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Flood Hazard Management in Lower Damodar Area: A Case Study of Selected Blocks of Haora District, West Bengal, India

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Abstract:

Lower Damodar Area is one of the most flood affected river basins of West Bengal. Because of that Damodar River is called as 'the Sorrow of Bengal'. Damodar Valley Corporation was established in 1948 to reduce flood in this area. Some another attempt has also been made to reduce flood hazards. But flood is still a serious problem. Haora District which is situated in Lower Damodar Area is affected by flood in almost every year. The present study concerns about the causes, affected area, prone area, damage assessment, relief measures, remedial measures of flood in Amta-i, Amta-ii and Udaynarayanpur Block of Haora District, the study area which is mostly flood affected area of this district.

Keywords: Carrying capacity, huge rainfall, spilling points, flood prone areas, flood frequency, flood damage assessment, relief measures, structural measures, non structural measures

1. Introduction

River was one of the bases for major ancient civilization such as Harappan in the Indo Gangetic plain, the Egyptian in the Nile Valley and the Sumerians in the Mesopotamia. But presently river created floods are seen as generator of hazards and sometimes disaster. Simply we can define flood as stagnation of water in a particular place for several days which affects human society most. Among different disaster occurred in India flood is most vulnerable. India holds second position in flood occurrence after Bangladesh (Centre for Science and Environment, 1996, Floods, Flood Plains and Environmental Myths). The flood prone area is mostly located in the states confined into Indo-Gangetic plain and Assam valley. Damodar, the tributary of Bhagirathi-Hugli created flood in lower Damodar area almost every year.

1.1. Study Area

West Bengal has 37, 660 sq.km flood prone area out of 88, 752 sq. km (42.4% of the total geographical area) of total geographical area (Irrigation and Waterways Deptt. Govt. of West Bengal, Annual Flood Report, 2013). Flood affected areas are spread in 111 blocks of West Bengal. Lower Damodar Basin in South West Bengal is a permanently flood prone area. Part of Bardhaman, Hugli and Haora District is in the lower Damodar region. The lower Damodar basin is very much devastated in the year 1978, 1984, 1986, 1991, 1995, 1996, 2000, 2 007, 2010, 2011, 2013 and 2015. Among these flooded years, very much devastating flood occurred in 1978, 1984, 1991, 2000 and 2015. From the absolute point of view the specific study area is located between 22° 30' 24" N to 22° 47' 2" N latitude and 87° 50' 24" E to 88° 4' 48" E longitude. The territorial extent of this study area is 365.60 Square Kilometers (as per census 2011). Administratively, the study area includes three Community Development Blocks i. e. Amta-i, Amta-ii and Udaynarayanpur of Haora district. These blocks are located in the north-western part of Haora district. On the west and south- western part, the study area is bounded by the big river Rupnarayan, demarcating the common boundary of Haora and Paschim Medinipur District. On the north the study area is bounded by Hugli district. Jagatballavpur and Panchla blocks of Haora district lie on eastern part of the study area. In the south there are Bagnan- i and Uluberia-ii blocks of Haora district. Damodar River flows through the middle portion of the stated study area.

1.2. Objectives of the Study

The main objectives of this paper are as follows-

1. To find out the causes of flood in Lower Damodar Area.
2. To identify flood prone area .
3. To find out the effect of flood in this area.
4. To find out the relief measures taken by the Government.
5. To identify suitable measures for the flood management in this area.

1.3. Data Base

Relevant data for this work has been collected both from primary and secondary sources. Primary data collected through field survey using appropriate questionnaire conducted in 2016. Published and unpublished Secondary data have been collected from District planning map of Haora District from survey of India, Annual Flood Report for the 2013 from Irrigation and Waterways Directorate, Government of West Bengal, Amta-i, Amta-ii and Udaynarayanpur community Development Block, Trans Damodar Drainage Sub-Division, Amta, Haora. Lower Damodar Construction Sub- Division, Uluberia, Haora and District Statistical Handbook of Haora District from Bureau of Applied Economics and Statistics, Government of West Bengal.

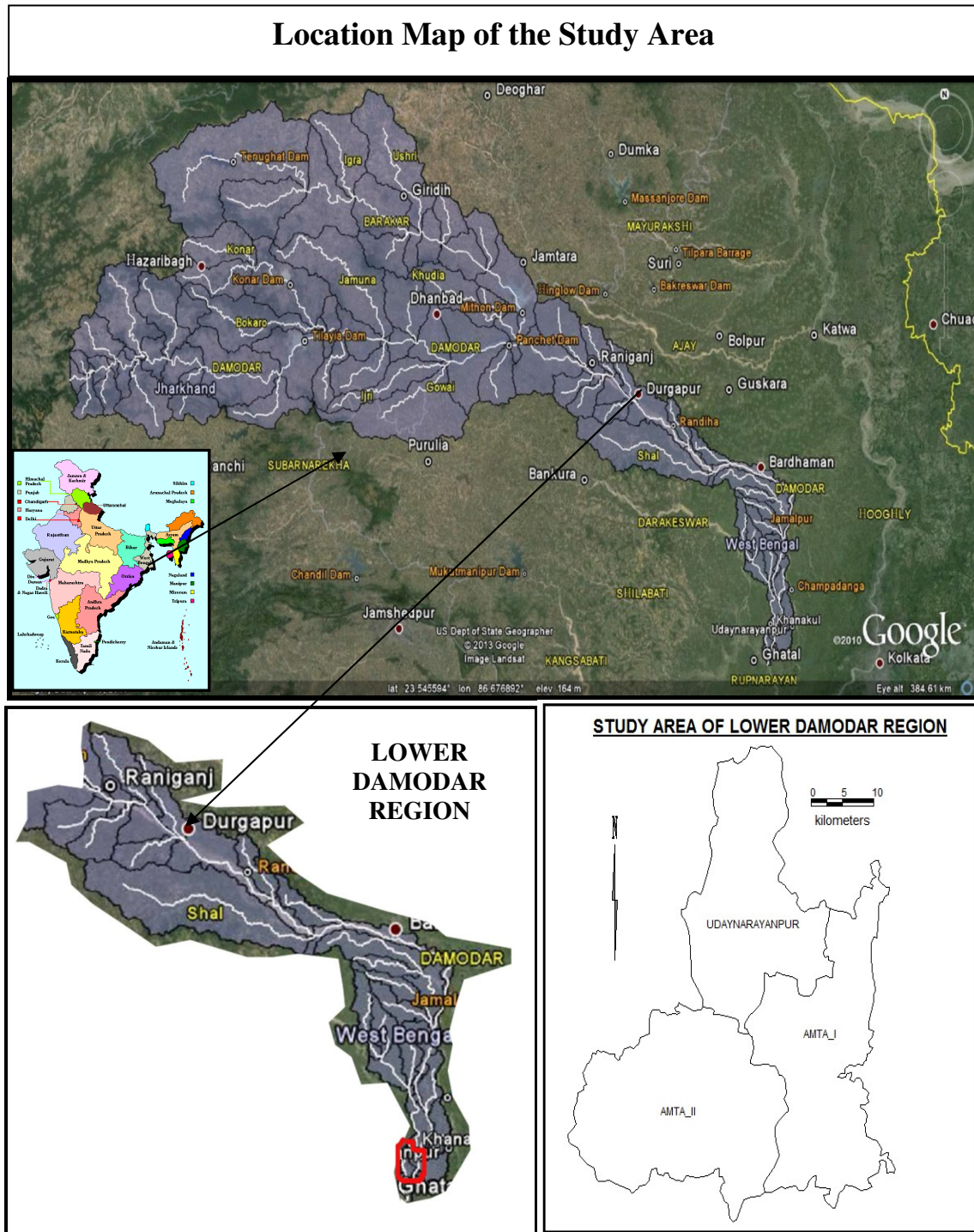


Figure 1

Source: Google Earth and District Planning Map, Survey of India

2. Methodology

Books, journals, monographs of Indian Statistical Institute, Kolkata, and Centre for Studies in Social Sciences, Kolkata have been used to formulate the problem.

Quantitative as well as qualitative data analysis method has been used to explain the result of the study. Suitable cartographic and statistical techniques have been used for easily explaining the data collected by field work. For better understanding the work has been enriched with illustration and photograph.

2.1. Causes of Flood

Causes of flood in the study area are natural as well as anthropogenic. The main causes are-

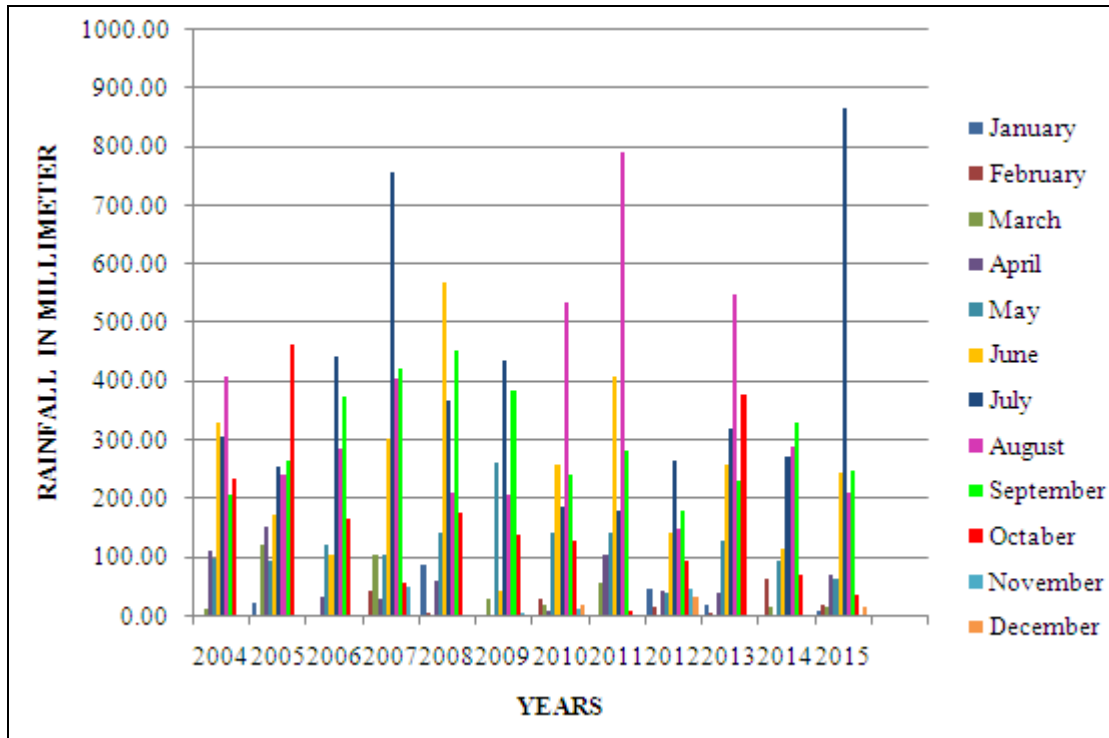


Figure 2: Monthly Rainfall In Lower Damodar Area of Haora District (2004-2015), Amta Station
Source: Trans Damodar Drainage Sub-Division, Amta, Haora

2.1.1. Huge Rainfall

During the month of monsoon (June to September) this area has received excessive amount of rainfall. Out of total rainfall almost 82 % rainfall occurred during the monsoon season. The study area of lower Damodar area has received an average annual rainfall of 1516.66 mm during 1978-2015. In this same period, eighteen years i.e. 1978, 1984, 1985, 1986, 1987, 1990, 1995, 1996, 2001, 2004, 2006, 2007, 2008, 2009, 2010, 2011, 2013 and 2015 the study area has received more than 400 mm rainfall in a monsoon month and eleven times i.e. 1978, 1984, 1986, 1995, 1996, 2007, 2008, 2010, 2011, 2013 and 2015 it crossed 500 mm. Devastating flood occurred almost in the same years and month when rainfall crossed 500 mm in a month.

2.1.2. Low Carrying Capacity

This area has been suffering from flood hazard due to low carrying capacity. The waited perimeters of Damodar have been reduced and carrying capacity of Damodar River has also been decreased.

2.1.3. Gentle Slope

Due to gentle longitudinal slope 2feet/1500 feet to 2feet/1 mile of the study area of lower Damodar area, the drainage efficiency is very low.

2.1.4. Huge Siltation and Sand Deposition

Damodar River has also lost carrying capacity due to huge siltation and sand deposition. At Beghuahana, Jamalpur Police Station, Bhardhman, where Damodar (Amta Channel) and Mundeswari bifurcated from each other a mid-channel bar formed on the mouth of river Damodar and obstacle in free flow of water through Amta Channel.

2.1.5. Tidal Effect

In the days of new moon and full moon, the spring tide occurs in Rupnarayan River. When spring tide occurs in rainy season; the river water height crosses extreme danger level (5.54 meters) and devastated the island area.i.e. Bhorta and Ghoraberia Chitnan Gram Panchayats of Amta-ii Block.

2.1.6. Ex-Zamindari Bundhs

Ex-Zamindars constructed some circuit embankment to protect their zamindari area from flood but this bundhwas made of soft clay and sandy soil and these are old too. But now the Zamindari Bandh has been breach and flood water enters into the area closed by the embankments. For this reason, flood water cannot flow down quickly from this area.

2.1.7. Elevated Embankment

In the past both banks of Damodar were opened and no embankment was there. Number of distributaries and canals were joined with or bifurcated from Damodar and flood water easily moved to Bay of Bengal through Hugli River. But drainage problem had to be acquitted when lofty embankment was made (probably around 1865) in the left bank of Damodar. Because of that, the rivers and canals which were joined with Damodar were disrupted from Damodar and not able to drain water to Damodar. For the time being the rivers and canals got silted up and collapsed the drainage system.

2.1.8. Construction of Dams and Barrages

Before construction of dams and barrages over Damodar and its tributaries, there was free flow through the river and river was capable of carrying adequate flood discharge. After construction of dams and barrages, this flood carrying capacity of the river has reduced due to siltation. Not only the downstream and up stream of the river but also the dams and barrages gets silted up and the reserve capacity of flood water has reduced. For this reason, DVC administration is forced to release water from dams and barrages.

2.1.9. Converting the River Bed in to Cultivable Land

People of the lower Damodar area used both bank 'char' as agricultural field. Human intervention in a river is very dangerous for a river. This activity destroys the carrying capacity of river and river gets silted up. Because of that flood water not freely moved towards out fall.

2.2. Spilling Points and Flood Prone Areas

Spilling points means through where flood water enters into the villages. The spilling points, identified during flood in different years are Right Embankment of Lower Damodar River from Hanidhara, under Binola Krishnabati Gram Panchayat to Betai, under Nowpara Gram Panchayat, 7 km long and Ghola, under Rampur-Dihibhursut-Asanda Gram Panchayat to Akna under Singti Gram Panchayat, Rampur Canal Left Embankment, Circuit Embankment of Mahisamuri Khal at Malik Para and Pramanik Para under Tajpur Gram Panchayat, Gaighata Khal Embankment and incomplete Dakatia Khal.

There are 109 vulnerable mouzas, villages or areas out of 225 mouzas under the study area of Amta-I, Amta-ii and Udaynarayanpur Block of lower Damodar area. Out of 81, 69 and 75 mouza of Amta-i, Amta-ii and Udaynarayanpur Block has 55, 35 and 19 vulnerable mouzas, villages or areas. The most vulnerable mouzas are located in Udaynarayanpur Block. Amta-ii Block has also some moderate vulnerable areas followed by Udaynarayanpur Block. Amta-I Block has some less vulnerable mouzas, but mouzas in Kandua Basin is so vulnerable that the Kandua Basin area has become water logged in rainy season.

2.3. Flood Affected Areas in Different Years

Spatial characteristics of flood have changed with time. Table-1 clearly indicates that flood affected areas have been increasing in recent time. Most devastating flood has been recorded in1978. In this year entire study area was submerged. Flood area has been reduced after 1978 because some structural measures have been adopted during this time. But the effect of these projects is not so longer due to haphazardly implementation of these projects. But the situation has changed during and after flood 2000. In 2000 217.77 Sq.Km area was submerged which has decreased to 163.81 Sq.Km in 2013and again increased to 341.61 Sq. Km. in 2015.

Year	Name of Block	Area in Sq. Km	Flood Affected Gram Panchayat
1978	Amta-i	118.54	Anulia, Balichak, Basantapur, Bhandargacha, Chandrapur, Kanpur, Khardah, Khosalpur, Rashpur, Sirajbati, Udang-i, Udang-ii Amta
	Amta-ii	137.45	Bhatora, G.B.Chitnan, Kashmiri, Khalna, Jhamtia, Amoragori, Thalia, B.K.Bati, Joypur, Gazipur, Tajpur, Nowpara, Kushberia, Jhikira
	Udaynarayanpur	109.61	RDA, Harali U.N.Pur, Kurchi Shibpur, Singti, Kanupat Monsuka, Pancharul, G.B.Sonatala, B.B.Pur, Debipur, Harishpur, Khila
2000	Amta-i	26.77	Balichak, Kanpur, Rashpur,
	Amta-ii	101.47	Bhatora, G.B.Chitnan, Kashmiri, Khalna, Jhamtia, Amoragori, Thalia, B.K.Bati, Joypur, Gazipur, Tajpur, Nowpara, Kushberia, Jhikira
	Udaynarayanpur	89.53	RDA, Harali U.N.Pur, Kurchi Shibpur, Singti, Kanupat Monsuka, Pancharul, G.B.Sonatala, B.B.Pur, Debipur, Harishpur, Khila
2013	Amta-i	Nil	Nil
	Amta-ii	65.21	Thalia, B.K.Bati, Bhatora, G.B.Chitnan, Amoragori, Jhamtia, Jhikira
	Udaynarayanpur	98.60	RDA, Harali U.N.Pur, Kurchi Shibpur, Singti, Kanupat Monsuka, Pancharul, G.B.Sonatala, B.B.Pur, Debipur, Harishpur
2015	Amta-i	105.70	Amta, Anulia, Balichak, Basantapur, Bhandargacha, Chandrapur, Kanpur, Khardah, Khosalpur, Rashpur, Sirajbati, Udang-ii
	Amta-ii	130.11	Bhatora, G.B.Chitnan, Kashmiri, Khalna, Jhamtia, Amoragori, Thalia, B.K.Bati, Joypur, Gazipur, Tajpur, Nowpara, Kushberia
	Udaynarayanpur	105.80	RDA Harali U.N.Pur, Kurchi Shibpur, , Kanupat, Monsuka, Pancharul, G.B.Sonatala, B.B.Pur, Debipur, Harishpur, Khila

Table 1: Flood affected areas

Source: Calculated by the author based on some collected data from the respective block office

2.4. Flood Frequency

In lower Damodar region frequency of flood is very high in general. Among the three selected blocks of Haora District situated in lower Damodar area, most of the Gram Panchayats of Amta-I Block faced flood problem only one year in 2000-2015. Only Balichak and Rashpur Gram Panchayat experienced flood hazards 2 and 3 years respectively during the same year. Another phenomenon is also seen that, Udang-I Grampanchayat is not flooded in a single year. Beside the Amta-I Block, Gram Panchayats of Amta-ii and Udaynarayanpur Block are very much flood affected. Pancharul and Khila Gram Panchayat of Udaynarayanpr Block are flooded only below three years. During the same period of time, Tajpur, KushBeria, Joypur, Gazipur and Nowpara Gram Panchayat of Amta-ii Block are flooded. It is also found that, Kashmiri, Khalna, Jhikira and Amoragori Gram Panchayat of Amta-ii Block and Kurchi Shibpur, Singti, Debipur, Kanupat Monsuka, G.B. Sonatala and B.B. Pur Gram Panchayat of Udaynarayanpur Block has experienced devastating flood in 7-9 years. More than nine years flooded Gram Panchayats are Bhatora, G.B. Chitnan, Jhamtia, B.K. Bati, Thalia of Amta-ii Block and R.D. A, Harali U.N. Pur of Udaynarayanpur Block.

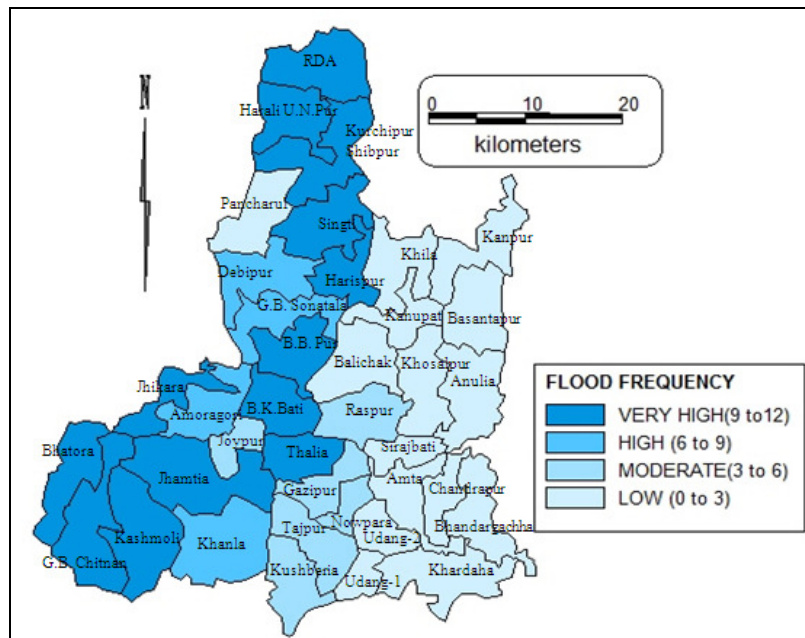


Figure 3: Flood Frequency Map (2000-2015) Gram Panchayet Wise
Source: Based on some collected data from block offices and field survey

2.4.1. Flood Damage Assessment

The flood hazards cannot be assessed without having knowledge of damage on land, water and socio-economic life. Flood damages relate with the loss of production, houses damage or destroyed fisheries damage, road and bridge damage, loss of human lives, loss of cattle lives etc. For rational flood damage assessment, total money value loss in flood is very important. In flood 2015, total money value loss of Amta-I, Amta-ii and Udaynarayanpur Block was 3016.052 lakhs, 1130.12 lakhs and 3296.452 lakhs of the respectively. Table -2 shows flood damages in the study area during flood 2015.

Nature of Damages and other Parameters	Name of the Block		
	Amta-i	Amta-ii	Udaynarayanpur
1.Date and Time of Occurrence of Flood	18/08/2015	28/07/2015	28/07/2015-14/08/2015
2.No and Name of affected G. P	12 (Amta, Anulia, Balichak, Basantapur, Bhandargacha, Chandrapur, Kanpur, Khardah, Khosalpur, Rashpur, Sirajbati and Udang –ii)	14(Bhatora, GB Chitnan, Kashmoli, Khalna, Jhamtia, Jhikira, Amoragori, Thalia, BK Bati, Joypur, Gazipur, Tajpur, Nowpara, Kushberia)	11(RDA, Harali U.N.Pur, Kurchi Shibpur, Singti, Kanupat Monsuka, Pancharul, G.B.Sonatala, B.B.Pur, Debipur , Harishpur and Khila)
3.No of Village affected	88	65	112
4.No of People affected	1, 72, 947	121250	190186
5.No of Human Lives Lost	1 (Vill-Sarpai, Bagua)	Nil	03(Narikelberia, Barda, Ghola)
6.a) No of Cattle/Live Stock lost	Nil	Nil	
b) Value	-	-	5.54 lakhs
7.Crop areas Damaged(in Hectors)	5300	6605	5607
8. Value of the Crop Damaged (Rs. In Lakhs)	15, 86, 26, 448	756.44	1801.5
9.No of Houses damage or destroyed	1396 (Fully)+ 3233(Partly)=4629	Fully-0 Partly-3724 (Cumulative)	3623(Partly) +1016(Fully)
a)Fully Value(Rs.in Lakhs)	13, 27, 59, 600	-	966.216
b)Partly Value(Rs.in Lakhs)	103, 45, 600	152.68	115.936
10.Damage to Properties other than crops and houses(Rs. in Lakhs)	2038 (637 Hectors Pond, 25480 qtl fish, Roads)	221 lac (Fisheries Damage)	407.26
11. Total Loss(6+8+9+10) in Rupees	30, 16, 05, 200	1130.12 lac	3296.452

Table 2: Damages during Floods of 2015 in Amta-I, Amta-ii and Udaynarayanpur Block

Source: Office of the Block Development Officer, Amta-I, Amta-ii and Udaynarayanpur, Haora. Year-2016

2.5. Rescue and Relief Operation

During flood, people of the study area go through the adverse situation. Government, NGO and local people are involved in that situation for flood rescue and relief operation. The steps which are taken for rescue and relief operation are opening of relief camp, opening of gruel kitchen, Deployment of boat, Deployment of medical team, opening of cattle camp and distribution of relief materials like tarpaulin, chira, gur, baby food, water pouch, rice, fodder, cash etc. Table-3 shows rescue and relief measures have been taken by the respective block of the study area during flood 2015.

Nature of Rescue and Relief	Name of Block		
	Amta-i	Amta-ii	Udaynarayanpur
1.No of Relief Camps Opened	79	23	2
2.No of People in Relief Camps/Shelter	Adult-22837Minor-4449	2076	105
3. No of Gruel Kitchen Opened	66	23	Nil
4. No of Persons Rescued	27286	1689	105
5. No of Boat deployed for evacuation	Country Boat-5Speed Boat-2Locally Arranged Boat-6	26	10 (Reserved-11)
6. No of Medical Team deployed	24	6(3 team of IMA operated in affected areas)	12
7. No of Cattle Camps Opened	37	4	4
8. No of Cattle in Cattle Camps	3987	Vaccinated- 4315 Treated- 8199Total- 12514	18
9. Relief measures taken			
a) Tarpaulin	12, 170 pcs	8661 pcs	9465 pcs
b) Chira	28, 400 kg	11400 kg/228 bags	255 qtl
c) Gur	7110 kg	3570 kg	55.8 qtl
d) Baby Food	917 kg	30 carton	875 pkt (2.18 qtl)
e) Water Pouch	1, 50, 000	41000 pouch	205000 pcs
f) Rice	628 qtl	310 qtl	24.7 mt
g) Fodder	18 mt	260 bags	-
h) Gunny Bags	-	-	17500 pcs
i) Cash (in Rs.)	8.95 lakhs	-	-
j) Disaster Management Kits	-	-	-

*Table 3: Rescue and Relief operation during Flood 2015 in Amta-I, Amta-ii and Udaynarayanpur Block
Source: Office of the Block Development Officer, Amta-I, Amta-ii and Udaynarayanpur, Haora. Year-2016*

2.6. Structural Measures to Combat Flood Hazard

Ex- Zamindars, British Government and Government of India had taken several measures to combat flood. Finally, to make a permanent solution Damodar Valley Corporation was established in 1948. But due to incomplete implementation of the D.V.C. project, these objectives were unsuccessful. After this, Damodar Area Development Scheme had been adopted in 1970-1971. But it was effect less due to haphazardly implementation. After a long time, the corrected project of Lower Damodar Drainage Scheme had started in 2004. Under this project, a channel name Short-cut Diversion Channel from Thalia point to Baxi point had been cut to channelize the huge discharge from Durgapur barrage to Amta Chanel. It was a different experience in flood, 2006. On 24 September, 2006 Durgapur Barrage released 2, 71, 675 cusec water though the drainage capacity of lower Damodar is only 25, 000 cusec water. In this situation Udaynarayanpur and Amta-ii block were washed away and the left embankment of Damodar was stand in bank fail situation. It was being feared that total Haora District will be divested like 1978. On that time incomplete shortcut channel had played an important role to control the effect of huge discharge of water.

The off take of Short-Cut Channel at Thalia was not connected with the Damodar (Amta Channel), but due to the overflow of water in Damodar, Short-Cut Channel joined itself with Damodar and 40-50 thousand cusec water flows towards Rupnarayan. As a result of that, within 5-6 days' flood water was released from the major portion of the study area. Excavation of Short-Cut Channel and construction of siphon has been completed within the year 2008.

The effect of Short-Cut Channel was clear in the year 2009. Gazipur, Nowpara, Tajpur, Kushberia, Saonriya and Kamargoria village under Jhamtia Gram Panchayat, Dhaipur and Mainan village under Thalia Gram Panchayat which are located in the left embankment of Short- Cut Channel, were not affected by flood. On the other hand, Jhamtia, Amoragori, Joypur, Ghora Beria Chitnan, Bhorta Gram Panchayats which are located in the right embankment of Short-Cut Channel had experienced devastating flood during the same year. Short-Cut Channel has protected the left areas of left embankment, but due to this some areas like Joypur in the right embankment have experienced flood after a long time. Not only that, the old drainage system of Amta-ii and Udaynarayanpur has been collapsed.

2.7. Peoples Suggestion for Reducing Flood Hazards

Respondents of different village have suggested some measures to control flood hazards.

(1) Need controlled release of water from D.V.C. Most of the villagers opined that if the D.V.C. release water in a rational and pragmatic way, then flood would be controlled in the Lower Damodar Region.

(2) Some respondents emphasized on creation of both side embankments. They believe that, embankment would protect their livelihood.

(3)Excavate lower Damodar and Cannels to control flood hazard. Actually lower Damodar River gets silted up and the carrying capacity of the river has been reduced.

(4)Few people opined that economic development can reduce flood damage.

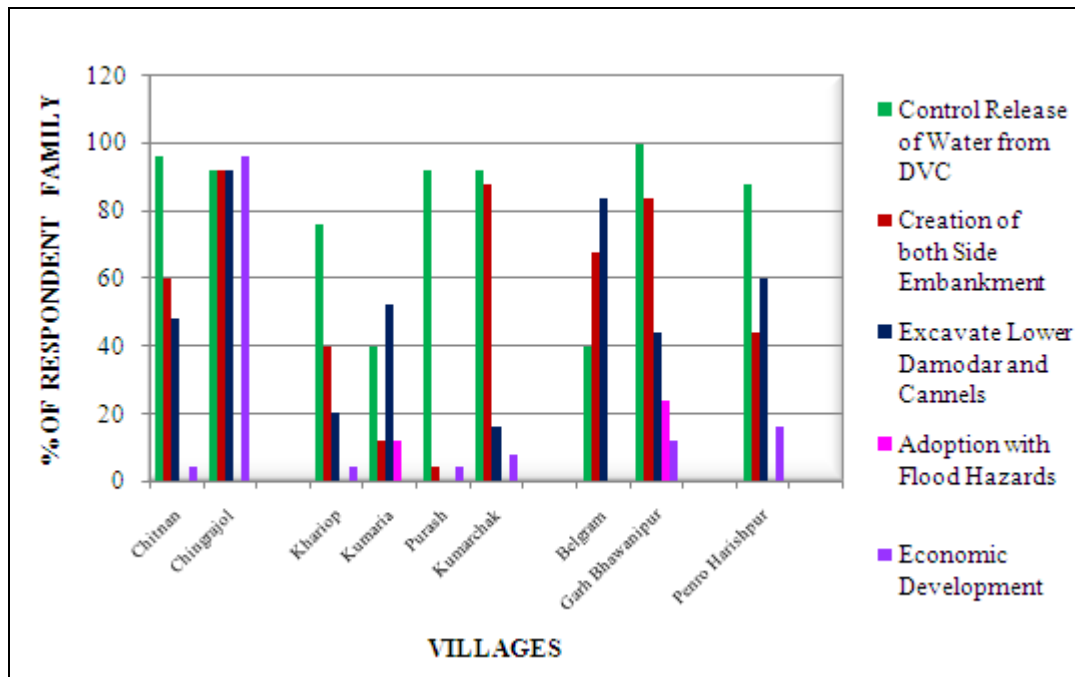


Figure 4: Peoples Suggestion To Reducing Flood Hazards

Source: Field Survey

During the field survey, the researcher interacted with aged people of the study area. They share their experience with the researcher and suggest their opinion to combat with flood hazard. Those suggestions are compiled below-

(6)Needed more flood shelter in flood prone areas.

(7)Arrange sufficient amount of relief materials like chira, gur, rice, tarpaulin, clothes etc.

(8)Set up new tube well which stand above the flood water level, so that the tube well will not submerge in the flood water.

(9)Need sufficient cattle shelter or highland for cattle during flood.

(10)Proper monitoring or repairing the river side embankment.

(11)Effective and proper flood warning which will give them enough time to save their property and life.

(12)Proper and good treatment care both for human beings and animal husbandry, arrangement of essential medicines and fodder should be needed.

(13) Local people also suggest some local varieties of crops which can resist flood like Dhanche, Sola, Mete Dhan, Orah Dhan can be cultivated in monsoon months.

3. Conclusion

Several measures have already been taken to arrest the flood but goes in vain. Huge amount of money has already spent for planning and implementation for different projects. But the result is less what it should have been. So, the view point regarding flood should be changed. Adjustment with flood hazard is the wise way for survive in flood prone areas and for sustainable development.

Structural measures like raising and strengthening of embankment, excavating of rivers and canals will not be effective for future. These would face the same problems which are faced in present. Moreover, the structural measures are very expensive. So, nonstructural measures like changing cropping pattern, effective and scientific flood warning system, awareness programme, insurance of crops and properties etc. can manage flood problem. It is also mentioned that; flood is most disastrous to the poorer people than richer. So, Priority should be given on economic development. Ultimately, we cannot stop flood hazards and that's why people should live with flood.

4. Acknowledgement

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