

mainland or provision of electricity. Accordingly, these island blocks show little difference in terms of educational achievement indicators like enrollment and literacy, when compared to the rest of Sundarban blocks.

However, the score of the island blocks in terms of primary health provisions is not up to the mark. Table 9.5 underscores the relative deprivation of the island blocks even within the Sundarban region, on this count.

Table 9.6: Inter-regional disparity in some indicators of standard of living

Standard of living indicator	Island-blocks around forest boundary	Other Sundarban Blocks
% of localities that are fully covered by provision of safe drinking water	38.8	41.4
% of households that are homeless	5.3	3.8
% of households that live in huts with only one room	71.7	60.4
% of households having less than two garments per member	12.3	9.3
% of households having two to four garments per member, but without any winter garment	35.6	30.6

Source: Rural Household Survey 2005, Office of the District Magistrate, South 24 Parganas

Turning to some standard of living indicators, from Table 9.6, it can be readily seen that the island blocks are lagging behind compared to the rest of Sundarban blocks. The table summarizes their status across five such indicators which can be considered as basic requirements for human living.

The combined score of the island blocks, across the three components of human development as well as the aggregate Human Development Index, thus compares poorly with the rest of Sundarban, which in turn is the relatively deprived region within the district of South 24 Parganas. Table 9.7 summarizes the indices across this categorization of blocks. Each of the indices has a highest possible value of unity. Each of the 29 blocks in the district is also ranked according to each of these indices with '1' standing for the highest and '29' standing for the lowest rank. The

'average rank' is the average of such ranks for blocks combined under the three categories. This average rank will also help bringing out the relative differences across the three categories.

As was indicated in earlier analysis, it is clear that there is a great deal of heterogeneity in terms of provisions and achievements within the blocks of Sundarbans. The five island blocks are laggards in terms of indicators of human development, except primary education. The average rank of these blocks in terms of other indicators as well as overall HDI is more than 23 out of 29 blocks in the district of South 24 Parganas. This calls for a differential treatment of these island blocks in a comprehensive developmental plan for this region. A uniform distribution of plan-resources across blocks in Sundarban will fail to take care of the inter-regional disparity.

Table-9.7: HDI and its components : intra-district comparisons

Indicator		Island-blocks around forest boundary	Other Sundarban Blocks	Rest of South 24 Parganas
Education Index	Average Score	0.87	0.83	0.86
	Average rank of blocks	10.20	19.00	14.50
Health Index	Average Score	0.44	0.55	0.53
	Average rank of blocks	23.60	13.13	13.25
Standard of Living Index	Average Score	0.34	0.38	0.48
	Average rank of blocks	25.20	20.75	8.94
Human Development Index	Average Score	0.55	0.59	0.62
	Average rank of blocks	24.20	17.00	11.13

Source: Calculated on the basis of data obtained from different sources identified previously

9.11 Threats to Sustainability

9.11.1 Climate Change Impacts

It is scientifically established by this time that the greatest threat to the future of Sundarbans is posed by the continued

Tale of a Sinking Island

Ghodamara, a tiny island within the river Hooghly falls on the western boundary of Sundarban delta. Ghodamara has been steadily sinking for the past 25 years. Fifteen to 20 years ago, the island had a population of about 20,000. According to the 2001 Census, it now holds only 5,236 people. Experts say that Ghodamara was reduced to 59 per cent of what its size was in 1969 and it will go under in another 14 years. The prediction is that the rising sea level will sink a dozen more islands in 15 years, half of which are presently inhabited.

Global Warming and the resulting sea level rise. Past century saw an increase in average global temperature by 1°C. At the present rate the temperature is slated to increase by another 3.5°C in next fifty years. The melting of polar ice cap is a direct and certain fallout and much of the coastal low lying areas in the world is threatened by possible submersion. Along the Indian coastline, the sea level is estimated to be rising at the rate of 2.5 mm per year. Research from Jadavpur University's Centre for Oceanographic Studies has estimated that along the eastern coast of India, this rise is even faster at a rate of 3.14 mm per year. It is estimated that by 2020, around 15% of Sundarban area will be

submerged and an estimated 70,000 people will be 'environmental refugees'. The threat is evident from the latest Geographic Information Systems (GIS) report which showed that in the past 70 years, 220 sq km of forest land had been submerged.

Apart from sea level rise, more immediate threat to human lives and livelihood can come from an increased frequency of cyclones and even super-cyclones. The area is cyclone-prone and historically these natural calamities came with devastating consequences for the islanders. With global warming and climate change, the frequency of such calamities is estimated to increase.

9.11.2 Anthropogenic Stress on Environment: Biodiversity Loss

Since the human settlements began in Sundarban under the British rule, a considerable loss in faunal diversity of the region has already taken place. Following a 1878 account, "Tigers, Leopards, Rhinoceros, Wild Buffaloes, Wild Hogs, Wild Cats, Barasinga, Spotted Deer, Hog Deer, Barking Deer, and Monkeys are the principal varieties of wild animals found in Sundarbans". However, due to habitat degradation and ecological changes, some of these animals in Sundarbans became extinct during the last hundred years.

Another problem threatening the

Tourism a Viable Option for Livelihood and Conservation?**– Research from an independent agency**

Due to its importance as a biodiversity hotspot and World Heritage Site, there has been a substantial increase in research interest on various aspects of Sundarbans from various agencies and individuals. Some of the research findings are publicly available and can be used as a baseline for a comprehensive developmental plan for Sundarbans. One such recent study has been carried out by South Asian Network for Development and Environmental Economics (SANDEE, www.sandeeonline.org). The study primarily examines the contribution of tourism towards improving the livelihoods of the local people in a remote island village of the Indian Sundarbans (Working Paper No. 26-07).

The study found that with the arrival of visitors in an island village bordering mangrove delta forest, the local people spontaneously availed the opportunity to enter into various tourism-related service provisions. Majority of them belong to landless and marginal cultivator households, a profile similar to those who mostly depend on direct forest exploitation. The study found 78% of the local service providers/traders operate with either very small or no capital investment. Village households that could avail tourism-related earning opportunities are found to spend 19% more on food and 38% more on non-food items per capita compared to other similar village households. However, the study found that presently no village household subsists entirely on tourism-based income since tourism is extremely seasonal.

The conservation effect of tourism is perceptible as the proportion of forest-dependent households is found to be significantly lower among the participants. This is indicative of a substitution of forest-based earnings by tourism-related earnings. However, the study found little evidence of the percolation of tourism-related income to non-participating households through intra-village transactions. While the villagers' overall perception of tourism is found to be positive, a significant section of villagers take cognizance of the growing income-inequalities resulting from tourism-based income. The study proposes a carefully crafted policy for promoting nature-based tourism with more room for local participation.

Sunderbans' mangrove ecology is the collection of tiger prawn seeds. Burdened by poverty, over two lakh people have turned to collecting tiger prawn seeds, using nylon nets, which are dragged along the river banks. In the process, apart from destroying mangrove seedlings and eliminating the possibility of a regeneration of mangroves along the river banks, at least 74 species of fish are also destroyed. Estimates by the Marine Biological Research Institute, 24 Parganas (South), revealed that in the process of collecting 519 prawn seeds, on an average 5,103.25 gm of other seed varieties that sustain different categories of fish are destroyed. Gradually, the food chain of this ecosystem is breaking down. The effect is

already evident by a dwindling fish yield in the delta region. It has already threatened one of the principal livelihood options in the region.

Also, the ecological significance of the Sunderban mangroves is immense. Apart from serving as a shield against natural calamities, it checks atmospheric pollution. It has a seemingly unlimited capacity to absorb pollutants from both air and water. But a 2007 report by UNESCO has stated that a 45-cm rise in sea level (likely by the end of the twenty-first century, according to the Intergovernmental Panel on Climate Change), combined with other forms of anthropogenic stress on the Sundarbans, could lead to the destruction of 75% of the Sundarbans mangroves.

9.11.3 Threat from Embankment Erosion

The Sundarban islands are in their formation stage and were still young when they were forced to support human habitation and agriculture, before attaining the necessary height through the natural process of siltation. Without human interference, only a small part of these islands' upper surface can keep above the surrounding saline water level at high tide. The salinity allows nothing but mangroves to grow on the soil. There is no possibility of growing food crops on such land unless it is kept out of reach of the river water for a considerable time and successive rainy seasons dilute the land salinity. This is why the settlements could take place only after surrounding each island with a sufficiently high earthen embankment that could withstand the daily onslaught of tidal waves. More than a century later, these embankments still stand as the chief defence and lifeline for the property and village economy in Sundarban.

Yet, these fragile acts of mankind are at the mercy of mother nature. Continuous erosion of these embankments are as real as their existence. The physical development processes along the riverbanks and coast are influenced by a multitude of factors, comprising wave motions, micro and macro-tidal cycles and long shore currents. The currents vary greatly along with the monsoon. These are also affected by cyclonic action. Erosion and accretion through these forces maintain varying levels of physiographic change whilst the mangrove vegetation itself provides a remarkable stability to the entire system. The practice of prawn-seed collection all along these embankments have largely wiped out the natural mangrove growth, exposing their base to the constant flow of water. The community cooperation among the islanders in jointly upkeeping this lifeline has weakened through ages and new institutional developments. As a result, each year, several of these islands routinely experience the loss of crop due to the breaching of embankments.

A Fact-Sheet on Embankments

The total length of 3,500 km of earthen river embankments and coastal dykes, along with 862 drainage sluices, are maintained by the I&W Department in the Sundarbans. Out of this:

Length of River Embankment on Major Estuaries:	700 km
Length of River Embankment on Medium Estuaries:	2,750 km
Length of Sea Dyke on the sea coast :	50 km
Presently more than 2,000 km of this embankment network are without the necessary mangrove cover.	

9.12 Saving Sundarban: Whose Responsibility?

This chapter has taken a closer look at the socio-economic fact-sheet within the Sundarban region. Empirical evidence overwhelmingly establishes the relative deprivation of the population on the islands, mostly in close proximity to the reserve forest. Priority must be given to such blocks to improve some of the basic infrastructural provisions like electricity and communication. Resources at disposal to the local authority are often limited and they usually flow to the area where maximum number of people can be served by a given amount of social investment. In remote islands, improvement in these provisions require a substantially larger cost relative to the number of beneficiaries. Seen from this local perspective, the backwardness of the island blocks of Sundarban can be logically explained.

Yet, neglecting these people may have global implications. It is fairly established by empirical research from different parts of the world that “poverty is the greatest polluter”. Poverty and underdevelopment of a region pushes the local poor to

overexploit the surrounding natural resources. In Sundarban’s island blocks surrounding the forest, crippled infrastructure leaves the local poor with few alternative livelihood options, but to depend on the forest and the rivers. The World Heritage Site and a delicate ecosystem’s future sustainability is at stake. This fragile ecosystem renders valuable ecological services to a vast region in South Asia – replenishing the fish stock in the Bay of Bengal and maintaining the region’s biological balance. It is also home to many endangered species, the most famous being the Royal Bengal Tiger. All these ‘user-values’ and ‘non-user-values’ of Sundarban are not exclusive to the local population. So, national and global responsibility is also called for. Financial assistance to the local authority should logically flow from both national and international stakeholders, and should be directed to the priority locations within Sundarban, as is indicated by the discussions in this chapter.