

Flood as a catastrophic hazards on Dwarakeswar river basin

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Abstract: Flood is one of the most catastrophic natural hazards. It is a physical phenomenon but can damage both life and natural or cultural properties with an excessive rate. Dwarakeswar river is one of the most important river on the western part of Bengal. Almost every year Dwarakeswar river basin is affected by frequent floods due to its regime and physical setup. Through this paper I want to show the causes of flood, to evaluate the lithosectional interpretation as an evidence of flood, embankment and to find out some probable solution to protect properties and lives of local people from the effects of floods. As data source I used simple techniques to collect quantitative and qualitative data. Beside those various books, journals and official websites as secondary database. Although geo-informatics helps to collect, analyze and making necessary maps and diagrams. However we can't stop occurrences of flood but by using some structural and non structural measures can mitigate the vulnerability of flood.

Index Terms: Catastrophic, regimes, lithosection, embankment, structural and non structural measures.

I. INTRODUCTON:

The natural flow of water supplied rainfall regularly or intermittently over the crust of the earth following its slope in a definite channel due to gravity is generally of referred to as river. Such natural flow of water has the greatest influence on the growth and development of human civilization. Thus the human rapidly changes land use land cover. As a result effects upon the river natural flow as well as human civilization. In the present study I wanted to show the negative impact of land use land cover change and changing river course of Dwarakeswar River. Physical and Anthropogenic factors on the morphology of fluvial systems has typically been examined through the study of effects of a single factors on the bed structure or the channel pattern of a river system. Almost every year Dwarakeswar river basin is affected by frequent flood as a result in loss of life and destruction of infrastructure on a large scale. Catastrophic natural hazards is one where a large number of people are exposed to the risk of a large loss by reason of the occurrence by these hazard with low intensity high magnitude or high intensity low magnitude.

S.M. Set (1998) has analyzed flood forecasting, flood estimation, flood routine, flood inundation mapping, floodplain zoning and flood management etc. in his paper entitled 'Flood Hydrology and Flood Management in India.'

S.C. Mukhopadhyay (2002) has studied the geomorphologic causes of floods in Brahmaputra basin in his paper 'Geomorphology and natural Hazards in the lower Brahmaputra Basin with special reference to Floods'.

S.Roy & B.Mistri(2013) has studied that channel geometry and hydrological models for estimation peak discharge in selected ungauged river and hydrograph used for flood forecasting and management in his paper 'Estimation of Peak Flood Discharge for an Ungauged Rivers : A case study of the Kunur River , West Bengal.

B.Das(2013) in his paper 'Risk Reduction Management of Flood By Bhagirtahi River: A Case Study Of Agradweep Of Burdwan District In Gangetic Delta' has studied that flood type, flood in the investigated area, role of disaster management and flood risk management.

S.Mondal, N.C.Jana & S.Bandyapadhyay(2014) has studied the flood frequency analysis ,trend of flood occurrence, risk damage with the high recurrence interval and flood control structures can reduce the magnitude in his paper 'Flood Frequency Analysis (FFA) of Annual Maximum Stream Flows For Dwarakeswar – Mundeswari Interfluve in West Bengal, India.'

S.S.Biswas, R.Pal, M.K.Pramanik & B.Mondal (2015) in his paper 'Assessment of Anthropogenic Factors and Floods using Remote Sensing And GIS on Lower Regimes of Kangsabati – Rupnarayan River Basin ,India' said that the occurrence of the floods are significant along with anthropogenic activities.

B.Das & A.Bandyopadhyay(2015) has studied find out causes of flood, effects on eco-geo environment condition and use some ecofriendly technological solution for flood risk management on his paper 'Flood Risk Reduction of Rupnarayan Rivers, towards Disaster Management – A Case Study at Bandar of Ghatal Block in Gangetic Delta.'

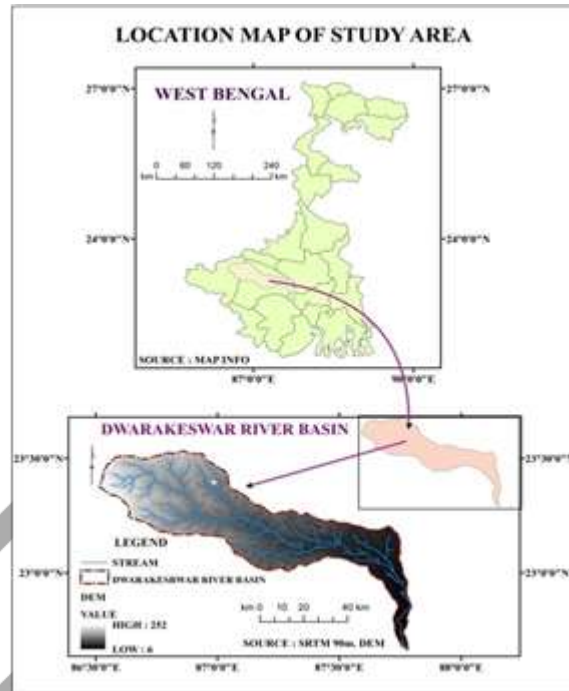
After reviewing various research papers, articles, journals and books come across several works relating to the field of flood hazards and its management is available. But in this paper we can represent as lithisectional interpretation as an evidence of flood and some structural and non structural measures to control the vulnerability of flood in Dwarakeswar river basin.

II. OBJECTIVES:

- To show the causes of flood.
- To evaluate the lithosection interpretation as an evidence of floods.
- To find out some probable solution with structural and non structural measures to protect the vulnerability of flood.

III. SELECTION OF STUDY AREA:

Dwarakeswar river is one of the largest river on the western Part of the Bengal. This area totally composed with pre- Cambrian crystalline and recent alluvium deposition. The shape of Dwarakeswar river basin is semi elliptical.



Maps and Diagrams No. 1: Location Map of the Study Area

IV. DATABASE & METHODOLOGY:

Explanation of past, present and future of any geographical event requires a particular method and analysis. The methods which are applied in the study area are given below.

- 1. Field Observation:** Field observation includes qualitative as well as quantitative methods of data acquisition. Data are obtained from extensive field observation in the form of numerical and informative source. I was visited the study area to collect the quantitative and qualitative data with ground truth verification.
- 2. Laboratory Observation:** Laboratory base observation indicates the computer based work with number of software, which help to rectify maps generate of data, measurement etc. The main softwares which are used in this paper are windows7, Google Earth, QGIS 2.8.2, ArcGis (10.2), & Microsoft office2007.
- 3. Official Observation:** Official observations indicate the collection of data from different official sources. It includes numerical data and different thematic maps.
- 4. Theoretical work:** This is a very important step because all of the previous works depend on its efficiency for result output. This step involves the processing, analysis and interpretation of the entire work. In this work, I am trying to find out the major reason of flood and its impact on environment and human life

V. FLOOD HISTORY OF THE BASIN:

River regime can describe one or two characteristics of a reach of an alluvial river. That represent as series of characteristics power law relationship between discharge and width depth and slope. This basin has an almost fair terrain with a slope between 1-2 percent. Lower part of this basin rapid fall their slope near to 0 and the other hand the general elevation of the basin is varies from 20 to 80m. Rainfall occurred mainly during south-west monsoon that the period from June to mid October. Funnel shape basin has been found lower part of the Dwarakeswer river, so huge amount of water are flow in the Rainey season of the channel

then due to cause of overflow massive flood have been occurred with high magnitude and high intensity. Flood history of that basin are recorded from 1984,1987,1993,1995,1999,2000,2007,2009,2011,2013,2014,2016and 2017.

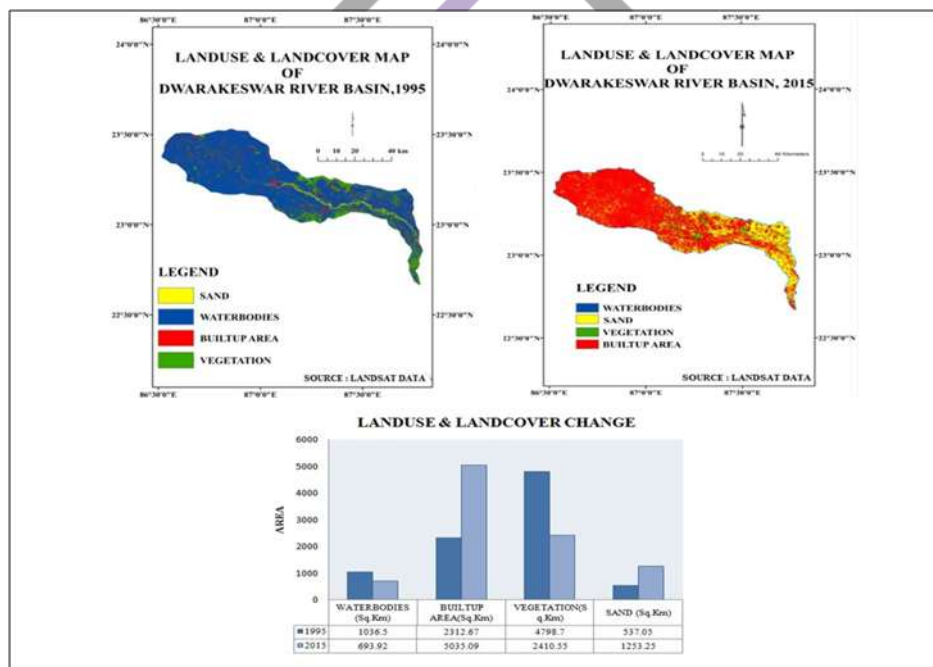
VI. TYPES OF FLOOD OF THAT BASIN:

Flood of that basin is classified into two categories of flood on the basis of their characteristics, that’s are River flood and Rain – fed flood.

- River flood is mainly depends on heavy rainfall in upper catchment of basin and huge amount of water in a single time they cannot hold the huge amount of water in its channel and excess water are overflow in their flood plain area.
- Rain- fed flood is mainly occurred due to excessive rainfall within a very short time in catchment and rapid rise the water level during south-west monsoon period.

VII. CAUSES OF FLOOD:

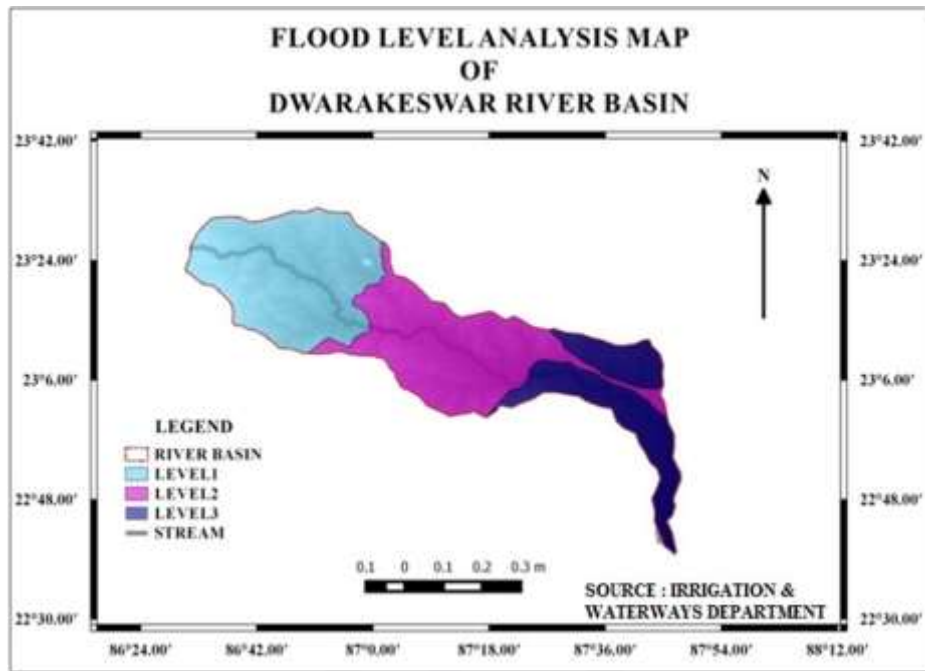
- Heavy rainfall at the Darakeswar basin.
- Severely affected river due to sedimentation of river bed.
- Deforestation in the upper catchment area.
- Construction of road, rice mill, industry on the floodplain.
- Agricultural encroachment in some parts of the basin.
- Illegal sand mining.
- Bad condition of embankment and natural levee in the both side of the river.
- The administration is not alert about the present day situation about this basin.



Maps and Diagrams No. 2: Temporal Changes of Dwarakeswar River Basin

The prominent flood prone areas having some particular locations are as follows-

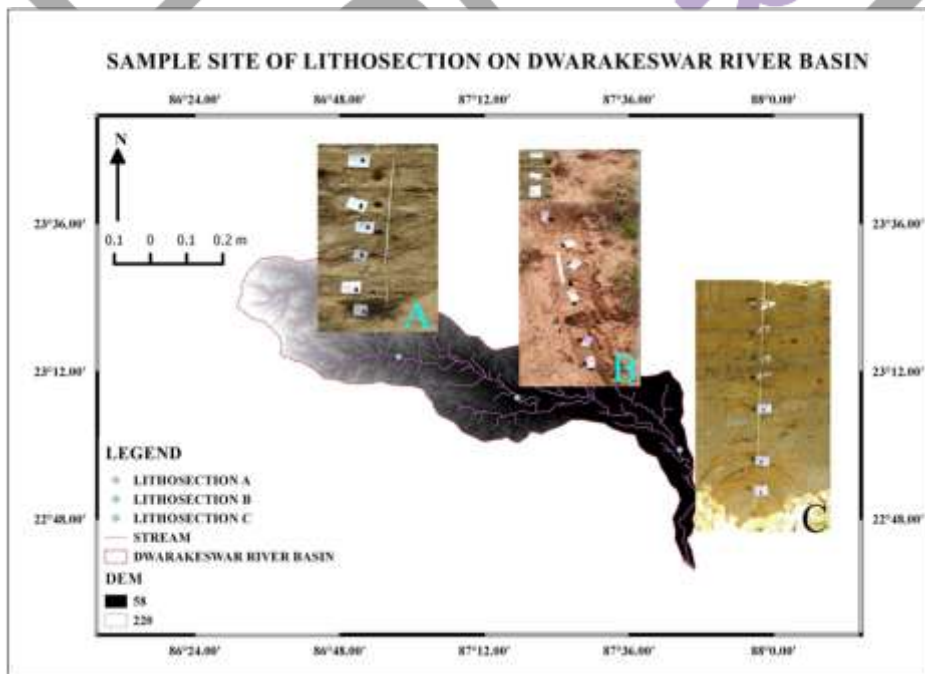
1. Level 3 flood are available lower part of the Dwarakeswar basin are generally occupied by some part of Burdwan and Hooghly district with some specific location are Dhaldanga, Ranichak, Balarampur, Srimantapur, Bara Dongal,Paschim Raypur, Salepur, Aklakhi etc.
2. Level 2 flood are available middle part of the Dwarakeswaer basin are generally occupaid by some part of Bankura district with some specific location are Dihar, Bishnupur, Belia, Naricha, Bagh Mari, Hetia etc.
3. Level 1 flood are available lower part of the Dwarakeswar basin are generally occuppaid by some part of Purulia and Bankura district with some specific location are Joykrishnapur, Abantika, Onda, Belatukri etc.



Maps and Diagrams No. 3: Flood Vulnerability Map on Dwarakeswar River Basin

VIII. LITHOSECTION:

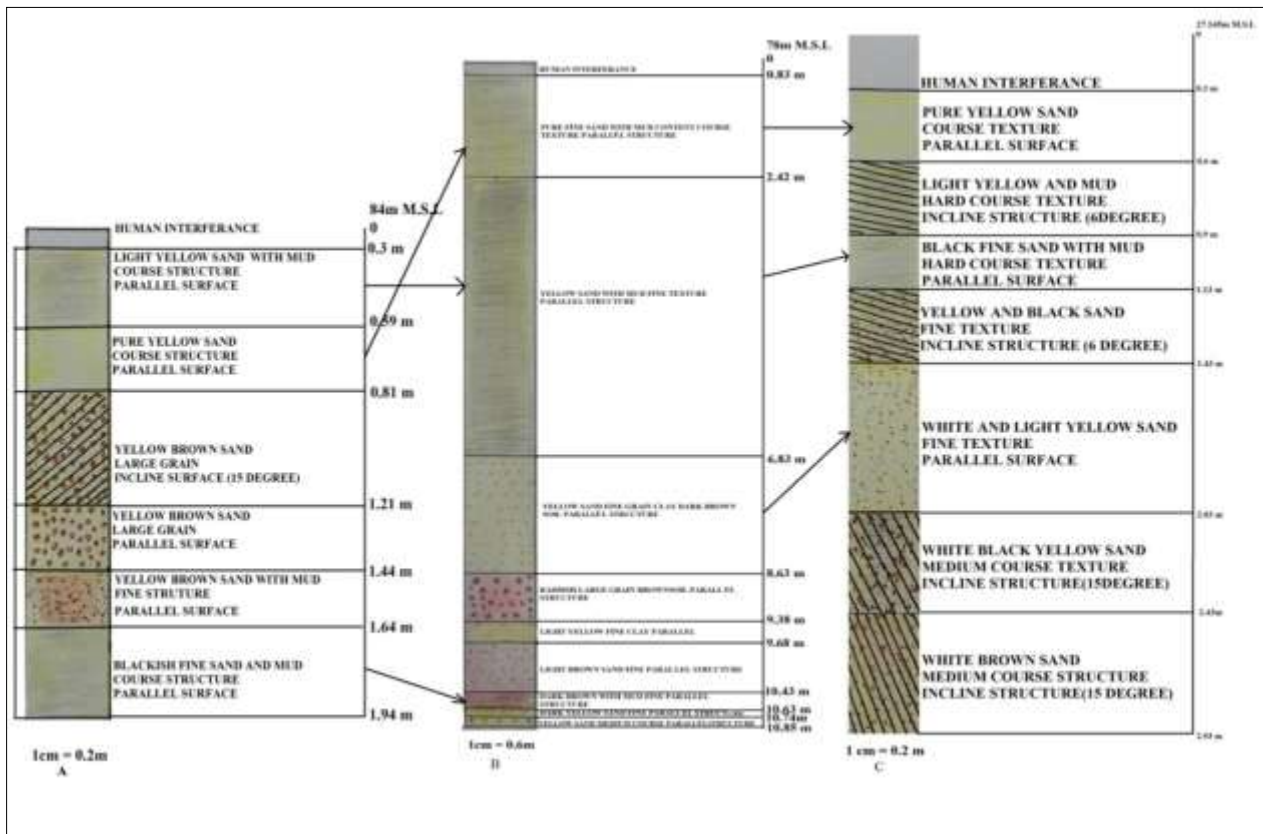
It is a sub discipline of stratigraphy, the geological science associated with the study of strata or rock layers. Major focuses include geochronology, comparative geology. In general a stratum will be primarily igneous or sedimentary relating to how the rock was formed. Lithosectional unit are classified into two major categories **Group** and **Supergroup**. Group the broadest unit of lithosection classification, comprises a thick succession of rock formation spread over large area. A group is divided into more than one formation. An association of mutually related group is known as Supergroup. Thus a supergroup and a group roughly correspond to the standard stratigraphic scale respectively.



Maps and Diagrams No. 4: Sample Site of Lithosection on Dwarakeswar River Basin

IX. LITHOSECTION RELATIONSHIP:

That is very useful techniques to determine the chronological geology of an area. In this respect we draw a relationship with 3 particular lithosection of Darakeswar river basin.



Maps & Diagrams No.5: Lithosection wise Relationship.

“A” lithosectional location is 23°13'35.06" N 87°01'17.23"E and it is situated on right side of river terrace on upper part of the basin.

“B” lithosectional location is 23°12'52.34"N 87°06'22.04"E and it is situated on right side of the river terrace on middle part of the basin.

“C” lithosectional location is 22°58'55.07"N 87°44'35.74"E and it is situated on left bank of the river terrace on lower part of the basin.

Upper part of river mainly depend on structural control in this respect mainly the fluvial sediments are transported and review of 100years climatic the water discharge amount are mainly high in the monsoon time at that time wave action and large grain are found at the 4 and 3 section so concluded that the massive flood. But otherwise we see the lateral erosion and sediments deposition are high at right bank of the river so mud particles are found but due to high river course shifting that the evidence are found as flood plain and flood margin

Middle part of the river highly effected by anthropogenic activity that the river course rapidly change and the suspended load, hydraulic drop, deposition of sediment and hydraulic behavior are change in this respect at the monsoonal time huge amount of water and velocity of water high and hydro dynamicity are also increase at this respect and local people perception wise that the right bank are highly effected by flood and river bank erosion. And this section we don't see wave action so we can determine as the right bank as a flood plain or selection wrong section. But in general way and perception of local people that the right bank of that particular region are highly affected by flood each and every year.

Lower part of the river are highly effected by anthropogenic activity that the river course rapidly change and the suspended load, hydraulic drop, deposition of sediment and hydraulic behavior are change in this respect at the monsoonal time huge amount of water and velocity of water high and hydro dynamicity are also increase at this respect and local people perception wise that the left bank are highly effected by river bank erosion. And this section we can see massive wave action so we can determine as the right bank as a flood plain or flood margin or turbulence of water. But in general way and perception of local people that the right bank of that particular region are highly affected by river bank erosion each and every year.

X. PERCEPTION OF LOCAL PEOPLE:

In the field survey, I have surveyed the three villages. One village situated near the Nandigram (Bankura) of the upper catchment of the river basin and another village situated Birbandh (Bankura) of the middle catchment of the river basin and another village is Aklakhi (Burdwan) of the lower catchment of the river basin. By the perception study of the village people I know the problem that the people faced throughout the year. I have selected the three village are represented my paper for the perception study about

the impact of changing river course land use change. There are both positive and negative impact of changing pattern of river and land use change.

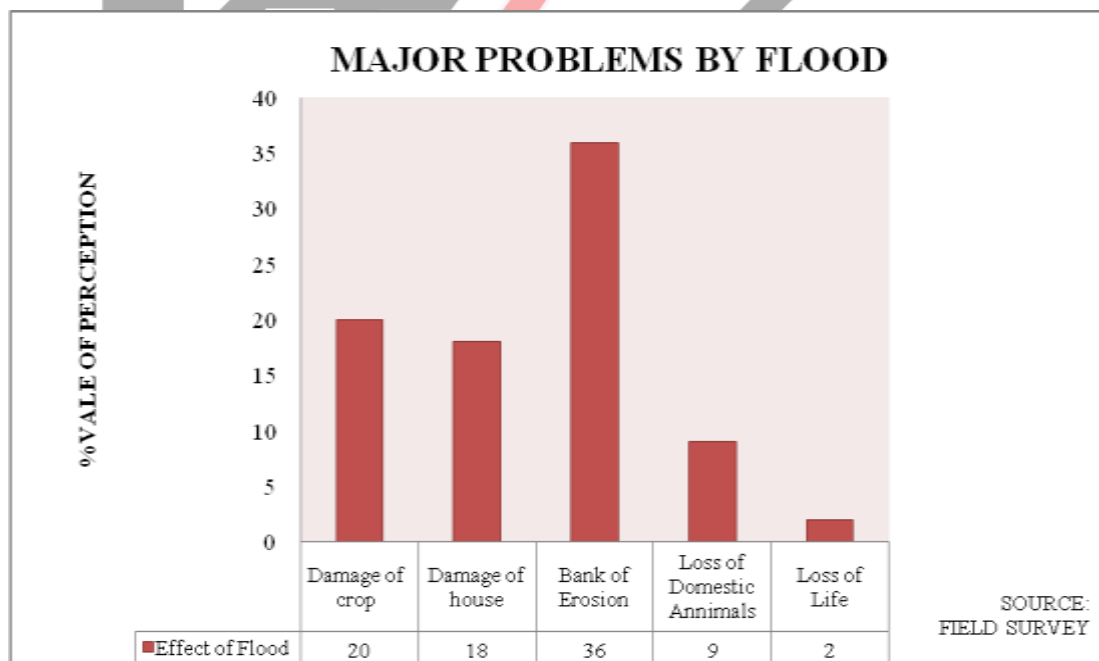
- **Major problem:** According to respondents after 1995, every year flood occurred in the Aklakhi & Birbandh village area. Causeway is constructed on the river near village as a result water in the rainy season cannot pass through the channel and become flood effected that region. In this area agriculture is the predominant activity. Cultivation is particularly in twice a year. Monsoon cultivation is mainly affected by the flood. The people of area are so poor as a result flood creates a disaster in their life.
- **Embankment erosion:** Bank erosion and channel shifting also create problem. In my study area bank erosion mainly occurred during the flood time when bank full discharge of the river occurred. Bank erosion occurred particularly at the convex part of the river. A number of people have losses their land due to meander oscillation. Total amount of land that have been loses due to erosion is 15 bigha in Aklakhi (Burdwan) & Birbandh (Bankura) village. House also damaged due to flood.
- **Occupation change:** In the Birbandh village significant occupation changes is observed due to the flood and river bank erosion. Before monsoon construction there was less number of cultivation, fishing activities throughout the year. According to respondents after monsoon huge number of man engaged in cultivation and fishing activities. This people were go to West and East Burdwan, Hoogly, Jharkhand, Bihar for their occupation as a agricultural labour, constructional labour etc. Now they are permanent people instead of seasonal migrated people.
- Damage of crops.
- Damage of house.
- Loss of life.
- Loss of domestic animals.
- Migration of people.
- Agricultural lands convert to fallow lands.



PLATE1: Embankment erosion



PLATE2: Illegal Sand mining



Maps & Diagrams No.6: Problems Related to Flood

XI. PROBABLE SOLUTION TO MITIGATE THE VULNERABILITY OF FLOOD:

Flood is a physical phenomenon but it can damage both life and property in an excessive rate. We cannot stop flood occurrence but we use some structural and non structural measures to mitigate the vulnerability of flood.

➤ Structural Measures:

- Improvement of river channel modification to improve the wetted perimeter thus helps to higher discharge within the channel.
- Proper scientifically maintain the reservoir (control the rate of siltation, increase carrying capacity, construct many dams in the upper catchment to reduce pressure and maintain a continuous flow all over the year) which are feed Dwarakeswar River.
- Flood ways are provide an outlet for flood waters during periods of high discharge and that water can help to agricultural practices.
- Maintenance levees and embankment with bolder and cementation that can prevent riverbank erosion and also control sheet erosion we can imply the afforestation techniques to prevent sheet erosion.



PLATE 3& 4: Structural Measures flood ways & Embankment

➤ Non – Structural Measures :

- Floodplain zoning and its management.
- Flood forecasting.
- Flood vulnerability zoning.
- Flood insurance that can provides economical support or beneficiary support or essential support by Central or State Government or various agencies or NGOs to recovered from their loss .
- Public awareness for Removal of Human Encroachment along river bank.
- Coir geo- textiles roll which can be used with aquatic plants to protect banks affected by strong erosion. It represent as a bio-engineering.

CONCLUSION:

Floods in Darakeswar river, a burning problem of present day scenario. It has already been mentioned that flood can't be stopped but the vulnerability of flood can be reduced by using some structural and non-structural measures. By doing empirical survey of some areas it is cleared that human activities like- illegal sand mining, encroachment on river basin, unstoppable deforestation etc destroyed the hydrological and ecological regimes of Darakeswar river. The risk of flood increasing over the period and as a result increased the rate of loss of riparian ecosystem. So, all characteristics of river have been changed. In present day local level geomorphic studies are very important because of taking immediate measures against flood and preparing policies related to flood. All plannings and policies about flood or about treatment of river health can be greatly successful by the participation of Central Government, State Government and local people who lived on the bank of the river.

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