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Embankment Breaching and its impact on local Community in Indian Sundarban
"A case study of some blocks of South West Sundarban"

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Abstract:

The Indian Sundarban consists of 13 blocks in the South 24Parganas and 6 blocks in the North 24 Parganas. The South 24 Parganasconsists of Sagar, Namkhana, Kakdwip,Patharpratima, Mathurapur I &II, Jaynagar I& II, Canning I & II , Basanti,Gosaba and Kultali. While 6 blocks of the North 24 Parganas are Haroa, Hasnabad, Minakahn, Sandeshkali I & II and Hingalganj. The total area of Indian Sundarban is about 9360 sq. Km. comprising of 102 Islands. Out of these 52 have human settlements.The early settlements began in this area in 1770.The land reclamation process here started during the British period to make settlement in this area. The average elevation of this area is only 2.8 to 3.5 meter from mean sea level.So very often tide water enters the villages through numerous channels, creeks and tidal rivers which cause severe damage to settlement, agriculture and man-made structures. To protect this area people started to construct embankment from the early period of settlement development. Around 3500 sq. km areas were protected by embankment. The entire Sundarban region is the part of Lower Ganga Delta. It is facing to the Bay of Bengal. So the local people must have to protect from the marine erosion also. The earthen embankments is almost 150 years old and are being weakened everyday by the swirling currents that scour at their bases and by tidal surges coupled with strong winds and cyclones. During the rainy season, during Kalbaisakhi and even throughout the year embankment breaching takes place. As a result the local communities are suffering a lot. Due to embankment breaching saline water enters the agricultural land and pond. So agriculture and fish farms are badly affected. Even mud built houses collapsed and seasonal flooding as well as tidal flooding also occurs. This is a serious problem of the area .So the present paper reveals the study of embankment breaching and its impact on the local community of some selected blocks of south west Sundarban and management aspects also.

Key words: Landreclamation, Embankment breaching, Tidal effect, Salt water incursion, Coastal flooding, Community vulnerability,Embankment management.

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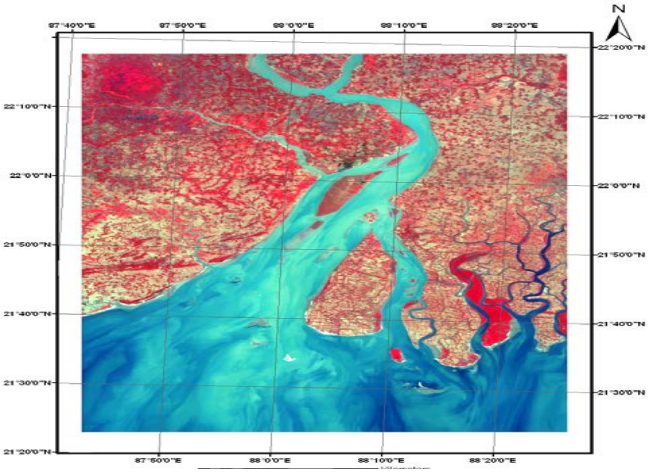
Introduction:

The 350 km long coastline of West Bengal is dominated by the Ganga Brambhaputradelta which occupies around 60% of this coastline. In the entire Sundarban area embankment are the crucial for the existence of settlement on the deltaic island.



The Study Area:

But breaches in embankments change in livelihood pattern from land base to water based which has significant bearing on the health of the ecosystem. The distributaries of the Ganga which criss-cross this land include Hoogly, Baratala, Saptamukhi, Thakuran, Mridanga-Bhanga, Matla, Gosaba, bidya, Hatania-Duania, Herobhanga etc. They are fed by sea tides twice a day.Sea water enters more than 100 km through these estuaries and inundate the lowlying plains. Tidal effect, seasonal flooding and impact of full moon cause embankment breaching in all the river banks area. This causes serious damage to agriculture, road, etc.

Objectives of the study

To identify the vulnerable embankment of the south western part of Sundarban.

1> To identify the impact of coastal environment on the embankment.
2> To identify the type and structure of embankment.

3> To identify the major sites of embankment breaching.
4> To findout the reasons of embankment breaching.
5> To assess the impact of embankment breaching to local community.
6> To suggest the embankment management options.

Methodology and data collection

Primary data collected from the field survey. Secondary sources of data are also used for analysis and outputresult of the present work. Sites of embankment breaching, the length of embankment damage measured by field survey. Some data collected from the pre-existing literature and newspaper report. So pre field, field and post field method are applied here.

Result andDiscussion*:* -

Some incidents of embankment breaching *:=>* Officially 9 out 13 blocks of Sundarbans in the South 24 Parganas district have been identified to have potentially weak embankments due to natural shocks and fishery problems. The most vulnerable blocks are Basanti, Gosaba, Patharpratima, Mathurapur II, Namkhana and Sagar. Some

incidents of embankment breaching have been discussed here:

a. – The western embankment atBaliara were washed away in October, 2004 and it had been moved further inland. Abdul Rashid has had to move his house twice in the past 17 years. Remnants of his second house still can be seen during low tide.

b. – On the south western side of KusumtalaMouja of Mousaniisland (Namkhana block) there was a primary school. In May, 2003 due to embankment breaching salt water incursion took place. With high tide water level raised high and submerged thekacharoad, making school inaccessible to children. Agricultural field was badly affected.

c. – During September (18-21), 2005MousaniIsland lost a km and a half of embankment due to tidal surge on the western side along Kusumtala and Baliaramouja. 321 families had been homeless during this time. Vast stretches of agricultural land were under water.It killed paddy and betel vine.Fish pond was also affected.

d. – During the Aila cyclone may (25-26), 2009 nearly 778 km of the total 3500 km embankment were completely destroyed. The saline water caused heavy damage to agricultural field, fish farm and other man made structure (The Hindu 27may, 2009).

e. - Due to strong cyclone in the Bay of Bengal embankment breaching took place in many embankments of the rivers of Sagar,Namkhana,

Basanti, Gosaba and Patharpratima block of South 24 Parganas (Bartaman 20 June, 2011)

f. – Embankment breaching took place along the bank of Chinairiver of Mousani Island. 12 km embankment breached due to high tidal wave during the full moon. Thousands of familieshave been rendered homeless. They took shelter in the tent along the road side.Some places of Muriganga and Ghoramarapanchayet of Sagar island embankment breached. Almost 40 km embankment destroyed during this time in the whole Sundarban region (AnandabazarPatrika, 17 July, 2014).

Type of embankment:- In the study area four main types of embankments can be seen along the different river side. These are –

I>Earthen embankment.

II>.Earthen embankment with bamboo fence.

III> Earthen embankment with bamboo fence and sand fill sag along the embankment.

IV> Boulder pitching or concrete pitching embankment.

Causes of embankment breaching:-I>

In the Hugli –Saptamukhi Estuarine Deltaic Complex area embankment breaching is the serious concern of the local community. Major course of embankment breaching are as follows:-

i) The area is crises- crossed by numerous tidal rivers and its tributaries and distributaries. The island villages and coastal villages are protected by earthen dykes but in some vulnerable areas and sea facing embankments daily flow of high tide and ebb tide source the base and side of embankments. During the months of April to October the tidal waves assume giant properties causes breach in the mud dykes.

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ii) According to Department of Irrigation and waterways major causes of embankment damage in the Sundarbans are weak technological structure of embankment and high rate increase of population in river and coastal areas. Technologically the Structures of the embankments are very weak. Because the embankment constructed on the uncohesivesilt that cannot resist the tidal surges in the long term. Population pressure is increasing at rapid rate in this area specially unplanned settlements developed in concave sides of the bends of the meandering river course. These are highly unstable due to natural scouring process. The base of the river embankment gradually weakened.

iii) Embankment breaching is also linked with the proper drainage through the sluice gates in the areas. Through the narrow artificial made cannel slice gates are connected. As a result earthen embankments become more weak due to flow of saline water. During rainy season local people pass excess water from agricultural field through this slice gates. Slice gates are also used for aquaculture practice. Very after rainwater accumulates in the crop fields, people make cuts on many parts of embankments for draining away the water. This process of water drawing makes the embankments more vulnerable to tidal surges and wave action.

iv) Other than hydro- meteorological causes large scale conversion of paddy fields into brackish aquaculture is another threat to the stability of the existing embankments. This practice is steadily increasing in this region. To ensure the inflow of saline water the fish farm owners dig deep channels in the embankments. This practice increases the chance of embankment failure during high tides and storm surges due to cyclones. v) Along the river side the prawn seed collectors trample upon the mud base embankment and this causes soil erosion. So causes of embankment.

Vulnerable Points under Joynagarirrigation Division:

Sl.No	Location	River/Khal	Bank	Length vulnerable sports(Mtr.)
1	PurbaSripatinagar,Taltala	Thakuran	Right	600
2	Dk. Kashinagar	Thakuran	Right	400
3	Sridharnagar,BijayRanjitGhat	Jagaddal	Left	600
4	Bishnupur	18 Gachirkhal	Left	250
5	PurbaDwarikapur,	Nakchara	Left	1200

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	near Jetty Ghat			
6	Laxmijanardanpur, near Jetty Ghat	Sibua	Right	250
7	Ramganga , Gangarghat	Mridangabhanga	Right	500
8	Kumarpur	18 Gachirkhal	Right	500
9	Ramganga,Bharatala	Barchara	Left	700
10	DkGobindapur, Shibergh at	Gobadia	Left	850
11	Achintanagar,Srighery	Mridangabhanga	Left	700
12	Kedarpur ,Hularkhal	Mridangabhanga	Left	350
13	Achintanagar	Shibua	Right	300
14	DkKasiabad	Gobadia	Left	400
15	Indranarayanpur	Mridangabhanga	Right	400
16	PutbaSripatinagar	Thakuran	Right	500
	, 0 point			
17	Kuemari near Sasan Jetty	Pakchara	Right	500
18	Sridharpur near Sluice	Gobadia	Left	200
19	Bairagi More, Dakshin Roypur	Sutarbag	Right	300

Vulnerable Points under Kakdwip Irrigation Division

Sl .No.	Block	Location of Damage	River/Khal	Length (In M.)
1	Kakdwip	Uttarchandranagar and Ramchandranagar	Hoogly	400
2	Kakdwip	Shibkalinagar	Muriganga	300
3	Kakdwip	Monmothopur,Gopalnagar,Ganghadharpur	Banstala, Chunpuri	500
4	Namkhana	Nadabhanga	Muriganga	560

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5	Namkhana	Narayanpur	Hatania-Dowania	270
6	Patharpratima	Gobindapur Abad	Curzon Creek and Saptamukhi	300
7	Patharpratima	Paschim Dwarakpur,Dakshin Laxminarayanpur	Saptamukhi and Walls Creek	525
8	Patharpratima	Krishnadaspur	Curzon Creek	300
9	Patharpratima	Chotto Banashyamnagar	Curzin Creek	325
10	Patharpratima	Khetromohanpur	Walls Creek	250
11	Patharpratima	Durgagobindapur	Gobadia	750
12	Patharpratima	Paschim Surendraganj	Barchara	250
13	Patharpratima	Chotto Rakshaskhali	Rakhaskhali	300
14	Patharpratima	Brajaballavpur	Walls Creek	300
15	Sagar	Ghoramara Island	Hoogly	1100
16	Sagar	Beguakhali	Bayof Bengal	1200
17	Sagar	Shibpur ,Dhoblat	Bay of Bengal	1400
18	Sagar	Chemaguri	Satbanki	150
19	Sagar	Murigangа	Muriganga	750
20	Namkhana	Kusumtala	Muriganga	800
21	Namkhana	Baliara	Bay of Bengal and Chener Gang	2200
22	Namkhana	Bagdanga	Muriganga and Chenargang	700
23	Namkhana	Mousuni	Muriganga and Chenargang	350
24	Namkhana	Haripur	Saptamukhi and Sundarika	300
25	Namkhana	Patipunia	Chenargang	300
26	Namkhana	Shibrampur	Sundarika	150
27	Namkhana	Debnagar	Chenargang	500
28	Namkhana	Dwarikanagar	Sundarika	300
29	Namkhana	Manangan j	Hatania-Dowania	400
30	Namkhana	Narayanganj	Muriganga	250
31	Namkhana	Namkhana	Hatania-Dowania	300

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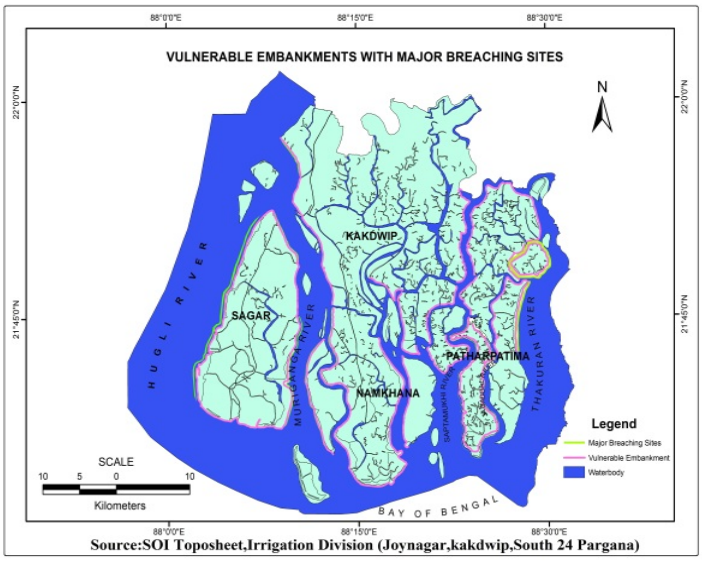
Data Source:-Joynagar and Kakdwip Irrigation Division, South 24 Parganas district.



Source:SOI Toposheet,Irrigation Division (Joynagar,kakdwip,South 24 Pargana)

breaching are multidimensional. This is from natural as well as anthropogenic factors.

vi) Most of the embankment is very old in nature. They are constructed during the British rule .But they are not maintained regularly. So these embankments gradually becoming very weak in nature. Only medium intensity cyclone and higverocity tidal wave and heavy rainfall causes in many places breaching .In rainy season embankment breaching and flooding is a very common incident in the coastal villages

vii) The mangrove forests are playing an important role by protecting the river and coastal bank erosion. But at present the local people who completely dependent on forest based resources for their livelihood collection, they cut the forests for various purposes. The mangrove trees protect the embankments from wave attack. Rapid degradation of mangrove forests cannot present the embankment breaching. So Physical and socio-economic environmental situation are responsible for embankment breaching along the river banks as well as coastal bank areas.

Trend of Embankment Breaching: -From the year 2002 – 2013 the trend of embankment of breaching if we look, we find that in different blocks the length of damage of embankment gradually increases year after year. Human activities, huge population pressure, tidal impact, unscientific method of embankment construction etc are responsible for embankment breaching. In Namkhana and Patharpratima block the rate of breaching is very high. During the Aila cyclone in the year of 2009 almost 35 km in Namkhana and more than 50 km in Patharpratima block embankment breaching took place. The expenditure

for new construction of embankment and repairmentalso increases.

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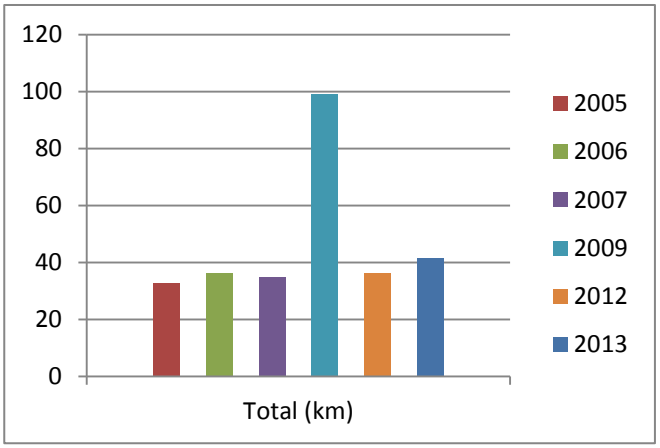
	YEARS					
Block	2005	2006	2007	2009	2012	2013
Kakdwip	3.5	3.6	3.4	11.2	3.75	4.45
Namkhana	7.2	7.09	6.09	15.8	13.45	12.16
Patharpratima	15	18.8	18.7	52.4	12.64	14.2
Sagar	7.2	6.88	6.7	19.8	6.34	10.67
Total Damage (km)	32.9	36.37	34.89	99.2	36.18	41.48

Impact of embankment breaching___:-Source-Block Disaster Management Report and Irrigation division,Kakdwip and Joynagar.

Direct Impact	Indirect Impact
1. **Loss of Land** 2. **Loss of wet land** 3. **Loss of settlement** 4. **Environment refugee** 5. **Agriculture and fish farm destruction**	1. **Depopulation** 2. **Survival problem of the people** 3. **Occupational hazard**

Embankments are the life line of the Sundarban's people. Breaching of embankments due to natural and anthropogenic factors because huge damage to man-made structure, economic loss and even life lose also. Economic and social vulnerability is also related to this incident. It has both direct and indirect impacts.



Most of the river and sea side mouzas are lost in last few decades of Sagar, Namkhana and Patharpratima blocks. In SagarIsland at Bamankhali, Begnakhali, Dhablat and Bishakhalak-shmipur and Ghoramara large areas went into the sea. In Namkhana block Baliara, Bagdanga, Kusumtala and Mousani, Dakshin Chandanpire ,Ganeshnagar and many other mouzas lost their agricultural land. Same case is also true in case of Patharpratima block. This block has 13 'islands and surrounded by so many tidal rivers with their wide mouth (creek) area. Most of the Mouzas situated to the southern side (Bay of Bengal) eastern and western sides are very vulnerable.
Sitarampur,Gobardhanpur,Buraburiritat, Banashyamnagar and Braiaballpur G.P also lost huge land area due to embankment collapse and breaching.

Settlements are also lost and thousands of people turn into 'Environmental Refugee' from Ghoramara Island of Sagar block many families became homeless and they forced to leave their native village to other block. Three fourth of the Gobardhanpurmouza of 'G' plot and its settlements completely vanished.

The local people are dependent on agriculture and fishing activities. Butdue tosaline water incursion agricultural field and fish farm badly affected. Even betel vine also affected .The land lost its productivity due to presence of high salinity in soil. Every year in rainy season due to

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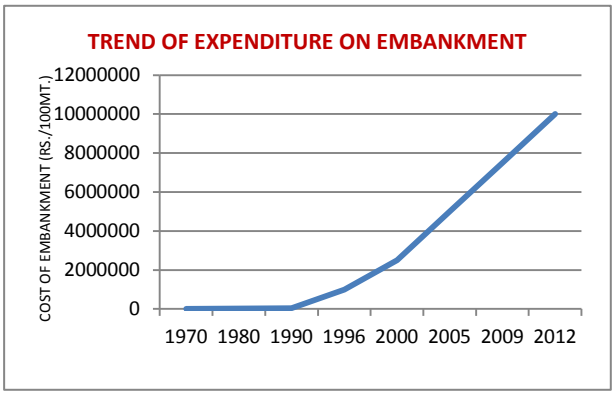
breaching of earthen embankment agriculture and pisciculture face severe problems

Most of the people are living here very poor they lie below the poverty level. Due to poor economic condition most of them live in Kacha houses. Their houses collapsed by flooding and heavy rainfall. During the high fide sometimes river overflows its bank and along the breaching point huge water enter the large area causing havoc damage to settlement and houses. Indirectly depopulation and occupational hazard are serious problem in this area. After Aila cyclone in 2009 a large proportion people lost their original occupation. Fishing and Agriculture these two main occupations are now facing serious hazards. Even they are not able to find new type of jobs. So social crimes are arising. There is always conflict



for resource sharing. It is now a burning issue in the Indian Sundarban region.

Management *:* - Embankmentis the lifeline of the Sundarbans people. So, management of embankment is very crucial. The following are the ways of embankment management.

1> Vulnerable embankment must be repaired at regular interval.

2> All the embankment creeks should be allowed wider spill area to reduce Hydrostatic pressure on embankment.

3> Embankment should be protected by block pitching, concrete structure and by brick pitching.

4> Setttelemet must be evacuated from the embankment sites.

5> Plantation mangroves can also

6> protect the bank from erosion.

Conclusion:- *After* field observation and secondary data analysis, many incidents can be seen. The villages which are located near the river site are very vulnerable along the Hatania – DoaniaRiver, Saptamukhi, Muriganga, Hoogly,Thakuran,CheniarGang embankment breaching is causing damage to agriculture fish farm, betel vine and also causing inundation of roads and settlement. Embankment breaching also hampered the livelihood support system of the local community. So, costal zone management and local people awareness and proper planning from the very grassroot level can save the entire region, specially the people and the environment.

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