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# Impact of Cyclone and Flood on Social Vulnerability "A case study at Kakdwip Block, South 24 Parganas, West Bengal."

**Satyajit Dhara*1, Dr.Ashis Kr. Paul *2**

*1st.Assistant Professor, A.J.C.BoseCollege, Kolkata20,satyajitd468@gmail.com.**2nd. Dr.Ashis Kr. Paul, Professor, Vidyasagar University, Dept of Geography. Paschim Medinipur-721102.

Abstract:

Vulnerability is a multi dimensional concept. It is controlled by Bio Physical, Socio Economic, Political and Ethical Factors. Actually Vulnerability includes Physical, Socio Economic, Ecological, Political etc. phenomena. It is a combination of particular state of that system from which the outcome of the losses measured in the form of Economic or Human life loss. Social Vulnerability includes the social vulnerability conditions like Livelihood system, Housing, Security and many other Social elements. One of the most dangerous impacts of natural Hazards (Cyclone, Flood, Tsunami, Volcanic Eruption) are the increase of Social Vulnerability, Economic Vulnerability, Physical Vulnerability etc.

Kakdwip Block is situated in the south Western part of Indian Sundarban .This block is within the mainland of deltaic plain of South 24 Parganas District. Although this block is comparatively more developed than other blocks like Sagar, Namkhana, Patharpratima, till now a major portion of population are socially very vulnerable here. Physical, Socio Economic and Political factors are responsible behind this. Along the Western side of this block the river Hugli is flowing. It is very near to Bay of Bengal. Many Villages are located along the river side. So tropical Cyclones, Coastal Flooding and Flooding due to Embankment breaching making the people of this block socially more Vulnerable which is hindrance to their economic development and standard of living. So the present paper reveals the study of the impact of major cyclones and floods on Social Vulnerability of the people of Kakdwip Block, South 24 Pargans District of the Indian Sundarban (south – west) and also to suggest the proper management options to minimize the Social Vulnerability of the people of this block.

Key words: - Social Vulnerability, Livelihood system, Natural hazard, Exposures, Sensitivity, Adaptive Capacity.

## Introduction:

In the low lying coastal areas of West Bengal, the people are affected by strong and frequent event of Cyclone and floods. This Natural Hazards make the people of Kakdwip Block Socially more Vulnerable.

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Community Vulnerability specially the Social Vulnerability is the major concern here. Social Vulnerability emanates from social factors of that place people in highly exposed areas, affect the sensitivity of people to expose and influence their capacity to respond and adapt (Yarnal, 2007). Parker et al (2009) described three major components of Social Vulnerability which includes Security and Social aspects. Here security means to respond and manage the particular natural hazard to cause minimum disruption to expose community. The Level of vulnerability highly depends of economic status of the individual. Social Vulnerability includes the demographic characters such as Age, Gender, Family Structure, Health, Disability, Occupation etc.

**Objectives of the study: -**

The Social Vulnerability perspective aims at identifying and understanding which group of people may be more sensitive and susceptible to the impacts of natural hazards and disasters. Main objectives of the present research work are as follows:-

a) To identify the villages which are Socially Vulnerable.
b) To assess the impact of Cyclone and floods on Social Vulnerability of the people of Kakdwip Block.
c) To prepare Social Vulnerability map of the block.
d) To suggest proper management options to minimize the Social Vulnerability.

**Methodology:-**

For the present research work pre field, field and post field methods are followed .C.D Block map and Census data collected from the Census office Govt. of West Bengal. Literature review done by searching internet and from many reports of the Govt. of West Bengal. Household survey done during the period of field survey. Disaster management plan collected from the B.D.O. office.

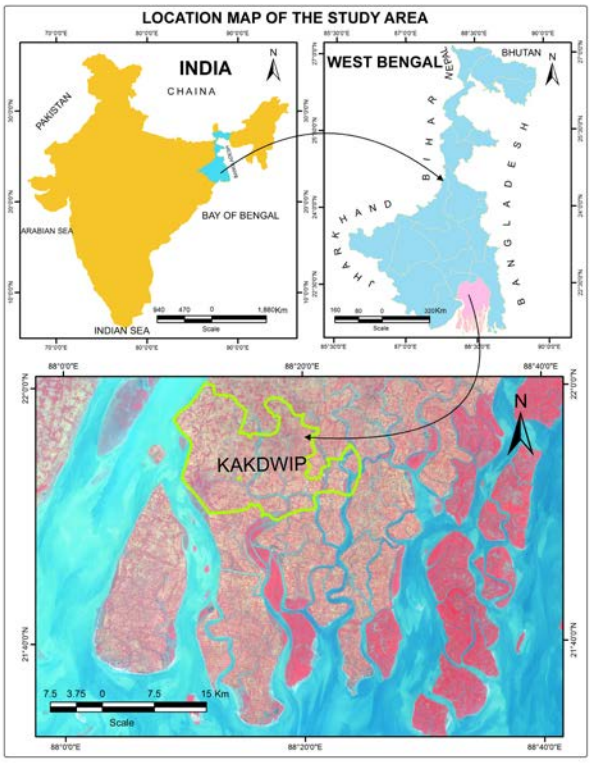
Data analysis done after completing field survey and finally maps and diagrams have been prepared.

Result and Discussion: Natural Disasters specially cyclone and floods frequently occur in the low lying Deltaic plain of south 24 Parganas district ,West Bengal.Kakdwip Block is also affected by natural hazards since historical past. According to official estimate that due to cyclone and flood hazard in this block, social vulnerability is very severe among the

**Figure-1:Location Map of the study Area.**

people of the this block. From many sources cyclone and flood history and occurrence of other hazards recorded and their impact also analyzed for the proper measurement of social Vulnerability of the Study area.

## Major Events of Cyclone and Floods:-




Under Kakdwip Block of South 24 Parganas District villages like Narayanpur, Bairagirchack, Mirinalnagar, Hasemabad, Kalinagar, Uttar & Dakhin Kasiabad, Ramtanu Ngar are highly flood prone villages due to Embankment Breaching and storm surge. The whole Block is affected by Cyclone and Severe Cyclone frequently. At Kakdwip Block Enbankment breaching

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take place along the Muri Ganga River, Hooghly River and Ghughudanga Khal.

Cyclone of 1737 :-The 1737 Calcutta cyclone is the worst in terms of intensity and damage.Good God, wrote

Sir Fransis Russel, what a sight was the town and the river in the morning! Not a ship but the Duke of Dorset to be seen in the river, where the evening before were 29 sail of vessels great and small ,many being driven ashore, some broke to pieces and others foundered. The waves penetrated almost 300 km inland from the Bay of Bengal. And this ,which is scarce creditable in the river hardly a mile wide, there was no ebb tide for near 24 hours .Our church steeple was blown down, as also eight or ten English houses and number belonging to the black merchants. The whole place looked like a place that have been bombarded by an enemy. Such a havoc did it make that is impossible to find words to express it.(A History of Old Fort William in Bengal, Bengal Past and Present, Volume -1,Page-44.The church referred to was St. Anne's ).

In the year 1938,the description of 1737 Calcutta Cyclone was given in the Gentlemans Magazine.

On the 30th September last happened a furious Hurricane in the Bay of Bengal, attended with a very heavy rain which rained 15 inches of water in five hours and a violent earth quake which threw down abundance of houses, as the storm reached 60 leagues up the river, it is computed that 20000 ships, barks, boats, canoes etc., have been cast away.

A prodigious quantity of cattle of all sorts ,a great many tigers and several rhinoceroses were drowned .Two English ships of 500 tons into a village about two hundred fathoms from the bed of the river Ganges, broke to pieces and the people drowned pell-mell amongst the inhabitants and cattle. Barks of 60 tons were blown two leagues up the land over the tops high trees .The water rose, in all, 40 feet higher than usual. A French ship was drove on shore and bulged. After the wind and water abated, they opened the hatches and took out several bales of merchandize. But the man who was in the hold to sling the bales suddenly ceased working, nor by, nor by calling him could they get any reply. On which they sent down another, but heard nothing of him, which very much added to their fear, so that for some time no one would venture down. At length, one more hardly than the rest went down and became silent and inactive as the two former to astonishment of all. The whole Sundarban region inundated by high tidal and sea water.

**The 1864 Cyclone Event:-**The most disastrous cyclone which caused severe damage is the 1864 cyclone. On 5th October a cyclone and associated storm surge swept across the island with great force and wrought great havoc (Pargiter, 1934, 117).The highest storm surge was 11 feet according to Hunter. Dampier(1864 in Chapman)evaluated the loss caused by storm, had reported that the cyclone has made a clean sweep of the island,1488 people are left alive out of 7022 cattle and 3365 are also gone.

The storm had been slowly travelling up the Bay of Bengal ,made itself felt at the sand heads on the afternoon of the 4th October and attained its full fury in the night. At Calcutta it raged from 10 a.m till 4 p.m .On the 5th October after which it gradually subsided, here the lowest reading of the barometer was 28.571 at 2-45 p.m .The destruction caused by the cyclone in two ways. First, the violence of wind caused widespread destruction to houses and trees. Secondly,the storm wave brought up by the gale swept over the country to a distance of 8 miles inland on either side of the Hoogly as far north as Achipur(now Ichhapur).This wave rose in some places to a height of 30 feet, sweeping over the strongest embankments,flooding the crops with salt water and carrying away entire villages. At Sagar Island it was 15 feet above the land level and appeared to cut a channel straight across the island, dividing it into two halves.The embankments,houses,huts, golas and buildings were destroyed.Those that did escape were saved by climbing up trees or floating on the roofs of their houses,which the wave swept away and carried many miles inland.

The cyclone wrought havoc among the shipping in the river.On 5th October there were 195 vessels within the limits of Calcutta Port. The vesels were sunk in the river and 145 driven on shore.The Govindapore, a new ship of 1200 tons,capsized and sank off the Custom House.The crew were saved by the gallentry of a sailor who swam off to the wreck with a line, by means of which the crew clinging to her masts escaped to shore.The Ally met the Gale a little below Diamondhrbour;she had on board 348 cooly emigrants for Mauritius,and went down with all on board save seven of the crew and 22 emigrants. Six tug steamers were lost.The

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Burma mail steamer foundered off the sand heads with nearly all hands: a hospital ship was carried on to the top of the Diamond Harbour embankment: two light ships were lost with all hands. At 6 p.m. the Strand road was flooded through out and in places water stood breast high.The avenues of Fort William and Botanic Garden were destroyed:the Eden Garden were turned into a wildrness; the Barrackpore Park lost 50% of its valuable trees,and the Avenue of Barrackpore road suffered even more.

**The 1995 Cyclone :-**On May,14,1995 a severe cyclone over 120 km wind speed per hour associated with tidal waves broke barrier of earthen embankments and flooded low lands and human habitation with the gushing water ,rendering millions of people homeless in the Sundarban and Medinipur litoral tract(The Statesman Report on 15th May,1995).Almost 78 km length of embankment damaged in the whole Sundarban.The number of houses damaged were 4640 and Rs. 3300 lac crop damaged(source – Irrigation Dept.,South 24 Parganas and Agricultural Meteorological Stations, Kakdwip).Beguakhali shoreline of Sagar Island shifted to the landward atleast 350 meters

**The 1999 Cyclone: -** In the year 1999, a cyclone occurred in Bay of Bengal. All the blocks of Indian Sundarban severely affected. Sagar, Namkhana and Patharpratima all these three blocks badly affected.

**The Cyclone of 2009:-**In the year 2006 a devastating cyclone did massive damage to the coastal areas of West Bengal. Livestock's, agricultural crops, houses damaged. Agricultural lands inundated by tidal water.

The Aila Cyclone 2009:-A severe cyclonic storm, Aila crossed West Bengal near Sager Island between 1330 and 1430 hours IST on 25th May,2009.Its intensification was very rapid only a few hours before landfall.

**The Events of Flood:-**Coastal as well as rain water flooding is another type of hazard in the low lying coastal areas of South 24 Parganas district .Coastal flooding occurs due to embankment breaching and tidal surge along with velocity wind. Throughout the year tidal surge may cause breaching of embankment of the estuarine rivers and water enters the coastal and riverside village's .From the month of June to September flood hazard is a very common incident here. Since 1582 to 2012 so many flood incidents occurred in the Indian Sundarban. Major events of flood occurred in the year 1688,1823,1838,1856,1864,1868,1871,1876,1885,1900,1907 ,1919,1968,1978,1986,2009.In recent years the most serious floods have been those of 1900, 1904 and 1907.In September 1900 there was abnormal rain fall. The total rain fall for the month was 38 inches which caused floods in all over the South 24 Parganas district(Bengal District Gazetteers,24Parganas,L.S.S.O Malley,page-171).Due to poor drainage network the rainwater accumulated here and there. In the year 1905 heavy rainfall occurred but it was uneven. Rain water accumulated for long time and caused flood.

**The 1978 flood:-**In the year devastating flood occurred in the whole South 24 Parganas. All the blocks of Sundarban flooded by heavy rain fall. Kutcha houses and agricultural crops damaged very badly. The people of Kakdwip, Sagar, Namkhana and Patharpratima block suffered a lot from such flood event. The low lying lands inundated by flood water.

**1986 flood:-**In the year 1986 flood occurred in the whole Indian Sundarban .Heavy rainfall caused havoc damage to agricultural crops,roads and houses in all the blocks of Indian Sundarbans. Moderately affected blocks were Jaynagar-2, Canning-1 and Mathurapur -2. The worst affected blocks were Kultali, Kakdwip, Kulpi, Patharpratima and Sagar.Kakdwip Block is connected to the main land of South 24 Parganas. This Block is highly populated and the population density is also high according to 2011 census report the total population of this block was 281963 and the population density was 1114 person per square Kilometer. The population pressure is increasing day by day as a result the social Vulnerability is also increasing. The United Nations framework convention on climate change (UNFCC) button up assessment framework approach has been used to assess the social Vulnerability. De, Leon (2006) expressed that Social Vulnerability = f (exposure, sensitivity and adaptive capacity).He used the following indicators of Social Vulnerability

25 grade points have been set up and after that it has been transferred into 100%. In this way Block Level (Village Wise) social vulnerability calculated.

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## Assessment of social vulnerability (Kakdwip block):-

| Sl No. | Village | Component Exposure(10) | Sensitivity(10) | Adaptive Capacity(5) | Social Vulnerability Score | Social Vulnerability in % |
|---|---|---|---|---|---|---|
| 1 | Uttar Chandranagar | 7 | 5 | 3 | 17 | 68 |
| 2 | Suryanagar | 6 | 5 | 3 | 14 | 56 |
| 3 | Ramtanunagar | 9 | 8 | 2 | 19 | 76 |
| 4 | Madhusudanpur | 8 | 7 | 3 | 18 | 72 |
| 5 | Lakshmipur | 8 | 8 | 2 | 18 | 72 |
| 6 | Sibkalinagar | 5 | 4 | 2 | 11 | 44 |
| 7 | Sitarampur | 2 | 4 | 2 | 8 | 32 |
| 8 | Srinagar | 5 | 5 | 2 | 12 | 48 |
| 9 | Kasinagar | 5 | 4 | 2 | 11 | 44 |
| 10 | Kalinagar | 8 | 7 | 3 | 18 | 72 |
| 11 | Ganespur | 5 | 4 | 2 | 11 | 44 |
| 12 | Ramratanpur | 5 | 5 | 3 | 13 | 52 |
| 13 | Nebutala | 4 | 7 | 3 | 14 | 70 |
| 14 | Chandipur | 3 | 4 | 3 | 10 | 40 |
| 15 | Taktipur Abad | 4 | 5 | 3 | 12 | 48 |
| 16 | Thangara | 3 | 6 | 4 | 13 | 52 |
| 17 | Manmathapur | 8 | 7 | 3 | 18 | 72 |
| 18 | Gopalnagar | 5 | 6 | 3 | 14 | 56 |
| 19 | Koaberia | 5 | 4 | 3 | 12 | 48 |
| 20 | Gobindapur | 3 | 6 | 2 | 11 | 44 |

| Component | Indicator |
|---|---|
| Exposure | Geographical Location, House Structure, Age, Education Status, Migration |
| Sensitivity | Drinking Water quality, Sanitation, occupation , income, Food Security |
| Adaptive Capacity | Access to Digital Communication, Capacity development to adjust with hazard. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21 | Srikrishnagar | 4 | 7 | 3 | 14 | 56 |
| 22 | Sankiberia | 6 | 6 | 2 | 14 | 56 |
| 23 | Sibnagar | 8 | 7 | 2 | 17 | 68 |
| 24 | Ramchandrapur | 7 | 6 | 3 | 16 | 64 |
| 25 | Ramchandranagar | 3 | 4 | 2 | 9 | 36 |

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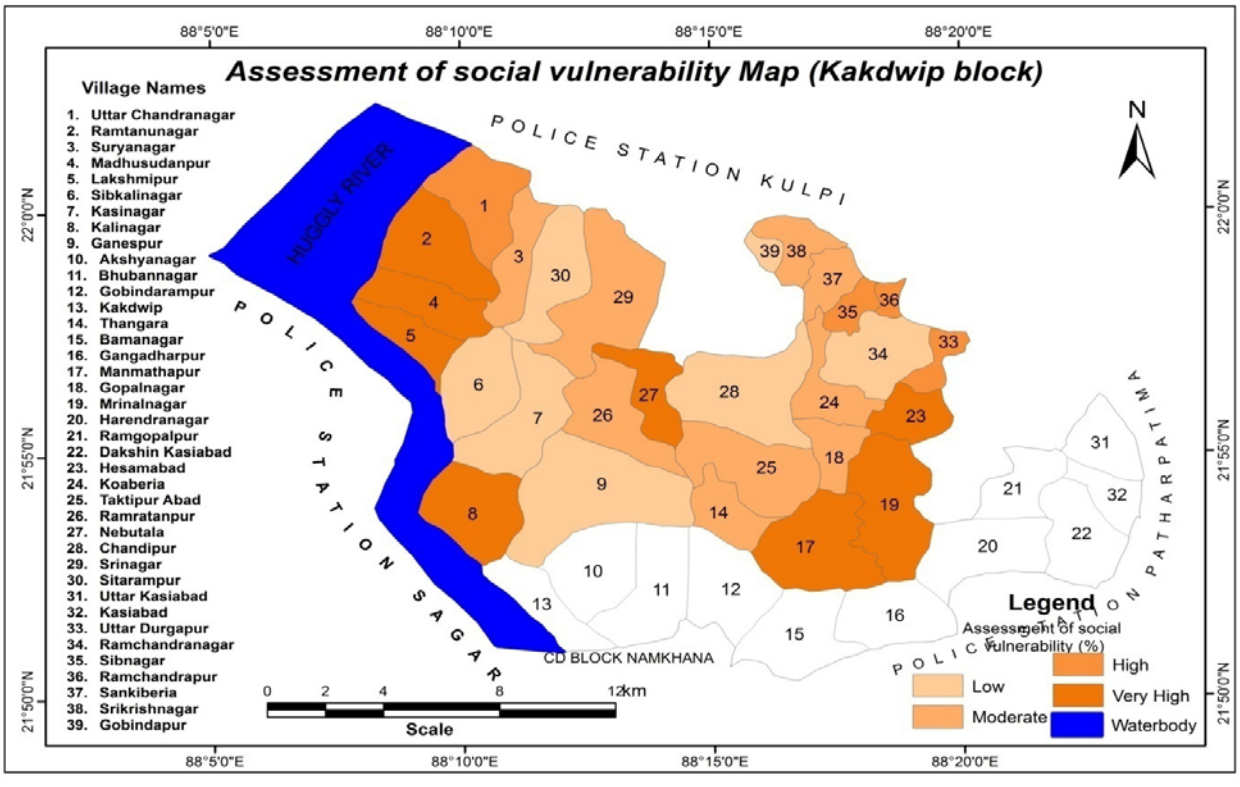
| | | | | | | |
|---|---|---|---|---|---|---|
| 26 | Uttar Durgapur | 5 | 7 | 3 | 19 | 60 |
| 27 | Hesamabad | 8 | 8 | 2 | 18 | 72 |
| 28 | Mrinalnagar | 8 | 8 | 3 | 19 | 76 |

Social Vulnerability score grouped into four categories such as less than 40 %, 40-50 %, 50-60% and above 60% . Forty percent means low social vulnerability, 40-50% means moderate social vulnerability, 50-60% means high social vulnerability and above 60 % means very high social vulnerability.

Kakdwip block is socially low vulnerable block in comparison to Patharpratima, Sagar and Namkhana block. While entire Patharpratima block, coastal villages of Namkhana and Sagar block are socially very vulnerable, Kakdwip block is not so vulnerable except some villages like Mrinalnagar, Hasemabad, Ramtanunagar and Madhusudanpur. Social vulnerability map has been prepared after calculating social vulnerability score. Very low social vulnerability can be seen at the villages like Sitarampur, Ramchandranagar, Shibkalinagar, Kashinagar, Ganespur, and Gobindapur. Physical vulnerability of this block is responsible for social vulnerable condition of the Kakdwip block. As this block is situated very near to Bay of Bengal it is very prone to tropical cyclone, coastal flooding and embankment breaching with saline water intrusion. Such physical vulnerability is very much responsible for social vulnerability of the people living here. For example during the cyclone Aila on May, 25 in 2009 due to saline water intrusion in agricultural land three consecutive years no crops grown. As a result the farmers became helpless and they have very little alternative in their hand to cope with such natural hazards. The monthly income of their family were below Rs. 500. There was no regular income. Alternative livelihood options were also very poor. Health and sanitation condition also was very miserable .The people who are living nearby river (Hugli River) are exposed to natural hazards like cyclone, flood and embankment breaching. Poor financial status and poor housing condition (kucha house) are also controlling factor of their social vulnerability.

## Management Options of Social Vulnerability:-

To save the poor and socially vulnerable group of people of these block management policies must be taken from the government and non government level. Poverty is the most important indicator of social vulnerability. So eradication of poverty is the most urgent job for the government and NGO



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of the block. Already many non government organizations are working in this block . They formed Self help group to

**Figure-2: Assessment Social Vulnerability map (Kakdwip Block).**

Improve the poverty status .The alternative job opportunities must be created for the people who are the victims of natural hazards. The government already implemented Rural Employment Generation Scheme. But this is not sufficient. Sustainable livelihood options must be generated for the poor people in this block .Social vulnerability is the most constrain for economic and social development here. For the very poor and marginal section economic opportunities must be created. Agriculture is the main occupation of the people of this block. But due to high salinity in the soil agricultural production is very low. So salt tolerable rice species must be given to the poor and needy farmers. High yielding variety seeds must be given to local farmers to increase the agricultural productivity. Agricultural land must be used for multipurpose benefits. Fish farms are to be used for commercial pisciculture for economic benefit of the people. Village based tourism and eco-tourism have to develop at this block to increase family income. It will help them to develop their standard of living.

Conclusion: Physical vulnerability and Social vulnerability is directly linked to one another. Due to natural hazards like flood, cyclone, embankment breaching, saline water intrusion the house, roads and agricultural activities are badly affected at Kakdwip block .These make the local people economically vulnerable and finally social vulnerability increased a lot. So people's awareness, government project, increase capacity development can improve the situation of the people of this block.

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**Satyajit Dhara**
**Assistant Professor, A.J.C.BoseCollege, Kolkata20.**

**Email – satyajitd468@gmail.com**

**Dr.Ashis Kr. Paul,**

**Professor, Vidyasagar University,**

**Dept of Geography and Environment Management,**

**West Medinipur.**