

Conflict and Vulnerability at Man-Nature Interface – A Case Study from Selective Villages of Gosaba Blocks Under Indian Sundarban

Nairita Sengupta[#]

[#]Research Scholar, Department of Geography, Diamond Harbour Women's University

Abstract – Sundarban, a reservoir of magnificent biotic diversity, is a perfect habitat for mangroves and Royal Bengal Tiger. But due to extreme poverty and deficiency of economic sources, conflict at man-nature interface becomes an inevitable phenomena in Indian Sundarban. This paper attempts to find out the major causes, consequences, vulnerable zones and magnitude of vulnerability at man-nature interface in ten selected villages of Gosaba block during 2007-2017. 300 households have been surveyed for the completion of the study. To fulfill the main objectives various sampling techniques, in-depth interview, focused group discussion, psychological assessment, target group analysis have been done. The result shows that Luxbagan, Dayapur, Sudhanshupur and Satjalia were most vulnerable pockets of the study area. The study reveals the truth that due to lack of alternative occupations, villagers were bound to encroach in the inaccessible zones of forest area and illegal trafficking, hunting, poaching are increasing day by day.

Keywords – Indian Sundarban, Conflict, Man-Nature Interface, Vulnerability, Illegal Trafficking

I. INTRODUCTION

Conflict at man-nature interface is a most vulnerable situation in the modern world. This type of conflict has dual impact on environment – human beings become vulnerable due to animal attack and existence of animals is threatened because of human activities [1]. From ancient period, existence of man-nature conflict was found in different parts of the world when primitive men killed animal mainly for self-defence and food-gathering [2,3]. Now a day, man-nature conflicts are happened in different sites with various species [4,5,6,7,8]. With the progression of time, magnitude of this conflict is increasing due to population explosion, human encroachment in the restricted parts of forest area, massive environmental changes, increasing of some wild animal population as an impact of conservational strategies, landuse/landcover change, habitat destruction and expansion of ecotourism [9,10]. Conflict at man-nature interface is a very common phenomenon in the adjoining regions of different forest areas of India. More than three million people who are residing in the vicinity of reserve forest and the main occupations are cultivation, wood and other forest resources gathering, livestock farming etc [11]. These people are highly vulnerable because they come into direct contact with nature and man-nature conflict becomes inevitable in this context.

Human-wildlife conflict is a predominant feature of Indian Sundarban. Sundarban, a reservoir of magnificent biotic diversity, is a perfect habitat for mangroves and Royal Bengal Tiger. The total area of Sundarban is 25500 sq. km. out of which 9630 sq. km. area is under Indian Sundarban and the rest of the part (15870 sq. km.) is covered by Bangladesh Sundarban. It is assumed that this mangrove forest is called Sundarban because of the existence of Sundari (*Heritiera fomes*) tree. The latitudinal and longitudinal extension of Indian Sundarban are 21° 31' N - 22° 53' N and 88° 37' E – 89° 09' E respectively. The total numbers of islands in Indian Sundarban are 102, out of which 54 islands are inhabited and 6740 sq. km. area of this deltaic region is covered by mangrove forest.

Indian Sundarban is surrounded by Ichhamati-Raimangal River in the east, River Hugli in the west, Dampier-Hodges line in the north and Bay of Bengal in the south. From mean sea level, average altitude of Sundarban is 5-8 meters [12]. Indian Sundarban comprises six blocks of North 24 Parganas namely, Hasnabad, Hingalganj, Sandeshkhali- I, Sandeshkhali-II, Minakha, Haroa and thirteen blocks of South 24 Parganas namely, Canning I, Canning II, Basanti, Gosaba, Kultali, Jaynagar I, Jaynagar II, Mathurapur I, Mathurapur II, Patharpratima, Kakdwip, Sagar, Namkhana. According to 2011 census, the total population of Sundarban is 4.1 million whereas in 2001, this area was the home of 3.76 million people. The predominant religion of this area is Hindu but few Muslims also reside here. In this diversified eco-region, 63.5% people belong to general category and remaining 36.5% people belong to scheduled caste and scheduled tribe. Here, 44% people sustain their life below the poverty line (BPL) which reflects distressed condition of the local villagers [13]. To conserve floral and faunal resources, 2585 sq. km. area of Indian Sundarban was declared as Tiger Project Area in 1973. In 1984, Sundarban was announced as National Park and in the year 1989, this area is also declared as World Heritage Site and Sundarban Biosphere Reserve respectively. Poor villagers of different blocks of Indian Sundarban become vulnerable because of human-wildlife conflict. Due to extreme poverty and lack of alternative job opportunity, local residents are bound to depend on forest resources for their livelihood [13]. Lots of people are daily attacked by tiger, crocodile, shark and snake during wood and honey collection, fishing, crab/TPS collection at forest, riverbank, creek in Sundarban region. Regular interaction between man and nature increases the possibilities of conflict in this mangrove ecosystem [14]. In Sundarban region, human and tiger habitat are overlapped and this reason acts as a major triggering force behind this conflict [9]. The research work has some specific objectives which are as follows – **(i)** to highlight the magnitude of vulnerability at man-nature interface in the study area, **(ii)** to find out the major causes of man-animal conflict, **(iii)** to highlight the consequences of vulnerability in the selected villages, **(iv)** to assess and typify the zones of vulnerability and **(v)** to find out the trend related with transformation of occupation of local villagers.

II. ENCROACHMENT HISTORY

Human encroachment in Sundarban region is started from 1757 during British period. But that time the rate of encroachment was very slow because of unfavourable physical condition. The rate was increased from the last phase of the 19th century. To reclaim the land of Sundarban, earthen embankment was constructed along the low-lying forest to control tidal inundation. Not only that, deforestation, construction of hut, small dams, tanks etc. energized the process of reclamation. The different phases of reclamation are discussed below:-

(i) During 1770-1780, the virgin lands of Sundarban was started to reclaim for collecting various forest resources, producing crops and developing settlements. But various boundary related complications were emerged due to land lease system. The then Governor General of Bengal Warren Hastings firstly took the initiative to demarcate the boundary of Sundarban in 1784.

(ii) During 1811-1814, Lieutenant W.E. Morrison systematically surveyed Sundarban at first. After that Mr. Princep surveyed the area of Sundarban between Hugli and Jamuna river in 1822-23 and separated the land into different 'Lots' (blocks). Mr. Dampier and Lieutenant Hodges demarcated the northern and western boundary of Sundarban in 1829-30. During this time, the governmental authority was established upon the land of Sundarban and the lower part of Dampier and Hodges line was reclaimed for agriculture and development of settlement.

(iii) The reclamation process was enormously extended in the north and southwest portion of Sundarban during 1873-1939.

III. STUDY AREA

Gosaba block is located in the eastern part of Indian Sundarban. The block is situated at 22° 16' N 88° 80' E. The total area of Gosaba block is about 29,672.57 hectares. It is surrounded by Melmel, Sajina, Gomar in the north, south and east sides respectively. According to Census of 2011, the total population of Gosaba block was 2,46,598 whereas in 2001 the total population was 2,22,764. This block comprises 51 villages. Few villages namely Satjalia, Sudhansupur, Luxbagan, Lahiripur, Dayapur, Sadhupur, Hamilton Abad, Pakhiralay, Rangabelia, Dulki under Gosaba block of Indian Sundarban (opposite of Sundarban Tiger Reserve) have been selected for detailed study. Sharp conflicts and vulnerability at man-nature interface are predominant in these selected villages of Gosaba block.

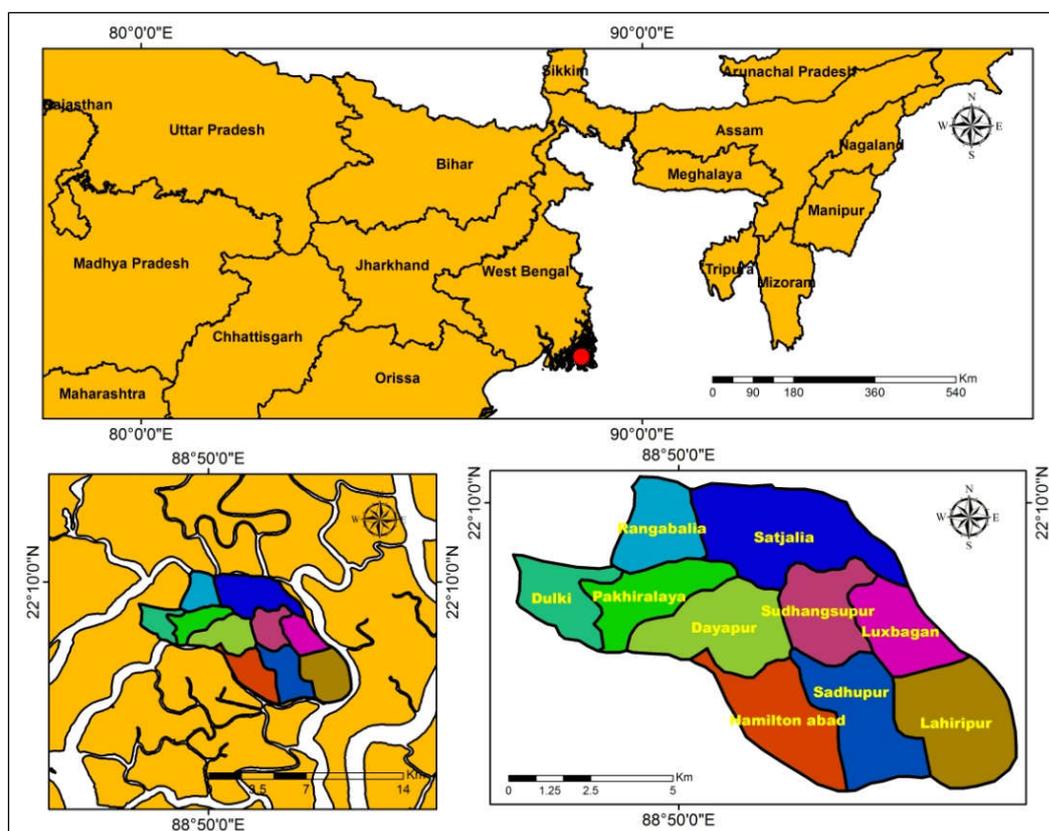


Fig. 1 Study Area

IV. METHODS AND MATERIALS

Various Books and Articles have been studied to conduct the research work properly. Various primary and secondary data have been collected through intensive field survey from the selected villages to find out the causes and consequences of vulnerability and conflict at man-nature interface (2007-2017). Focus Group Discussion, Target Group Analysis and Psychological Assessment were done to obtain the ground level truth. Local teachers, quack doctors, wood collectors, honey collectors, fishermen are personally interviewed to know about the real scenario.

Several sampling techniques namely Random sampling, purposive sampling, stratified sampling have been applied to conduct the study. Almost 300 households have been surveyed with the help of prepared questionnaire schedule in the selected villages. Quota sampling technique was also applied along the households on riverbank to find out the socio-economic condition of the distressed villagers.

The computation of both Primary and Secondary data, the cartographic representation and thematic maps are to be carried out with the help of Microsoft excel and ArcGIS 10.3 software.

V. RESULTS AND DISCUSSIONS

The result of this study clearly indicates the trend, causes and consequences of conflict at man-nature interface. From 10 selected villages of Gosaba block, 7951 people are surveyed to highlight on their occupational structure and vulnerability due to the conflict. Among the surveyed population, only 27% male and 7% female are engaged in different agricultural and non-agricultural activities. In the surveyed villages, 38.19% people are engaged in agriculture, out of which 24.79% are agricultural labour. The scope of employment in agricultural sector is decreasing because of the high intensity of saline water intrusion and conversion of double-cropped field into ingle-cropped field. Beside this, 61.79% people are dependent on non-agricultural sources for their livelihood.

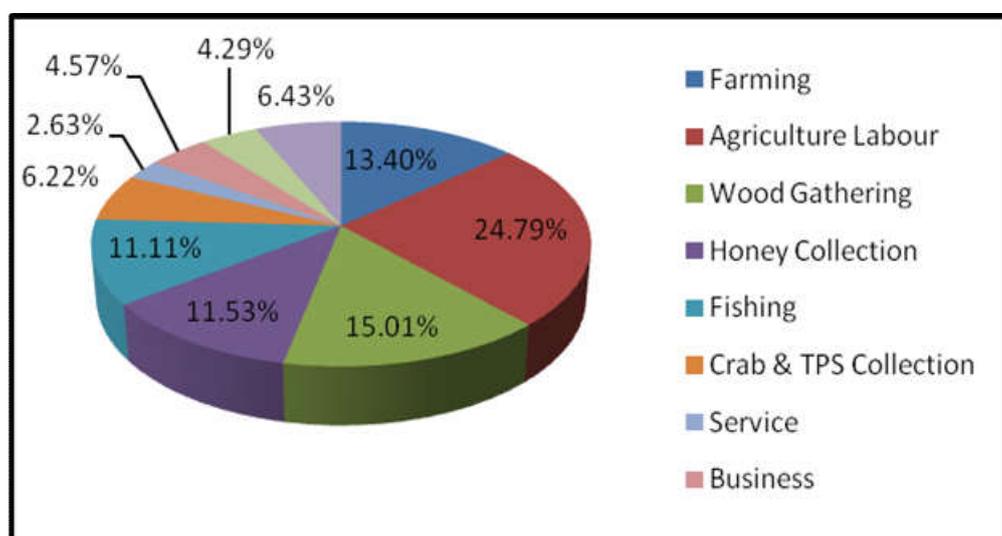


Fig. 2 Occupational Status

The local people are bound to depend on forest resources for their livelihood. In previous days, the local villagers are free to enter in the core of the forest and collect wood, honey and other forest resources. But during 4th five year plan (1969-1974), the scenario has been changed. After Stockholm Conference in 1985, the ministry of forest and environment of India was setup and several attempts were taken to conserve Sundarban. Beside this, IUCN declared Sundarban as World Heritage Site in 1989. The conservational attitude of authority has restricted for the free movement of local villagers into the forest area and some portions of forest become inaccessible to them. But due to sustain life, the poor residents try to enter inside the forest and collect forest resources illegally. The incidents of losing lives of socio-economically vulnerable people are due to tiger, crocodile, snake or shark attack. Due to the excessive depletion of forest, the tigers are strayed towards different villages and killed lots of people and cattle. On the other side, the rate of illegal hunting, poaching, wildlife trafficking and trading are increased indiscriminately day by day.

Overview of animals attack scenario

Based on collected data, it is clearly stated that tiger attack is very frequent in day than night. The result shows that 52.10% tiger attack had been occurred during noon because local villagers are mainly encroached in the forest area during this time for different activities. Highest rate of tiger attack was found in Satjalia because of its proximity of Sundarban Tiger Reserve and over-dependency of the local people on forest resources.

The predominance of tiger-attack was generally found during pre-monsoon. In post-monsoon season, the incidents of tiger attack were not so remarkable. As pre-monsoon is the peak season for wood and honey collection, the human-tiger conflict is the inevitable feature during this time. In this context, the main victims are wood collectors, honey collectors and fishermen because they are encroached into the protected pockets of the forest area due to the shortage of alternative occupations. The result indicates that the intensity of crocodile/shark attack was maximum in Dulki village. Mainly fishermen and crab and TPS collectors were most vulnerable because they intrude into habitat of crocodiles and sharks while doing their job. Crocodile and shark attack is very common along the river bank and creek. The rate of crocodiles/shark attack was maximum (61.30%) in evening because crocodiles and sharks take rest along the river bank in evening when the fishermen, crab collectors and TPS collectors come back to home. It is evident from the survey that during monsoon the majority of people were engaged in fishing related activities and that's why the magnitude of crocodile and shark attack as very high at that time. In the surveyed village, snake attack was very common in monsoon season because snakes frequently move from one place to another. In these study area, 31.64% people were attacked by snakes. The magnitude of snake attack is highest in Luxbagan village. The study clearly indicates that the rate of snake attack was highest (5.21%) in night. The maximum incidents of snake-bites have been found to occur during sleeping at home.

Table 1 Animal attack scenario (2007 – 2017)

Name of Villages	No. of Offending Animals		
	By Tiger	By Crocodile/ Shark	By Snake
Satjalia	49	48	32
Sudhanshupur	46	46	37
Luxbagan	34	41	48
Lahiripur	28	51	32
Dayapur	47	38	38
Sadhupur	27	35	42
Hamilton Abad	25	21	32
Pakhiralay	15	53	35
Rangabelia	30	62	15
Dulki	8	65	45
Total	309	460	356
In %	27.47	40.89	31.64

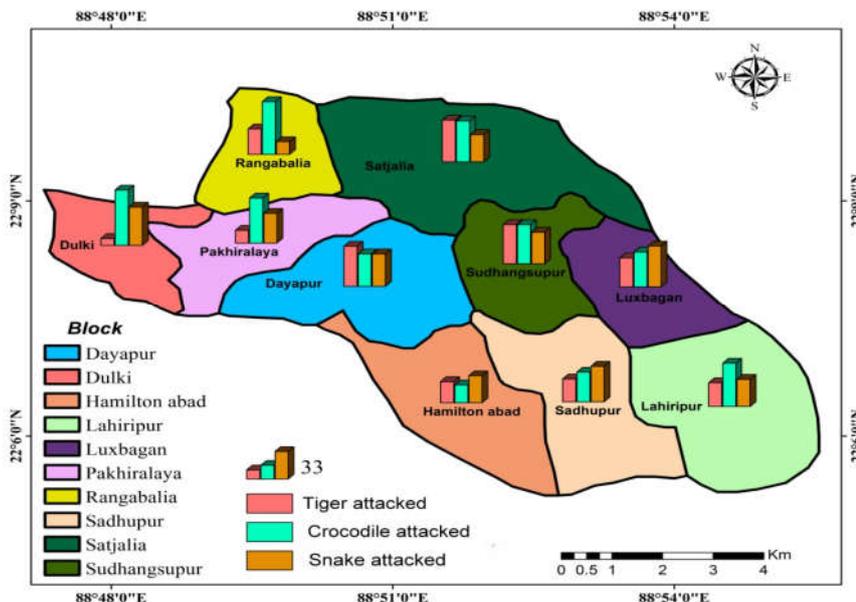


Fig. 3 Animals attack status

Consequences of Man – Animal Conflict

In the surveyed villages, 17.45% people have lost their live due to tiger, crocodile/shark and snake attack. In this context, the most vulnerable village was Luxbagan followed by Dayapur, Sudhanshupur, Satjalia, Lahiripur, and Hamilton Abad. The local people of these villages were highly vulnerable because they were bound to depend on forest resources for their livelihood. On the other hand, Dulki, Rangabelia, Pakhiralay villages were least vulnerable due to the lower rate of engagement of local villagers in forest-based activities. Although 48.44% people have survived, but many of them have been suffered from post attacking trauma. In the study area, 77.22% people were victim of physical and mental disability and 22.78% people have attempted suicide due to social an economic deprivation. Among the injured an survived people, 86.9% people have committed suicide. Not only that, during post-attack phase many people specially the widows were victimized due to social isolation and they were bound to choose the profession of daily labour or maid servant as their livelihood.

Table 2 Consequences of Man – Animal conflict (2007 – 2017)

Name of Villages	Fate of Attack		
	Death	Injured	Survived
Satjalia	25	41	63
Sudhanshupur	27	43	59
Luxbagan	31	33	59
Lahiripur	22	37	52
Dayapur	29	35	59
Sadhupur	17	37	50
Hamilton Abad	21	26	31
Pakhiralay	10	36	57
Rangabalia	8	46	53
Dulki	6	49	61
Total	196	383	544
In %	17.45	34.11	48.44

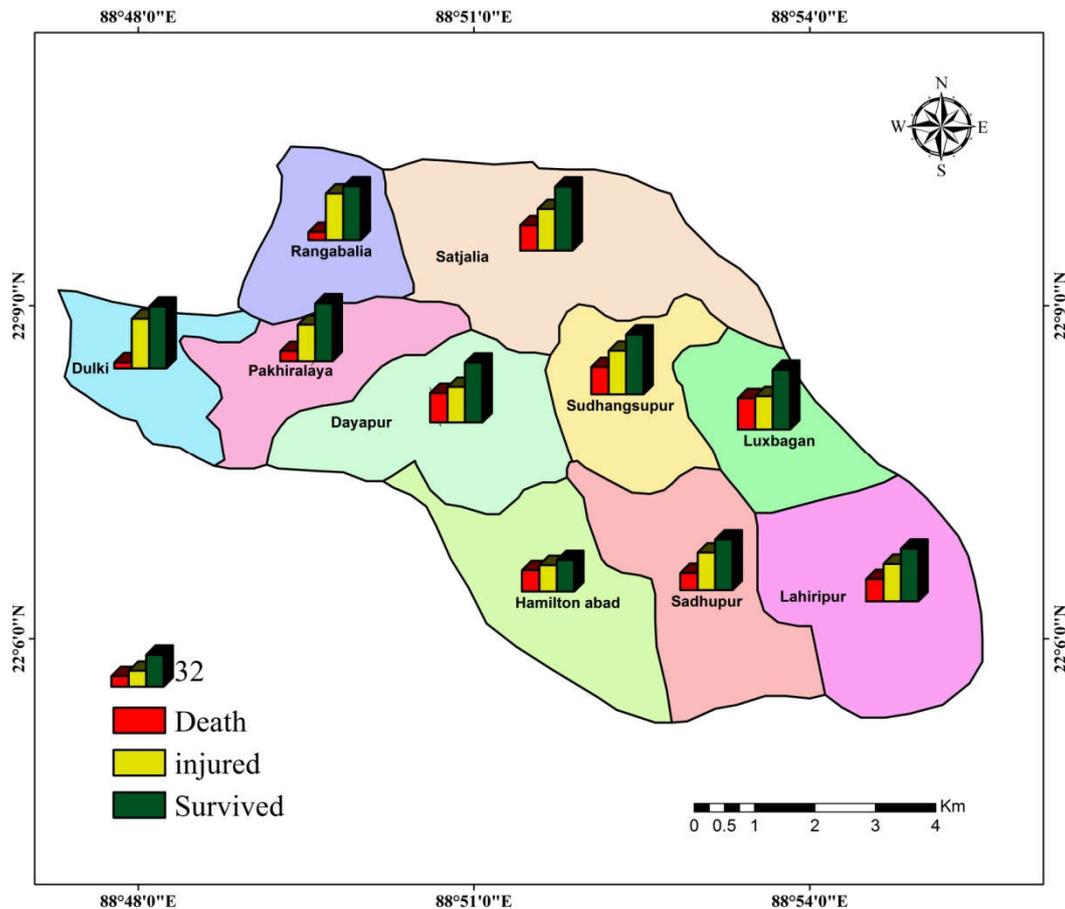


Fig. 1 Fate of animals attack

VI. FINDINGS AND CONCLUSION

The major findings which have been derived from the study are as follows:

1. Due to rapid population explosion and lack of alternative sources of livelihood, local people of the study area were forced to enter into restricted parts of the forest.
2. The study identified highly vulnerable villages namely Luxbagan, Dayapur, Sudhanshupur, Satjalia whereas the magnitude of vulnerability was low in Dulki, Rangabelia and Pakhiralaya village.
3. The male of the study area were mainly victimized due to tiger attack because they were generally engaged in forest-based activities like wood collection, honey collection, fishing and crab collection.
4. The majority of female have been suffered due to crocodile attack as their main occupation as tiger prawn seed collection.
5. The intensity of illegal hunting, poaching, wildlife trafficking are increasing indiscriminately in the study area.

It is assumed that the magnitude of man-nature conflict will be increased in near future [15]. Development of alternative sources of livelihood and overall socio-economic upliftment can mitigate the severe conflict and vulnerability at man-nature interface in Indian Sundarban region.

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