



# AN ASSESSMENT OF FLOOD AND ITS IMPACT ON HUMAN SOCIETY: A CASE STUDY AT KANDI BLOCK, MURSHIDABAD

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**ABSTRACT:** Flood is such a catastrophic event to the world, which shakes the socio-economic structure of any regions instantly. Kandi block of murshidabad district is known as flood prone area as it envisaged many severe floods.

Data have been collected to using primary and secondary sources. Primary data were collected from using simple random sampling technique in flood effected area. Secondary data were collected from office as well as using satellite images, SRTM dem and other sources. In addition, different types of cartography and statistical technique have been used to demonstrate the project.

The flood of this region is mainly due to poor drainage system, low relief and sudden downpour. The result also shows that high intensity zone covers hizole, andulia, purandarpur and kumarsanda panchayats; moderate intensity zone covers gokarna-i, gokarna-ii, mahalandi-ii, jashohori anukha-i, jashohori anukha-ii panchayats and low intensity zone covers mahalandi-i panchayat of the block.

Some management steps have been used such as methodically build up embankment, river dredging, kandi master plan etc to overcome the future flood situation of the region.

**KEYWORDS-** Flood intensity zones, Poor drainage system, Kandi master plan.

## INTRODUCTION

The mayurakshi basin (MRB), one of the most flood-prone areas of India, registers flood almost every year. On the other hand, flood creates and modifies the fluvial landscape and on the other, it brings sufferings to the people. In the year 1998, the release of 19000 cusecs of water on 2<sup>nd</sup> September from tilipara barrage triggered inundation in the kandi subdivision on destroying crops spreading over 18000 acres of land. In the year 1968, the Mayurakshi, Brahmani, Dwarka and Gombhira rivers flooded simultaneously affecting kandi subdivision. The water level rose to maximum of 7 feet above the normal level [1]. The Mayurakshi system of river is rainfed. After construction of massongore dam, the main river Mayurakshi have no flow after monsoon months.

Occurrence of frequent flooding in district of murshidabad is directly impact on agriculture system where the agriculture is the main livelihood for the peoples [2]. River floods occur when a river overtops its banks, potentially causing bank failures and inundates adjacent areas [3]. Two main rivers are passing through this block, one is Dwarka and another is Mayurakshi. Drainage density of kandi development block is much higher than the other block of Murshidabad district [4]. Kandi suffers from flood in rainy season due to lack of making proper drainage system [5]. Riverine flooding is one of the most frequent types of flooding, which is caused by long-term rainfall and gradual increase of water level [6]. Floods are one of the most relevant natural hazards which can become in natural disasters and can occur anywhere after heavy rain events. Some 1.5 billion people were affected by floods in the last decade of the 20<sup>th</sup> century (World Meteorological Organization, 2015) [7]. River flood represents the most common geomorphic hazard encompassing a wide range of events like largely unpredictable, highly localized. According to the geological history of the moribund delta formation of Ganga system of West- Bengal, Kandi block of Murshidabad district was formed by gradual deposition of sand, silt and clay and is experiencing floods almost in every year since the period of immemorial. Topographically this block is almost a part of flat moribund deltaic flood plain with very mile slope (0.19m./km.or1:5280) [8]. Kandi is one of the maximum floods affected blocks in Murshidabad. The Hijal beel, the central part of the kandi block along with its surrounding areas and areas along the river Dwarka are affected by floods almost every year [9]. About 1,800 sq.km. of area in the neighbourhood of kandi town lying on the west bank of the river Bhagirathi is flooded by the combined discharges of the rivers Mayurakshi ,Dwarka Brahmani,Gambhira,Kopai and Bakreswar of which Mayurakshi is the main contributor [10].

## STATEMENT OF THE PROBLEM

Flood is such a natural hazard that can disrupt the socio-economic condition of anywhere and especially if there economic structure depends on the primary activities. So for being the kandi block (fig-1) a flood prone area there is 'kandi master plan' to be protected from this hazard and it was supposed to be successful. But this block is struggling still now without any proper successive management against flood.

During flood this block faced up the following issues:

- i) During flood the cultivation is badly affected.
- ii) Houses and agricultural lands are very much damaged specially the kaccha house.
- iii) Occur loss of life and outbreaks various diseases.

So, overcome the adverse situation the block needs to successful the 'kandi master plan'.

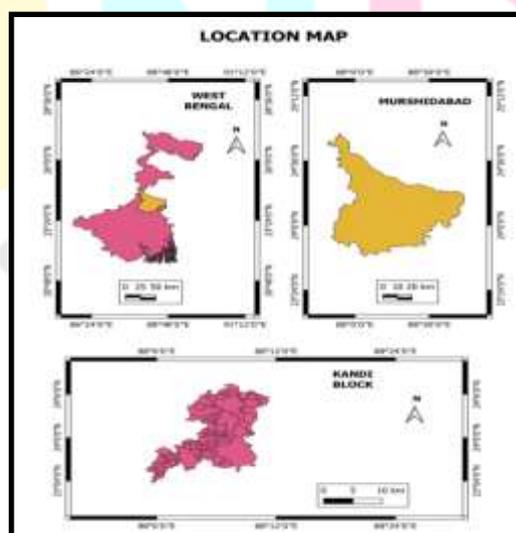


Fig-1: Location Map of Kandi Block

## OBJECTIVES

- a) To determine the intensity of flood zone area.
- b) To identify the reasons behind the flood of such area.
- c) To find out the impact of flood on human society.
- d) To propose some management steps to reduce the flood situation.

## MATERIALS AND METHODOLOGY

### MATERIALS

In this study, two types of data have been utilized primary and secondary to constitute the paper.

#### a) PRIMARY DATA

Primary data is collected to visit the field around interested area. 50 samples are collected to visit the study area. The local people helped to gather the information about our interest which supported us to establish the project.

#### b) SECONDARY DATA

Secondary data is a pre-collected data. We have exercised on many research projects and gathered difference types of data that made our project highlighted. Kandi block office also has been visited and collected secondary data as well as satellite images are collected to conquer the project.

### METHODOLOGY

Methodology is a very essential part for any research paper. It helps to understand the process which through the research paper has been flowed. We have established our paper by follow up two methods. At first the data have been collected and after that the collected data have been presented with difference software application.

#### a) DATA COLLECTION

Data collection is the most important part to prepare a research paper. For prepare this paper the data has been collected from two sources which are primary and secondary.

#### b) DATA PRESENTATION

Data presentation depicts the gathered information are shown with various statistical methods and diagrams and so on by software application. Here collected primary and secondary data have been displayed with various software applications. The diagrams, like-‘line graph’ and ‘bar diagram’ have been presented by ‘MSEXCEL 2007’. ‘MS WORD 2007’ also has been used for typing the entire project. ‘DIVA GIS’ has supported to get the map of ‘West Bengal and Murshidabad’ in ‘.shp’ format to make the location map of the study area. From ‘BHUVAN’WEB ‘SRTM ‘LISS-3’ satellite images have been collected to create elevation map and drainage system of the study area. And ‘QGIS 3.16’ software has very well assisted to make the diagrams, like-location map, elevation map and drainage system.

With the help of all above mentioned data and software the project has been established significantly.

## RESULT AND DISCUSSION

Kandi block lies in the Mayurakshi river basin area and it is the western part of Murshidabad district. The main passing rivers of this block are Mayurakshi (Bele), Kuye, kana-Mayurakshi, Dwarka and Babla.

Kandi is a flood affected block of 26 blocks of Murshidabad district. This block is covered with ten Gram Panchayats. The Gram Panchayats are- Jashohori Anukha-1, Jashohori Anukha -2, Andulia, Purandarpur,

Hizole, Gokarna -1, Gokarna-2, Mahalandi-1, Mahalandi-2 and Kumarsanda. Topographically, this block is almost a part of flat moribund deltaic flood plain with very mild slope (0.19m./km. Or 1: 5280) and having 278.94 Sq.km. Area. Pedagogically, thick alluvium soils of recent origin covers almost the whole area. Hydrologically, large numbers of seasonal water logging areas also exist here. Seasonality of rainfall i.e. Intensive rainfall during monsoon period makes an adverse flood situation almost in every year.

The climate of this Block region is characterized by grim summer with rising of temperature to about 41 degree centigrade followed by the rainy season and monsoonal rainfall pattern very recently have altered to some extent. Total amount of rainfall during monsoon months have not been changed notably but the irregular rainfall pattern have been noticed due to arrhythmic short ranged outburst interleaved by long range rainless day. Winter season is moderate with lowest temperature varying from 13 degree centigrade to 09 degree centigrade.

Basically this place is inundated in the time of rainy season. Although all the administrative areas are more or less flood effected but the quantity of inundation is not same for all the areas of this block. According to the severity of flood, there are shown three zones of the of the flood prone areas, one is high intensity zone, another is moderate intensity zone and last one is low intensity zone (fig-2). Furthermore it has been compared the extent of flood with total are as per panchayat (TABLE - 1 ) and presented graphically the extent of flooded area to total area as per panchayat of 2015 of this block (fig-3) as well.

#### a) High intensity zone

The extent of flooding in the areas covered by this zone is higher than all other areas of this block. The names of the panchayats of this zone are- Hizole, Andulia, Purandarpur and Kumarsanda.

#### b) Moderate Intensity Zone

The extent of flooding in the areas under this zone is lower than high intensity zone. The panchayats' names are- Gokarna-i, Gokarna-ii, Mahalandi-ii, Jashohori Anukha-I, Jashohori Anukha-ii.

#### c) Low Intensity Zone

The area under this zone is not much affected by flood. The panchayat is mahalandi-i.

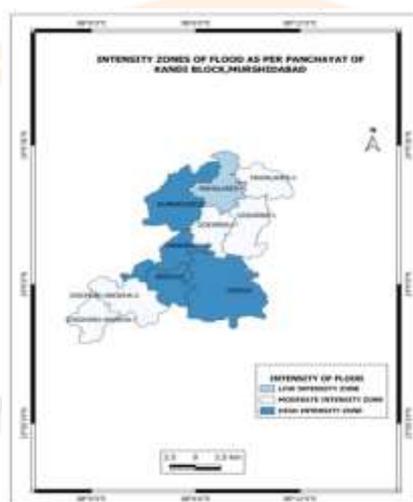
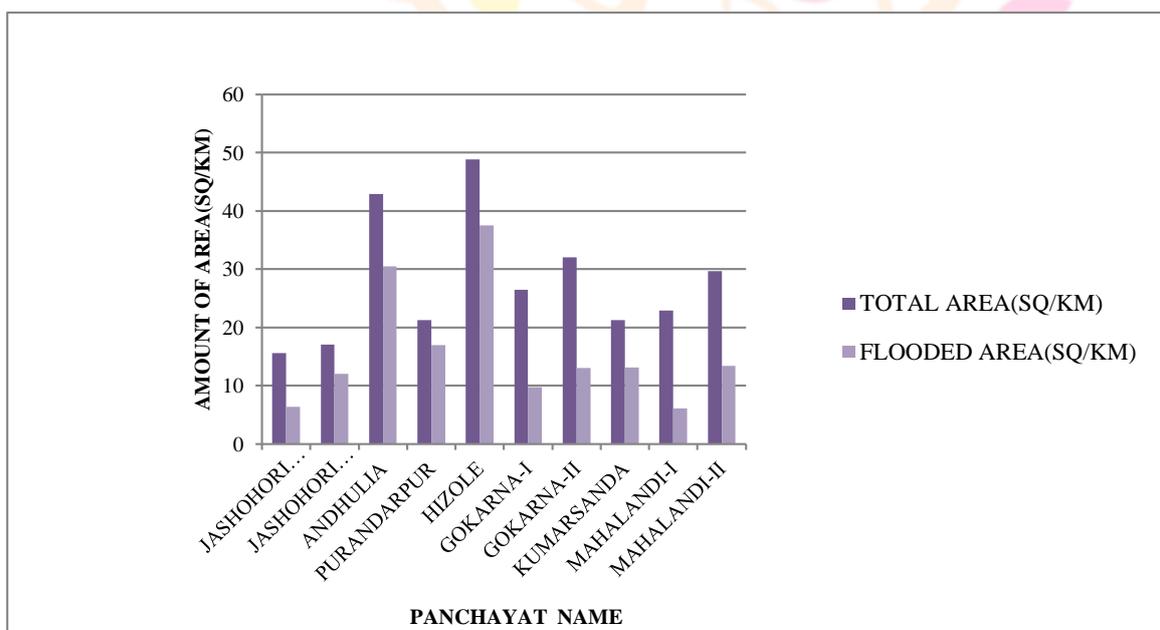


Fig-2: Flood Intensity Zones of Kandi Block

**Table -1 Comparison of the Extent of Flood with Total Area as Per Panchayat (2015)**

Sl No	Place	Total Area(Sq/Km)	Flooded Area(Sq/Km)	Flooded Area (%)
1	Jashohori Anukha-I	15.59	6.31	43.2488
2	Jashohori Anukha-Ii	17.07	12.03	66.55607
3	Andulia	42.91	30.46	73.81609
4	Purandarpur	21.22	16.93	78.78338
5	Hizole	48.89	37.52	83.58209
6	Gokarna-i	26.48	9.75	44.37311
7	Gokarna-ii	32.07	12.99	43.1992
8	Kumarsanda	21.29	13.11	61.57821
9	Mahalandi-i	22.92	6.04	26.352523
10	Mahalandi-ii	29.67	13.37	57.33276

Source: 'An Assessment Of Flood With Reference To Deltaic Plain: A Case Study Of Kandi Development Block, Murshidabad,(W.B.)' (2016), Koushik Barick



**Fig-3: Bar Diagram**  
Showing the Extent of Flooded Area to Total Area as Per Panchayat (2015)

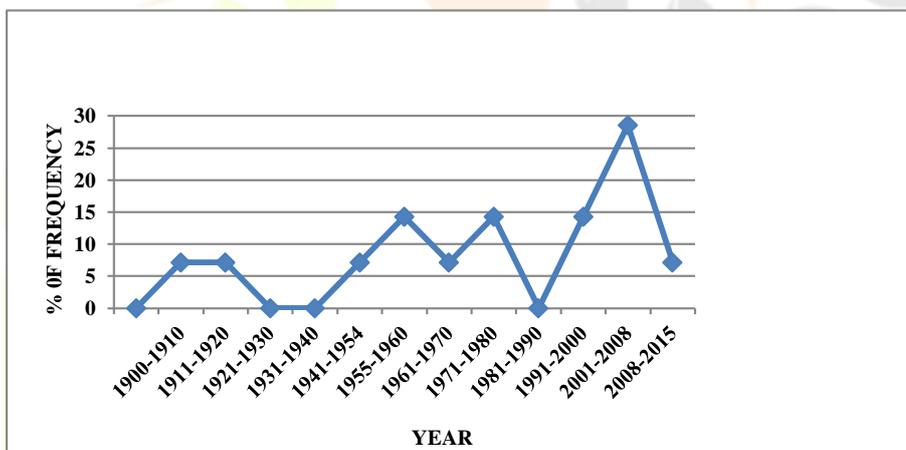
## REASONS BEHIND THE FLOOD

Flood such a natural hazard that basically occurs for rain. Having said that, there are so many human interferences behind it. History depicts (table-2) that the kandi block is experiencing this condition from long time. Through the graphical presentation (fig-4) it can see that the trends of percentage of flood frequency (1900-2015). There are some specific reasons behind it. With the previous evidences of here the reasons can be divided into two, one is natural reasons and another one is anthropogenic reasons.

**Table -2 Flood Histories**

Range Of Time	Flood Frequency	
	Frequency	% Of Frequency
1900-1910	1	7.14
1911-1920	1	7.14
1921-1930	N.A	N.A
1931-1940	N.A	N.A
1941-1954	1	7.14
1955-1960	2	14.28
1961-1970	1	7.14
1971-1980	2	14.28
1981-1990	N.A	N.A
1991-2000	2	14.28
2001-2008	4	28.56
2008-2015	1	7.14

Source-Kandi Block Office



**Fig- 4: Trend of Percentage of Flood Frequency (1900-2015)**

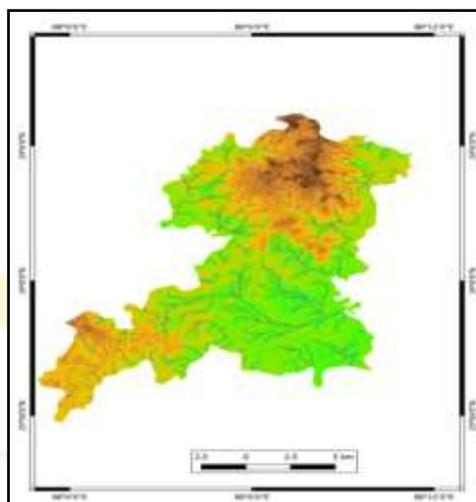
**i) NATURAL REASONS**

Natural reasons indicate that there are no human interferences. There are some natural issues behind the flood of here. The reasons follow as:

**a) Poor Drainage System**

It has been observed that most of the part of kandi block, specially the south eastern part, is suffering under poor drainage (fig-5). Large number of rivers likes mor, beli or tengramari, kuye, banki etc. have concentrated in hizole beel and influxes with dwarka river within very short range of space. It should also be mentioned that dwarka river before interception of these rivers has conceived some other

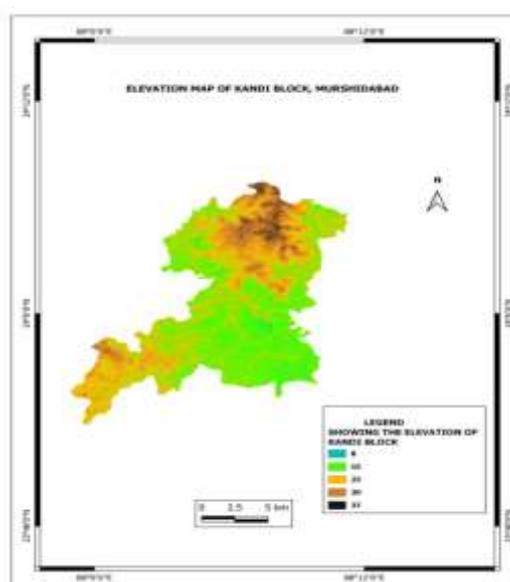
significant rivers just north of kandi block. So, in general situation, dwarka itself becomes brimful with its own huge volume of water as well as it has not any further ability to carry out any extra water debouched by the tributaries. Moreover, large number of river segments have spaced interwovenly in the confluence zone of mayurakshi - kuya river in such a fashion that no one could find their paths due to abyssal submergence by monsoonal water.



**Fig-5: Drainage System of Kandi Block**

#### **b) Low Average Slope**

Average slope of this region is 0.19 m. Per 1 km, which is further reasonably low in the south eastern part of this block. Due to such poor physiographic slope (fig-6) swift water movement is beyond expectation. There are no significant slope & relief differences and the water pressure during monsoon is much stronger in the tributaries. So from this information, inference can easily be drawn out that the parent stream dwaraka has not ability to carry the combined discharges of the tributaries which is about 25% greater than Master River. So, it is highly responsible for inundation.



**Fig-6 Elevation Map of Kandi Block**

### c) Massive Downpour Within Very Short Range Of Time

As per the perception of sufferer and previous record the prominent reason behind the flood of here is massive rainfall. Before, it has been mentioned that the block suffers a grim summer and irregular rainfall pattern.

According to the record of previous years, it is shown here that some monsoons have more rain and some monsoon less. The extent of rain at monsoon time having the block is not enough for the inundation condition. It has been experienced that the massive downpour of eastern states is mainly responsible for the adverse condition of here.

During 23rd to 25th September, 2007 amount of rainfall was 174.8 mm. recorded by Kandi Meteorological Station is not just enough to inundate the region. But large amount of rainfall in the Chottanagpur area and the Rarh region of West Bengal are mainly responsible for flood. About 872.4 mm. or more rain within 3 days (19th to 21st September, 2000) in the study area is highly responsible for acute flooding in the Kandi block and surrounding areas. About 358.2 mm. rainfalls during 9th to 11th July of 2006 and 435.4 mm. rainfalls during 9th to 13th July of 2007 had beaten the region black and blue with flood surge.

### d) Huge Siltation And Deposition Of Sand In Beel And River

Siltation and sand deposition to river is a part for inundation of here. The rivers Mayurakshi, Kuye and Mor have lost its carrying capacity for siltation. The Reason for the siltation is reducing of water from different dams or barrages. And at the monsoon time the river or beel can't carry the extreme water causing condition.

## ii) Anthropogenic Reasons

When anything is occurring for human activities then it is called anthropogenic reasons. Now days the flood of the study area is not only because of natural causes, some anthropogenic reasons proportionally responsible for it. The reasons have been discussed below.

### a) High Embankments Construction

Present time mostly rivers is controlled by the advanced technology of engineers e.g. embankments. All the rivers of the kandi block is manage by purely river embankment for about more than 100 k.m. length and with the height of 4.26 m. to <6.40 m. Almost interval of 2-3 years the height of the embankment is increasing to keep balance with flood height. In 2007, centre pool of Dwarka-Babla system has been raised up almost about 0.914 m.

### b) Erection of Dam and Barrage

There are some dams and barrages that built up over the passing rivers through the block. The Massanjore dam and the Tilipara barrage are situated over the Mayurakshi river, Farakka barrage across Bhagirathi river, Deucha across Dwarka have conclusive effects on kandi block. These projects are felicity to upstream habitat but it is course to downstream habitat. These dam and barrages have been constructed to increase the interest of irrigation but the experience speaks out that facilities of irrigation are much lesser compare to vulnerability of flood wildness. In the monsoon time due to heavy rain a huge volume of water is reduced from dam and barrage which is beyond the retaintibility of the rivers and as a result kandi block suffers a massive flood surge. In this century two remarkable floods which were in 2000 and in 2007 is because of sudden discharge of water from dam and barrage.

During the flood of 2000, within 5 days (8<sup>th</sup> to 22<sup>nd</sup>) Tilipara barrage reduced 52,884 cusec water and consequently the habitants of the kandi block experienced a gigantic flood. After that, during 2007 the block again suffered a massive flood because of water reduces from Tilipara barrage.

## IMPACTS OF FLOOD ON HUMAN SOCIETY:

The kandi block is flooded in the rainy season with more or less all mouzas. The human society is badly affected during the flood but here one evidence is presented of the year 2015 (TABLE-3). We can see in the previous mentioned year the quantity of vulnerable people as per panchayat graphically (Fig-7). There is shown vulnerable situation on many fields, like- socio-economic, communication etc.

### i) Socio-economic Impact

A huge part of population of this block makes their livelihood depends upon the agriculture. So, the occurrence of flood disrupts the socio-economic flow of this block. History says the time of occurrence of flood is from June to October in this region and as a result the farmer needs to suspend their cultivation. For that the productivity of paddy is badly harmed where it is the main crop of this block and also other seasonal crops owing to stagnation of water. The livestock sectors also have an economical role for many of this region but that also suffers a trouble during flood.

### ii) Impact on Residence

For the occurrence of the flood the residence is very much badly affected. We can see collapsing of mud built houses, cowsheds and hut. As a result the people and domestic animal of this region become homeless.

### iii) Loss of Life and Outbreak of Various Diseases

When this flood occurs severely then we can see a huge loss of human and also domestic animals' lives from different areas of this block. And it has an effect on economic structure of this region. We also got witness of outbreak of various water borne diseases, like-jaundice, enteric, cholera etc which are also harmful for human life.

### iv) Communication Impact:

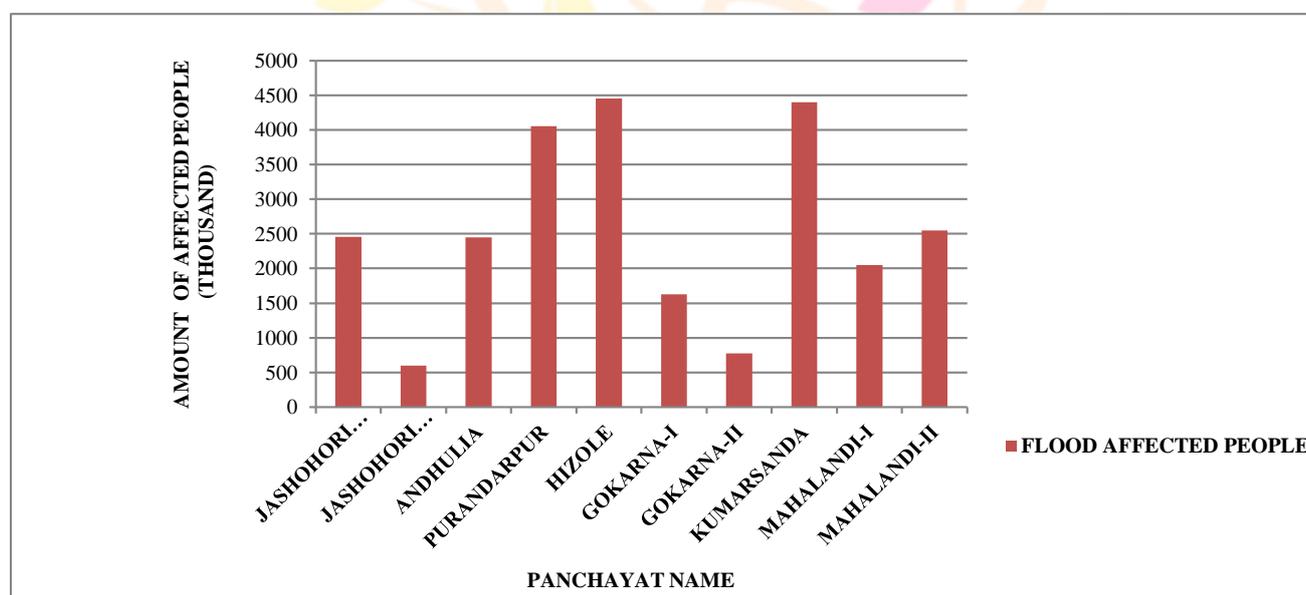
For the stagnation of water the roads are blocked and the communication system is totally disrupted for long of this block during flood. And after flood the roads specially mud roads become very much damaged.



**Table-3 Flood Affected People and Flood Shelter In Different Panchayat In Kandi, 2015**

Sl No	Name Of The Gram Panchayat	No Of Flood Centre	Flood Affected People
1	Jashohori Anukha-I	16	2460
2	Jashohori Anukha-Ii	8	600
3	Andulia	13	2450
4	Purandarpur	18	4050
5	Hizole	15	4450
6	Gokarna-I	5	1625
7	Gokarna-II	3	775
8	Kumarsanda	16	4400
9	Mahalandi-II	9	2050
10	Mahalandi-II	13	2550

Source: 'An Assessment Of Flood With Reference To Deltaic Plain: A Case Study of Kandi Development Block, Murshidabad,(W.B.)' (2016), Koushik Barick



**Fig-7: Bar Diagram**  
**Showing the Extent of Affected People as Per Panchayat (2015)**

## CONCLUSION

To depending upon the previous discussion it can say that kandi block is such a flood prone area. The last severely flood occurred in the year 2015 at this block. After that there has not been noticed such a severe flood but at the monsoon time the water level is high to agricultural land of some areas of this block in every year. Paddy is the main crop of this block and the prime time of cultivation for it of here is rainy season. So the huge loss of productivity of paddy as well as of the other crops disrupt the economic structure of here where it is mostly depends upon the paddy cultivation. Without this we can see in the region the origin of water born diseases, loss of life, damaged of residences and so on so forth. So along with all previous evidences can come to a point that the occurrence of severe flood very much disrupted the human society and as well as the stagnation of water at croplands in every year at monsoon time to some areas disrupts the agrarian sector. Finally to combat against this natural hazard we need some strategies.

The proposed steps are:

There is a 'Kandi Master Plan' to protect from this flood but it has not been completed. Prescribed steps on 'Kandi Master plan' as follow:

Raising and strengthening of 223 km of existing embankments on river mayurakshi, bele, dwarka, kana-mor, kuye and babla.

ii) Bank protection work for a total length of 38.72 km. At different reaches of different rivers.

iii) Resuscitation of drainage channels namely swarupkhali (8,30 km), jibonti (9 km), banki (14.30 km) and jhum jhum khali for a total length of about 40 km.

iv) Renovation of 57 nos of existing sluices.

v) Widening of 12 nos of existing bridges.

vi) Construction of 3 nos of new bridges at sabitrinagar (river kuye), andulia (river bele) and shrikrishnapur (river babla).

vii) Secondly, to increase retention capacity of the passing rivers through this block.

viii) And last but not the least, people of this block should make their residences or roads planfully not follow the bank of the rivers.

There is no certainty to say that the flood of this region can be totally stopped since it is depended upon the rain but we must can try to mitigate the scale of the flood along with the proposed steps.

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## ACKNOWLEDGEMENT

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**Contribution Of Authors:** Ankita Ghosh - Investigation, Methodology, Data collection, Data analysis, and Writing original draft.

Dr. Sanatan Ghosh – Conceptualization, Methodology, Supervision and Visualization.

**Founding:**No founding was received.

**Conflict Of Interest:** None of the writers have any conflicts of interest to declare.

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