TOWARDS A CONCLUSION

The world renowned tidal mangrove forests of Sundarbans where the biotic and abiotic factors are enormous, truly represents a dynamic eco-system. It is the largest mangrove forest in the world intersected by a complex network of tidal waterways, mudflats and small islands of salt tolerant mangrove forests and represents a remarkable example of ongoing ecological processes.¹ The Sundarbans is in fact a region of global significance because of its unique coastal zone ecology. Her outward appearance of divine calmness and solitude is an ideal example of human emulation. But nature has its own tale to tell. Sundarbans is a region of uncertainty where ecological changes are subtle enough to impact human lives there. Death, destruction, regeneration and construction are going on unceasingly as witnessed in every pool, creek, forest and everywhere. Where there is a dancing river today there may be a fierce subsidence next day. Thus beautiful forest of the past becomes barren or lost under the sea for ever. Capitals, busy ports and market centers of the by-gone days have gone into oblivion by nature’s playful trick.² As one writer so very correctly pointed out that in the Sundarbans events were dominated by the actual situation of the wilderness and the fluid
riverine atmosphere of the wetland.³

If one studies the settlement history of Sundarbans, one clearly notices that the region had been inhabited quite early in the pre-historic times (Holocene period) and we also have references to this region in the Mahabharata and literary sources of ancient India. The archaeological evidences prove the presence of ancient settlements in the Sundarbans but what is also a reality about Sundarban’s settlement history is its “impermanence” and here the role of ecology is becoming relevant with history. Indeed one can never completely understand its settlement history without taking note of the ecological events of Sundarbans which shaped and conditioned it. Besides, one cannot overlook the genuine attempts made by British colonial administrators like Hamilton in establishing colonies of settlers under unfavorable conditions. (In 1903, Sir Daniel Makinan Hamilton came to the Sundarbans and established his zamindari with the purchase of 9000 acres of land in Gosaba island, comprising the villages Gosaba, Arampur, Dulki, Sonargaon; and Rangbelia island consisting of the villages Rangabelia, Pakhirala, Bagbagan, and Uttardanga. The first to come
to this settlement were the Bhumij and the Munda from Chotanagpur plateau. The Bengali Mahisya population and the muslims followed them from Midnapore district. In 1920 Hamilton procured the islands of Satjelia and Lahirpur comprising 13000 acres of land. For details see ‘In the Lagoons of the Gangetic Delta’ by Gautam kumar Bera.) Here we can outline three aspects of Sundarban’s settlement history.

- Firstly, natural hazards like floods, earthquakes, cyclonic storms as well as ecological events like subsidence, frequent changes in river courses, silting up of river mouths as well as the problem of saline water – all having an impact on the settlement history of Sundarbans. While cyclones, tsunamis and floods caused widespread devastation to human settlements, subsidence and other ecological changes forced the settlers to look for new settlements.

- The second aspect deals with the reality that in order to survive in this harsh environment one has to adapt to it. Here one must understand that before the normal delta building process could proceed further, human beings started interfering with the natural environment. In this premature stage of land formation, the normal
geographic processes proved to be totally incompatible with the prospects of human settlements in Sundarbans. Hence, the incompatibility of human settlements in an active delta is a stark reality. But priority and immediacy ultimately prevailed over futuristic desires, nature thus had to be tamed and environment changed as well as ecology disrupted, to meet the requirements of this human habitation. The settlers in turn had to adapt to this environment by building embankments to keep out the saline water, and even the animals and plants adapted to this peculiar saline water terrain. Thus protection and strengthening of the earthen embankments became a prime requirement for supporting the life-system in these islands.

• The third issue brings us to the cultural practices and beliefs of the settlers which came to be greatly influenced and inspired by nature and ecology of this region. In fact the environmental limitations forced the people to adopt the local folk behaviour in order to maintain their livelihood. The Sundarban’s ecology was incorporated into the popular religion of the settlers. As one writer noted that “so vast and terrifying a region has, indeed evoked its own ideational representations” . Thus Bono-Bibi – the protector
and Dakshin Roy – the lord of the South, were both regarded as protectors of forests and flora and fauna. Gradually as settlement progressed, reclamation of jungles became an urgency during the colonial period these Godly representation became the protector of the settlers/extractors going into the forests for honey/timber collection. Besides, all these people depended entirely on the natural economy of the forest for their livelihood and they had to struggle perpetually against natural hazards. But as their weapons were often inadequate against such dangers, they came to bank mentally on divine intervention. Thus a superstitious fatalism pervaded the folk cults of Sundarbans. Therefore, the ecological realities of a region like Sundarbans (which led to a constant struggle between man and nature) always had a primary role in conditioning the settlement patterns of the region as well as the beliefs and culture of the settlers. Hence, ecological and demographic features coupled with the history of reclamation of land lay the foundation for understanding Sundarbans in terms of its spatial and cultural growth.7

Although the clearing of land for cultivation began prior to
the Turkish role, the British appear to have been responsible for much of the conversion to farmland and changing the face of the Sundarbans. The history of the land reclamation in the Sundarbans, especially during the colonial times (1770 onwards) has two very important aspects.

- Firstly, the colonial period witnessed systematic intervention by the colonial administration, when intense clearing of jungles began, which transformed the virgin land of Sundarbans into paddy fields. It is this transformation which eventually had wide ramifications for the history of Sundarbans. One must understand that while during the time of Pratapaditya (pre Portuguese and pre British) forests were cleared from land where the delta-building process had reached some order of maturity, during the British rule even the low-lying tracts were occupied and cleared and circuit embankments were constructed. This in fact is the basic difference between the intervention made during these two regimes. Besides, demand for land revenue and other forest produce, the other reason for largescale transformation was the view that “a land covered with impenetrable forest, the hideous den of all descriptions of beasts and reptiles … (can) only be improved by
deforestation. The result of this was that Sundarbans witnessed a transformation of landscape, creation of tenurial system and large-scale deforestation of the valuable floral wealth. There was also a transformation of resource access regime. During the pre-British period, as the frontier was being extended into the Sundarbans, access to resources came to be controlled but this pertained only to the cleared tracts. The forest, watercourses and sea remained as open-access common pool resources. But during the time when the East India Company was pushing for extension of settlement further into the no-man’s land of the forest by clearing it, disputes arose over ownership of lands and amount of revenue to be paid since the zamindars were clearing forest tracts in addition to what they had taken on lease. The state considered itself sole owner of the Sundarbans forests, the zamindars’ land extended only to the edge of the forest but the boundaries remained uncertain. The colonial boundaries state thus started surveys to establish the boundaries and asserted their claim to the Sundarbans by limiting the rights of private individuals from moving freely into the Sundarbans by a system of leases or grants allowing the extension of civilization by the grantees.
Reclamation of land witnessed the migration of tribals from neighbouring regions to the Sundarbans who ultimately settled permanently and adapted to the harsh environmental conditions of the region. In fact, these tribals were renowned for their skills in clearing dense forests. The Bengali zamindars had organized and financed these labourers and tenant cultivators to reclaim an estimated 790 sq km of the original Sundarbans forest in the four decades since the Permanent Settlement (1793). Between 1873 and 1904 a new spurt of clearing and settlement ensued. The officially recognized area of the Sundarbans diminished by 2,608 sq km (13.3%), from 19,510 in 1873 to 16,902 sq km in 1904. This shrinkage reflected successful conversion of wetlands to cultivation and settlement in the area declassified as “Sundarbans”. In the same year, 2401 sq km of reclaimed cultivated land area within the Sundarbans was recorded. The latter represented new lands leased, cleared and cultivated over the ensuing three decades. These figures conceal a counter-process of failure and land abandonment. Grantees beset by financial problems threw up their leases and cultivators unable to sustain their lands left in
discouragement. A reconstructed hundred-year history of land use for the three districts in which the Sundarbans occur (24 Parganas, including the city of Calcutta; and Bakarganj and Khulna in Bangladesh) reveals a massive transformation of the land. Between 1880 and 1980, cultivated land in these districts expanded by 6210 sq km or 49%. Wetlands decreased by 45% or 5765 sq km. Both trends were particularly marked in the Sundarbans portion of the districts, where rates of anthropogenic change far outstripped the process of siltation and land formation. Over the century natural processes added an estimation 185 sq km (6.3% of the total area) to the alluvial wetland formations along the water channels and at the sea face in the Bay of Bengal. During the century the human population of these districts more than quadrupled, from 5.6 million to 25 million persons. Between 1880 and 1910 arable land in these three districts expanded by 1,975 sq km. Reclamation progressed primarily at the expense of the wetlands, which shrank by 1,744 sq km during the same period. The area of land in crops dropped between 1910 and 1920 but increased by 8% from 1920 to 1940. Large scale land clearance occurred between 1940 and 1950 and cropland expanded by 23%.
Like everything else in the Sundarbans, reclamation too was greatly affected by the ecological conditions of the region. This brings us to the next aspect of the history of reclamation in colonial Sundarbans. The process of reclamation in Sundarbans entailed great hardships on the part of the settlers. Apart from natural hazards like cyclones and floods which often led to the abandonment of the cleared lands due to the collapse of embankments and invasion of saline water, one had to constantly face the fear of the tiger and other dangerous wild animals of the jungle. Besides, as Hunter pointed out to the “evil fertility of the soil” which even left uncultivated for a year would soon be covered with reeds/nal.14 Hence it posed a constant challenge to the cultivators to maintain the land cleared. Apart from these difficulties, certain changes in the natural environment such as silting up of the mouth of a river or shifts in the course of a river which often led to an insufficient fresh water inflow and hence an increase of salt water that made the land unsuitable for cultivation. Thus ecological factors and environmental conditions were crucial in the reclamation history of Sundarbans. This fact is
illustrated wonderfully by the reclamation history of Bakargang district. Here the conditions for rice cultivation were generally more favorable than either of its neighboring districts. The land here was higher & better drained. The tides were lower than those of the adjoining areas. No doubt embankments were required to prevent salt water from following into the new fields, but they need only be of modest height. Besides the waters in Bakargang streams tended to be less saline, with direct access to the larger rivers and the soil was fertile. Consequently, after 1879 settlers poured into the fertile land of Bakargang, which became the most favoured by settlers rather than 24 Parganas or Khulna district. This district was therefore over 90% occupied & reclaimed in 1904 while the majority of Khulna’s lands still lay in forest & 24 Parganas was barely 40% reclaimed in 1904. In the eastern part of the Sundarbans, clearings and cultivation extended almost to the sea face. In the turn of the century in Bakargang even the scattered “little blocks of jungle & waste lands” had begun to disappear. Hence ecology here too conditioned the reclamation pattern. We know that the cyclone of 1876 in Bakargang, which was accompanied by a huge storm wave, brought about enormous destruction & loss of life and
killed of or discouraged many peasant farmers and grant holders.

After the cyclone many lands were abandoned & soon they returned to jungle. Thus natural calamities were a constant threat to the cultivators of Sundarbans and they had to adapt to this harsh & uncertain environmental conditions. Another important ecological factor which had an impact on reclamation history was the phenomena of land formation in the delta. In 1915, J.C.Jack estimated that in Bavarian district alluvial action had increased the land area by 4 sq miles (10 sq km) per year in the half century since the 1859-65 Revenue Survey. Between 1793 & 1905 aggradations increased the land area of Bakarganj district by 18%. But in the same period, the occupied & settled area increased from 66%-93% of the district area. although the statistics are for the entire district, the implication is clear. The cultivators cultivated far more wooded land than natural processes could throw up at the river mouths. This was a reality in the history of reclamation in colonial Sundarbans.

As reclamation proceeded, there was a simultaneous need felt among the colonial administrators to carry out surveys of the
Sundarbans region. This was especially important as it demarcated the boundaries between the zamindari lands and the Sundarbans forest. Hence, it was primarily done to settle the disputes between the state and the zamindars. Two different aspects emerge out of the survey history in colonial Sundarbans.

- The first aspect of the survey history of Sundarbans highlights the ecological challenges and constraints under which the British surveyors worked. We know from the field books of the surveyors that they were constantly in fear of the tiger and crocodiles and alligators of Sundarbans, during their survey periods. Besides, many had succumbed to jungle-fever while working in the harsh conditions in the jungles of Sundarbans. As the last entry made by Hugh Morrieson in the Field books, dated 28 February 1818, follows: “I am now so ill that I can no longer carry on the survey, I have therefore got bearers to carry me by Dawk to the station of Jessore.” It is believed that he died of the deadly Jungle Fever. Besides, the marshy saline terrain with intertwining dense vegetation were constant companion of the surveyors. The surveyors thus carried on their work against all kinds of harsh conditions imaginable- savage wild beasts of
A History of the Social Ecology of Sundarbans: The Colonial Period

the field, the monsters of the deep, the malaria of the forests and a pestilential climate.

- The second aspect focuses on the positive side of colonial intervention. Indeed the colonial surveys undertaken by Rennel, Morrieson Brothers, Prinsep, Hodges and Stuart illustrated a positive form of colonial intervention in the form of mapping a vast, unknown and mysterious terrain for the first time and demarcating the boundaries between forest and cultivated lands. It is from the notes and field books maintained by the surveyors that we come to know of numerous unknown species of flora and fauna inhabiting the dense forests of Sundarbans, among which many have now become extinct. There are numerous references to the rhinoceros, alligators and deers. It is during these surveys that new river routes were discovered and many mysteries and popular myths associated with the jungles unraveled. Hence, it is important to chronologically organize and present the colonial survey history of Sundarbans, a classic example of colonial intervention in a virgin unknown land, that has remained unprecedented in Sundarbans’ history.
At the advent of the British rule in the 18th c, the Sundarbans forest were at least double their present size, while to the north were areas taken earlier from the forest and converted to rice production. It was primarily for generating revenue that the British cleared the jungles and reclaimed the lands of Sundarbans. Besides, the expanding urban population of South Bengal looked to the Sundarbans as the most accessible source for their timber and fuelwood. The most valuable timber tree in the Sundarbans was the Sundri or Heritiera fomes and was sought after by boat and carriage builders, the makers of agricultural implements and furniture. The timber was also extensively used in local construction. In the late 19th c stocks of Sundri were plentiful. Woodcutters moved ahead of the reclamation frontier, eluding as much as possible the tigers, crocodiles and other menaces of the tidal forests. Water transport reduced the cost of transporting timber and fuelwood from the delta forests to urban markets. Invariably, prices rose and cutting intensified. By the 1870s, the pattern of the wood trade had long stabilized. The history of colonial forest resource management and utilization has three very important aspects.

- The first aspect focuses on the largescale deforestation of the
Sundarbans due to the reclamation policies of the colonial government. The trend of constant assault on the forest continued well into the 19th c. In fact for three quarters of the 19th c the Sundarbans witnessed a constant assault on the eco-system. Huge areas of wetlands were lost to posterity for ever. It took sometime before the importance of the Sundarbans for purposes other than cultivations were realized. Men such as Brandis and Schlich had long emphasized the importance of scientific forestry. By scientific forestry we mean the careful management and conservation of wood resources and the importance of standing forests in watershed management. No doubt there were varying ideas of the forests’ importance and roles, but eventually it had become clear to some within the government that protecting part of the forests would be advantageous. Schlich understood the importance in the Sundarbans’ supply of timber, thatching grass and fuelwood. In places where the forest had been cleared extensively, Schlich and others were uncertain of the Sundarbans’ chances of regeneration. He in fact expressed concern that the supply had been already exhausted to a large extent and thus suggested introduction of certain restrictions and
This brings us to the second aspect of history of forest resource management in colonial Sundarbans. The conservationist ideas of Brandis, Schlich, Temple and others succeeded in bringing the Sundarbans under forest management in 1875 when 5 forest divisions were created in Bengal. The 2292 sq km of tidal forest lying within Khulna district were demarcated as the Sundarbans forest division. After an extended period of investigation and debate, Act VII of 1878 constituted ‘Reserved and ‘Protected’ forests for every province in British India. The newly forming Forest Service busied itself in surveying, mapping and bounding government forest areas throughout the subcontinent. The Sundarbans came under this new regime. To the reserves forest classification the Forest Department added the “Protected” category. These were lands that could be opened for reclamation by consent of the Forest Department. By 1890, there were 4,095 sq km of Reserved Forests in Khulna District and Protected Forests totaling 4,480 sq km in 24 Parganas. Khulna also possessed 65 km of Protected Forest. This difference in classification offered far greater protection to the eastern-most region of the Sundarbans.
(Khulna).

By designating the 24 Parganas tidal forests as ‘Protected’ rather than ‘Reserve’, the Forest Department left itself an option. It could either lease these lands for clearing & conversion to rice, or it could transfer them to timber production & management as ’Reserved’ forests. The forest department gradually transferred small areas of protected forest in Khulna district to the reserved classification. By 1904, the reserved forest area in Khulna stood at 5390 sq km (78% of the total area of 6962 sq km classed as Sundarbans in the district). By 1938 the total reserved forest area had reached 6,000 sq km. Thus in eastern Bengal the Reserved Forest tracts grew slowly but steadily in size.

But in the western Sundarbans in 24 Parganas district it was different. The area classed as protected forest stayed relatively constant from 1890 through the year 1930s at between 4400 & 4500 sq km. Thus approximately 60% of the Sundarbans area in the district was administered by the forest department. It is important to understand that the state preserved these mangrove forests primarily as a means of ensuring a continuing supply of timber & other forest products. Designation as ‘Reserved’ or ‘Protected’ forest was an intervention designed to protect the
Sundarbans forests against the forces of land market & reclamation pressure. Hence the Sundarbans forests became & remained a production unit run as a state monopoly industry in lower Bengal.

- The third aspect of forest resource management history in colonial Sundarbans stresses on the fact that although this new system of conservation helped to protect forests, those who had previously depended upon their resources were now legally restricted against the use of these resources. This created a competition over resource uses that had not previously existed. Prior to the colonial rule Sundarbans were not an open resource to unlimited exploitation by all & sundry. There were pre-existing local common property arrangements for the utilization and management of natural resources. Local communities had specific, well established rules, customs and norms regulating the use of local forests, including rigorous sanctions for those violating established practices. Traditionally, forest and its products were used as sources of food including fish, which was used along with the products of settled cultivation, medicines, fodder, wood and other products and were often revered as sacred places, protected by religious customary sanctions. Once colonial rule tried to assert
their claim to the Sundarbans and went on to demarcate the regions as a ‘Reserved’ and ‘Protected,’ it naturally limited the rights of private individuals or resource extractors from moving freely into the Sundarbans. Access to the forests in the early 19th century was most likely limited to local communities living in the immediate vicinity. Traditions developed regarding the extraction of resources, which exercised controls over individual greed. Commercial extraction of wood resources got under way with the growing demand from cities like Calcutta and Dhaka mainly from the 1830s onwards, for construction, railways, the tea industry, and paper pulp production onwards. With the growth of commercial demand and exploitation, the common property rules weakened and became irrelevant. The role of zamindars and jagirdars etc. with regard to controlling access by their peasants to the forest, changed from deciding the principles of determining access to the forest, to that of charging of various cesses from the resource extractors, who increasingly came from areas further off from the forest, with commercial interest.29

Settlers carried out fuel wood extraction in order to meet their domestic requirements. Thus, until the early 19th century, it was
limited to the local needs of communities living around the forests. The role of fuel wood extraction was important in meeting the subsistence needs of the local communities whose major livelihoods consisted of cultivation of wet rice and fishing. The emergence of fuel wood extraction as an independent occupation can be associated with the role of the bawalis / wood cutters who did not constitute a specific cast or social group but could be drawn from the land poor groups looking for opportunities for labour particularly in agricultural off season. The emergence of fuel wood extraction as an independent economic activity can be linked to the growing land hunger & increasing rent burdens on the Bengal peasantry in the mid 19th c onwards on the one hand and the growth of demand from other parts of the country. Soon the bawalis emerged as contract labour entering in to agreements with the traders & moneylenders who would finance their expeditions, to sell the produce to them at prices that were always considerably lower than market price. Along with the changing motivations of the resources extractors, whose own identity changed from being merely local peasants and fishers, to contract workers linked up come with traders and moneylenders, seeking to satisfy larger and distant markets, there was a gradual transformation of the
belief systems of the extractors. The Dakshin Rai’s role as protector of the forest subtly underwent a change to one who protects cultivators or the ones who clear the forest. This change may also denote almost a justification of changed levels of resource use and extraction than formerly would be the case. Thus the power of gods who if propitiated, may have at one time helped humans against the dangerous of the forest, now became associated with successful exploitation of the forest.  

The deterioration of the forest took place over a long period as there was very little understanding of the ramification that would later develop as a result of such an active focus upon cultivation. The thousands of square kilometers of wetland forests that had once extended up to the northern Sundarbans boundary in 1793 & vast unmanaged tidal forests soon came to be replaced by domesticated wetlands dedicated to rice production. It is indeed a reality that the density and luxuriance of the vegetation, and the diversity and abundance of animals and fish became far less than what it was two centuries ago. Within the Sundarbans the Javan Rhinoceros was last recorded in 1870 and the last wild buffalo was shot in 1890. The muntjac and fishing cat are also locally extinct. Remnants of the
threatened Bengal tiger population survive on the reserves in both nations, but some of their prey (the swamp deer, hog deer & gaur ) are gone forever.\textsuperscript{31} Within the past 300 years, the two-hundred rhinoceros, the Indian rhinoceros, the Indian cheetah, the golden eagle & the pink headed duck, wild buffalo- all species indigenous to the Sundarbans have disappeared. In 1895 Clark in his Forest Working Plan recorded 20,000 km\textsuperscript{2} of mangrove forest in Sundarbans. In 1903 Prain recorded some 175000 km\textsuperscript{2} & and in recent estimates only 8373 km\textsuperscript{2} remains. This area is distributed as 4264 km\textsuperscript{2} in India & 4109 km\textsuperscript{2} in Bangladesh.\textsuperscript{32}
Sundarbans is intersected by large rivers and estuaries running from north and south. It is also home to several species of fish and a major habitat for wild shrimp. In the chapter on the water resource management in colonial Sundarbans, two vital aspects have been highlighted.

- Firstly, ecological changes in the form of changes in river courses due to neo-tectonic disturbances and the consequent siltation & problem of salinity are important factors in Sundarbans riverine history. The 16th century event of the eastward tilting of the Ganges river basin is a wonderful example of how ecology conditioned historical
development. Due to this event fresh water stopped flowing to the western portion and salinity increased, thus rendering the region affected, stagnant. On the other hand the eastern part of the delta, that received fresh water, thrived and prospered. This had an impact on the development of new towns as well as decay of others. Indeed the problem of salinity is a very real problem of Sundarbans. We have reference to the decay of prosperous towns due to the siltation of the mouth of a river & subsequent salinity. But as in every other sphere the settlers in Sundarbans adapted to this condition by building embankments, to keep saline water out and constructing tanks & canals to preserve sweet water. O’ Malley gives the example of the village of Gobra, a village on Kobadak. It was once prosperous when that river was active and maintained its health and agriculture, and also supplied good drinking water, but was soon decaying along with the decay of the stream and was fast being deserted by the inhabitants.33 Besides, the navigable rivers and creeks are the principal means of communications in the Sundarbans, with roads hardly existing. Hence rivers are crucial in maintaining a prosperous existence in Sundarbans. Interestingly, in the course of his survey Lieutenant Morrieson found that the
north east branch of the Raimangal estuary was within a small distance of the Kalindi. He thus made a cut thus joining the two rivers. The stream of the latter soon enlarged the cut and a large quantity of its fresh water was diverted into the Raimangal. At that time cultivation extended much further south on the east bank than on the west bank of the Kalindi, but the diversion of fresh water deprived that country of its chief advantage and a considerable tract reverted into jungle. This is an instance of far reaching disastrous consequence arising out of a seemingly trifling human act. Hence one can easily understand how the problem of salinity and the want of fresh drinking water was a constant problem for the cultivators of the region.
• The second aspect brings us to the attempts made by the colonial administration of Sundarbans to control the water resources and its utilization by the people. This also includes the unsuccessful attempts to build ports like the Port Canning. The preference for cultivation over fishing existed even in pre-colonial times and this continued into the British rule of India. Infact the transformation of the forest into cultivated land also signified a shift from fishing as the main livelihood for the local communities to cultivation. Here, the siltation of fish bearing lagoons was important among other factors. In pre-colonial times fishery resources and water bodies were managed as common property through a complex tenure system enforced by the local communities themselves. But during the British period a new tenurial system was introduced giving zamindars exclusive ownership and rights of use over waterbodies within their estates. However, communities continued fishing by paying taxes in exchange for the right to fish. The system also served to regulate harvest and fish quantities. Traditional fishers were aware of the spawning seasons of different species of fish and the catching of these types of fish during such months was
prohibited. But with the growth of commercial fisheries, the entry of outsiders, non-fisher castes from further away, as well as big fishing trawlers belonging to traders and moneylenders, any kind of traditional practices with regard to fisheries were gradually abandoned. The right to fish in the watercourses of the Sundarbans, even during the colonial times, was in the realm of the common-pool, and no-revenue for it was collected on behalf of the government. Although in 1866 the government had put up to auction the rights of the fisheries in all the Sundarbans rivers for a term of five years and Port Canning purchased the fishing rights, it was abandoned by 1869, as the claims of the Company came to be disputed by the fishermen and others who had perspective rights. Finally it was decided that the Government had no right to farm out the fisheries in tidal waters to private persons. The Sundarban grantees, however framed out the fisheries within their estates.  

Thus the condition of the fishery in colonial Sundarbans has been accounted in details along with the traditional modes of fishing and the numerous varieties of fish found in Sundarbans, with an emphasis on fisheries being a common-pool resource. The necessity of building embankments in a saline terrain as the
Sundarbans has also been discussed in some details.

The occurrence of cyclones, floods, earthquakes and other forms of natural hazards, like salinity and subsidence are part and parcel of Sundarbans' environmental history. Here, two important strands have been discussed

- Firstly the occurrence of various cyclonic and other natural hazards has been outlined. The cyclones have the most diversified and dramatic impact on environment and ecology. During cyclonic storms, the water surges from the sea bringing huge amounts of saline water into the mainland. This saline water, in turn, destroys the agricultural lands, damages the fish culture and contaminates the water sources. Besides, the strong wind during cyclonic storms uproot trees. Sundarbans history is full of accounts of severe cyclonic storms which devastated huge regions killing massive number of people and destroying their properties.
- Another natural hazard which is almost a persistent problem for those living in the region is the problem of saline water which usually invades fertile agricultural lands when floods occur and embankments often collapses. Sometimes when rivers change
course or their mouths get silted up, there is a gradual stoppage of the flow of fresh water and hence salinity increases. Among other natural hazards the role of subsidence has been huge in conditioning the settlement history of Sundarbans. Official records are replete with accounts of buried remnants of Sundri branches found in areas close to Calcutta. They believe that perhaps the forest of Sundarbans once extended till the vicinity of Calcutta and due to a sudden earthquake, subsidence occurred, when chunks of the forest disappeared. Hence subsidence is another vital ecological factor in Sundarbans’ environmental history which one cannot ignore.

- The second strand discusses the ways the settlers adapted to these natural hazards. Here the role of colonial disaster management and the attitude of colonial administrators to these calamities have been examined. To protect themselves from these environmental hazards and calamities the people usually constructed embankments. Often the colonial state offered assistance but it was primarily the responsibility of the zamindars, who neglected the maintenance of these structures. These embankments were mostly not up to the mark and in many
instances did not reach the required safety level. Infact colonial administrators like Hunter in his Statistical Account displayed complacency and casual attitude towards the occurrence of natural calamities in the Sundarbans and thus did not feel the need for embankments. This is truly astonishing as one can clearly see that Sundarbans occupies a cyclonic zone in the Bay of Bengal and protection in the form of embankments are a pre-requisite. Besides, the role of the mangrove vegetation as breaking the intensity of the tidal waves has been considered. It is a debated topic requires to be studied further.
Problematics

As we come to the very end of this project certain relevants questions/problematics arises that need to be answered and their solutions outlined.

- Colonial intervention in the Sundarbans witnessed large-scale transformation in the region. But what was the exact nature of this intervention also the nature of change witnessed in Sundarbans? And whether this transformation had any impact on the fragile ecology of Sundarbans? In other words, what were the damages and what can we learn from it?

- Moreover, in this entire period of colonial intervention whether there existed a “tragedy of commons” type situation which impacted the traditional resource-extractors of Sundarbans.

- In an ecological dominant region like the Sundarbans what was the exact role of the state in planning a developmental frame-work and whether the various environmental problems of salinity, rise in sea-level and recurrence of cyclonic activities could have been more realistically addressed/managed to mitigate their impact. Here the role of disaster management needs to be urgently addressed.
In search for some answers

- As regards to the first problematic, one needs to understand that the British almost dramatically changed the face of Sundarbans. The period witnessed unprecedented and profound transformation in land cover, rise in population, largescale deforestation and extinction of large species of plants and animals. Never before had the state so aggressively asserted its claim over the resources of Sundarbans. The nature of this intervention was aggressive, organized and was led by a single motive i.e generating revenue for the state. Despite one hundred years of cropland expansion (1880-1980) the available cultivated land per capita dropped from 0.22 to 0.08 ha. Even more striking was the reduction in per capita area of all forms of natural vegetation (wetlands, forest, scrub, grassland). This declined from 0.27 ha in 1880 to 0.04 ha in 1980. Simultaneously, there was also a steady growth of population both in Sundarbans and in the metropolitan area which it served. Over the one hundred years from 1880 to 1980, a 340% of population increase in the combined districts of 24 Parganas, Bakarganj and Khulna brought their total population to 24.9 million
in 1980. Interestingly much of this increase occurred after 1930 –
after land reclamation on the frontier had largely ended. In the
period prior to 1910, during which Sundarbans forest reclamation
represented true frontier expansion, population growth was not the
most influential driving factor. Also important was an expansionist,
state policy that guaranteed security of land tenures, operating in
combination with market forces.\textsuperscript{41} Such an active focus on
reclamation eventually had wide ramifications on the ecology of
Sundarbans. Two hundred years of colonial rule seriously depleted
the forest resources, timber supplies and vegetation of Sundarbans
through over exploitation and inadequate management. Wetlands
disappeared, many plants varieties and animal species became
extinct and mangrove vegetation was greatly reduced (statistics
mentioned above).
This brings us to the impact on the control of common resources by the colonial state. When the colonial state realized the need to preserve the resources of Sundarbans forest, a conservationist phase began in Sundarbans history. But even the idea of “Reserved” and “Protected” forest benefited the State. The “tragedy of commons” has come to symbolize the problems between the survival of nature and the extractive tendencies of humans interacting with nature in order to ensure subsistence as well as profits. Once there was a breakdown of common property systems, the tragedies associated with it emerged as it limited the free movement of traditional resource extractors. Hence, as in the case of the bawalis and the mowalis, there was a subtle change in the nature and status of their

---

### Threatened and extinct reptile species in Sundarbans

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Species</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Crocodilus porosus</em></td>
<td>Crocodylidae</td>
</tr>
<tr>
<td>2.</td>
<td><em>Varanus bengalensis</em></td>
<td>Varanidae</td>
</tr>
<tr>
<td>3.</td>
<td><em>V. salvator</em></td>
<td>&quot;</td>
</tr>
<tr>
<td>4.</td>
<td><em>V. flavescens</em></td>
<td>&quot;</td>
</tr>
<tr>
<td>5.</td>
<td><em>Chelonia mydas</em></td>
<td>Chelonidae</td>
</tr>
<tr>
<td>6.</td>
<td><em>Eretmocheles imbricata</em></td>
<td>&quot;</td>
</tr>
<tr>
<td>7.</td>
<td><em>Lepidochelys olivacea</em></td>
<td>&quot;</td>
</tr>
<tr>
<td>8.</td>
<td><em>Caretta caretta</em></td>
<td>&quot;</td>
</tr>
<tr>
<td>9.</td>
<td><em>Dermochelys coriacea</em></td>
<td>&quot;</td>
</tr>
<tr>
<td>10.</td>
<td><em>Lissemys punctata</em></td>
<td>Trionychidae</td>
</tr>
<tr>
<td>11.</td>
<td><em>Trionyx gangeticus</em></td>
<td>&quot;</td>
</tr>
<tr>
<td>12.</td>
<td><em>T. hurun</em></td>
<td>&quot;</td>
</tr>
<tr>
<td>13.</td>
<td><em>Batagur baska</em></td>
<td>Emydidae</td>
</tr>
<tr>
<td>14.</td>
<td><em>Python molurus</em></td>
<td>Boidae</td>
</tr>
</tbody>
</table>

*Extinct species (Source: Chaudhuri and Choudhury, 1994).*
occupations – with the bawalis emerging as contract labourers entering into agreements with the traders and moneylenders. Simultaneously there was a gradual transformation of the belief systems as the Gods became the protectors of not the forest but those who cleared the forest. Hence the Gods became associated with successful exploitation of the forest. In other words, traditional norms that dictated the use of common resources weakened and we have now the imposition of various cesses and taxes.

- One must realize that the colonial state that imposed its control over the use of common resources, essentially suffered from lack of clarity of objectives of state policy. The state had little understanding of the ramifications of such control and aggressive reclamation of the wastelands. It is now widely believed that eco-systems are complex adaptive systems and their governance requires flexibility and a capacity to respond to environmental feedback. The colonial state lacked in this perspective and had little understanding of the value of a region like the Sundarbans with its rich fauna and flora. While the people from below were still clinging to their age-old beliefs for sustenance in an harsh ecological environ, the state-system from above planned a developmental framework that was almost delinked from the actual mindset of the people. Hence, the two world retained their different mindset and identities. The colonial state lacked in proper management skills with a focus on the future. The sole driving force behind the policies of the state was to generate more
and more revenues. No doubt some officials understood the value of Sundarbans and expressed their concern, but by that time considerable damage had already been done.
What can we do?

- One needs to continuously test, learn about and develop knowledge and understanding of an eco-system like the Sundarbans, so that it becomes easier to cope with the changes and uncertainty of a complex adaptive system. The colonial state lacked in this perspective and was solely driven by profit motive. The present modern state has to understand this aspect.

- As to the tragedies of the common resources, one must understand that this was the natural outcome of the policies of the colonial state. Proper forest management must focus on the judicious balance between the preservation of resources and the livelihoods of traditional resource extractors. As in the pre-colonial times, we have seen, how the users respected nature and at the same time extracted resources, keeping in mind certain traditional customs, norms and rules of common property resource, which was sanctioned by the society. In order to save Sundarbans we need to revive those customs which maintained a balance between the regenerative power of nature and resource extraction. Whether in the case of timber felling, fishery or honey gathering – these customs of common resources can prove extremely valuable in
protecting the Sundarbans and even to some extent mitigating the damages done so far.

- We know that the Sundarbans is a region of cyclonic storm, floods and other forms of natural hazards like subsidence, salinity as well as rise in sea-levels. The colonial period is full of descriptive accounts of these hazards. In fact salinity and want of fresh sweet drinking water is a very real problem affecting Sundarbans from time immemorial and has to be addressed seriously. Colonial attitude to these hazards were often casual, while they were a reality for the people. No doubt embankments are vital to keep out the saline water, but often their constructions had been faulty and unscientific during the colonial times. Neglect on the part of the zamindars in maintaining the embankments on a regular basis often resulted with their collapse during every flood or cyclone. This led to the destruction of crops. Hence, one has to build these embankments keeping in mind certain vital facts - the height of these structures should be more than 20 feet and they should make use of proper scientific methods and knowledge. Here the active role of the state and the participation of the
community are very important. As to the problem of supply of fresh drinking water, the role of rain water and flood water harvesting can be of immense value to a region like the Sundarbans.

- As to the protection against the cyclones one has to seriously look into the role of proper disaster management. In fact climatic events seem to be worsening in intensity, duration and frequency in recent years. Thus disaster preparedness and response becomes very important. Disaster management in all its aspects- pre-disaster, during-the-disaster and post-disaster relief, all have to be urgently organized. In a region like Sundarbans, which is a flood and cyclonic prone area, flood management mechanism, institutions and strategies must be urgently developed, based on participatory process. The colonial state had little mechanism to provide protection from the severe cyclones. They also lacked in the genuineness of their attempts to provide relief and protection to the affected people. But in this present scenario, when severe cyclonic storms like the ‘Aila’ caused such massive destruction, there is an urgent need to upgrade existing satellite image receiving and analyzing techniques;
establish radio-networks, identify and establish user friendly warning systems. Thus pre-disaster planning must be urgently highlighted. As to during– the-disaster management more shelters and embankments have to be constructed on higher grounds in the more sensitive regions, so that precious lives can be saved. There is also an urgent need to actively seek the reasons and remedies for these physical processes by devising reliable means of understanding of the natural hazards and their mitigation. Hence disaster analysis programs and establishment of effective system of coordination between the government and the NGO can be part of post disaster relief.

The present project has endeavoured to bridge the gap between historical knowledge concerning the social ecology of Sundarbans during the colonial era, on one hand, and the present scenario when so much is being discussed and debated regarding climate change, global warming, problems of rise in sea-level and disappearance of islands as well as the growing intensity of cyclones in this land of water and forest. Let man survive with his struggles and victories, but that survival must acknowledge the power of nature. Harmony lies in nursing reverence for a region like Sundarbans where ‘adaptability’ to ecological realities is the key to a peaceful co-existence.
References:

1. A. Danda – Surviving in the Sundarbans: Threats and Responses; Page 17


5. P. Bertocci – Notes toward an ethno Sociology of the Bangladesh Sundarbans, 1998; Pg.9.


   http://dlc.dlib.indiana.edu/documents/diro/00/00/03/08/index.html

8. Chakraborty - The Sundarban Terrain, Legends, Gods and Myths, Geographical Review of India, 67(1), 2005; pg4; Also see Danda Pg 30.


10. Ibid – Danda; Pg 30

11. Ibid – Manoshi Mitra


14. W.W. Hunter – Statistical Account of Sundarbans; 1875; Pg 52


17. Ibid – Bakarganj Settlement Report; Pg 121

18. Ibid – Manoshi Mitra

19. R.S. Pearson – Note on Sundari Timber Forest

    Bulletin. No 29; Pg 3-4
    (Calcutta: Superintendent Government Printing, 1915)

20. R.S. Troup – The Silviculture of Indian trees,

    Vol 1, (Pg 304-313) Districts 24 Parganas and Sundarbans (London, Trubner and Company 1875)
22. Ibid – Danda 31, 32


24. Tikader – Threatened animals of India 1983; Zoological Survey of India; Pg 43.

25. P. Stebbing – The Forests of India, 3 volumes
   (London: bodley Head, 1922-26), Vol II 1923, pg 470-481; Ibid - Richards and Flint

26. The 1904 figure is cited in the Imperial Gazetteer
   23; Pg 143. The 1920 figure from Government of India, Bengal Presidency, Forest Department; Reproduced in Richard & Flint.

27. Ibid – Richards & Flint.


29. Ibid – Manoshi Mitra.

30. Ibid – Manoshi Mitra.

32. K. Nakar, D.N.Guha Bakshi, P.Sanyal(ed)-Sundarban Mangals, Calcutta; Pg 62
33. L.S.S. O’ Malley – Bengal District Gazeteer – Khulna, 1908; Pg 6

34. Rathindranath De – The Sundarbans (Oxford); Pg 15

35. Dilys Roe – Evaluating Eden Series, International Institute for Environment and Development; Pg 20

36. Ibid – Hunter; Pg 19

37. H.N. Srivastava and G.D. Gupta – Management of natural disasters in developing countries; Pg 14-15


39. Ibid – Hunter - Pg 7
http://www.bioone.org/doi/10.1505/ifor12338390

41. Ibid – Richards & Flint.