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An Analysis about Flood Situation in Daspur-I Block under Ghatal Sub-Division of Paschim Medinipur District in West Bengal, India with a Comprehensive Analysis of Environmental and Societal Causes

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Abstract:

The paper discussed about the situation & environmental and societal causes of flood, occurred at Daspur-I Block under the Ghatal Sub-Division, Paschim Medinipur District, West Bengal. Daspur-I Block is considered one of the most vulnerable areas out of the five blocks under the Ghatal Sub-Division. 50% of Mouzas are flood affected and inundated by flood water during the period from July to October every year. The River Silabati and a tributary of the Kangsabati named Cossey, flow through the block. A flood is a natural hazard that creates an unexpected threat to human life and property. The study is based on field surveys of the local people of 10 No Gram Panchayats under the Daspur-I Block and different data for the last 11 years, which have been collected from the Daspur-I Block Office and the Irrigation and Waterways Department, Ghatal. The years of the occurrence of floods in the last 11 years are 2011, 2013, 2015, 2017, 2019, 2020 and 2021. Heavy rainfall and heavy water discharge from dams increase the intensity of flooding in the Daspur-I Block. Floods cause damage to a large number of Agricultural Crops, Livestock, Roads, Houses, School Buildings, River Embankment, Ponds, Tube-wells and Electrical Equipment.Floods also largely affect the health system and commercial activities. Descriptive Statistics, Quantitative and Qualitative Methodological Principles are adopted for this study with suitable illustrations of the map of the average rainfall, total rainfall, maximum water level of the river and different flood-affected characteristics. Flood Prone Mouzas are identified based on previous records of floods to alert the villagers of that area before the occurrence of a flood. In this analysis, the Flood Warning Technique and the Long Term-Short Term-Emergency Flood Management Plan (L-S-E Flood Management Plan) are designed to minimise the severity and combat flooding in the future.

Keywords: Flood, River, Vulnerability, Daspur-I Block, Embankments, Flood Management Plan.

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Introduction

Floods are the expression of a natural hazard. Drowning circumstances are created when water levels in the channels increase and spill over, flooding land and populated areas. Surface runoff overflows onto nearby low-lying flood plains when river channels and streams can no longer handle the additional water. Many people are suffering in their daily lives.

Floods cause huge damage to public buildings, school buildings, electric equipment, tube-wells, motors, pumps, agricultural crops, roads, and communication systems. Floods also have a significant influence on business activity. Floods are becoming more common and severe in many areas, including Daspur-I Block under the Ghatal Sub-Division, Paschim Medinipur District, West Bengal, which raises serious questions regarding the ways in which human, societal, and environmental variables are contributing to this developing issue.

With an emphasis on both natural and man-made elements, this article aims to investigate the different causes of floods in Daspur-I Block under the Ghatal Sub-Division, Paschim Medinipur District, West Bengal. We can gain a better understanding of the complex interactions between several factors that contribute to such catastrophic occurrences by looking at trends in rainfall, river dynamics, land use changes, and climate change, as well as human activities like urbanization, deforestation, and inadequate drainage management. As a result, people have endured long periods of economic loss and unpleasant conditions.

Research Gap:

Flood in Daspur-I Block occurred 7 times in the last 11 years. Before my research work, considerable investigation was made regarding flood in Daspur-I Block. However, the flood affected and relief characteristics were not analysed for last few years. Proper flood management strategies were not properly designed. To completely understand the year wise different flood affected and relief characteristics and design proper management strategies, I think further study and research will be required.

Objectives:

The main objectives of this study are:

- To know about situation of Flood in Daspur-I Block under the Ghatal Sub-Division, Paschim Medinipur District, West Bengal
- To know about area of Daspur-I Block under the Ghatal Sub-Division, Paschim Medinipur District, West Bengal are affected.
- To Determine the environmental and societal causes of the flooding in Daspur-I Block under the Ghatal Sub-Division, Paschim Medinipur District, West Bengal

Study Area:

Daspur-I Block is an important Block out of 5 Blocks in Ghatal Sub-Division under Paschim Medinipur District. It is surrounded by five rain-fed rivers and is situated at a distance of 25 km. north of Panskura Station on the South-Eastern Railway. It is connected by the State highways Ghatal-Panskura and Ghatal Medinipur roads respectively. Daspur-II Block is situated on the east side, Keshpur Block is situated on the west side, Ghatal Block is situated on the north side, and Debra Block is situated on the south side of Daspur-I Block. The Daspur-I Block is situated on the eastern side of Paschim Medinipur on the plain and is made of alluvial soil. Major rivers like Silabati and a tributary of Kangsabati named Cossey, flow through the block. Daspur-I Block consists of 10 Nos. of Gram Panchayats (Daspur-I, Daspur-II, Basudevpur, Panchberia, Nandanpur-I, Nandanpur-II, Rajnagar, Sarberia-I, Sarberia-II and Nij-Narajole). The astronomical location of the area is 22º 85′40" N to 22º 37′19" Nand 87º 41′15" E to 87º 44′20" E.

Fig 1: Location map of the study area

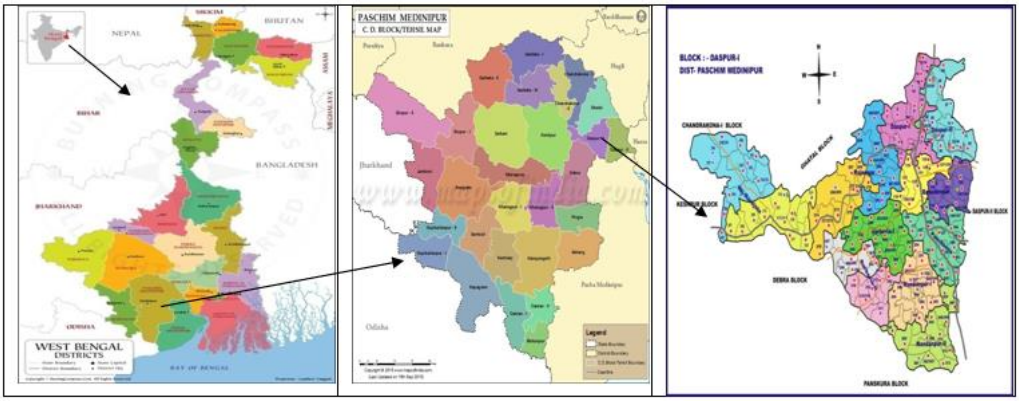


Table-1: Basic Data of Daspur-I Block:

PARTICULARS	AREA / QUANTITY / PERCENTAGE / RATIO
Geographical Area	166.5 Sq. Km.
Population- Male	103836
Population- Female	100121
Total Population	**203957 (As per Census 2011)**
Parity Ratio	1.0371
Literacy Rate -Male	81.74%
Literacy Rate -Female	69.01%
Total Literacy	**75.48%**
SC Population	48685
ST Population	5351
OBC Population	20096
Minority Population	3241
Total Mouza	162
Total Gram Sansad	161
Inhabited Village	157
Depopulated Village	06

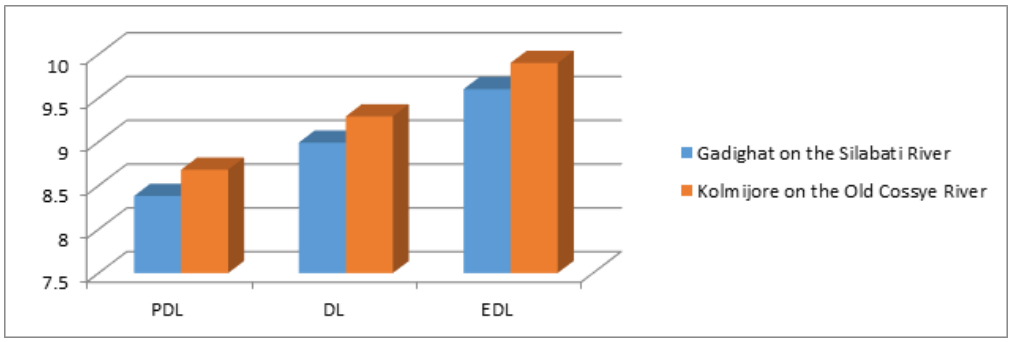
Table-2: Flood related Data of Daspur-I Block:

PARTICULARS	AREA / QUANTITY / PERCENTAGE / RATIO
Heavy Rainfall affected Mouzas	134
Flood affected Mouzas	63
Flood Period	July to October
Name of Gram Panchayet mostly affected by flood	Nij-Narajole,Rajnagar, Nandanpur-I, Nandanpur-II, Sarberia- I, Sarberia-II

Table-3: Name of River & its different water Level:

NAME OF RIVER	LEVEL	STAGE
Gadighat on the Silabati River	Primary Danger Level(PDL	8.38 Mtr
	Danger Level(DL)	8.99 Mtr
	Extreme Danger Level(EDL)	9.60 Mtr
Kolmijore on the Old Cossye River	Primary Danger Level(PDL)	8.68 Mtr
	Danger Level(DL)	9.29 Mtr
	Extreme Danger Level(EDL)	9.90 Mtr

Fig 2: Water Level of Two Rivers

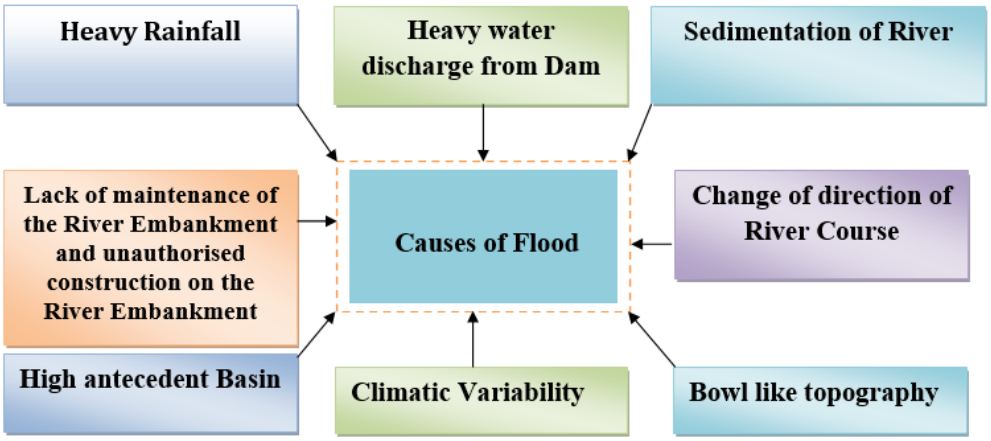


Materials and Methods.

The present study examines the causes of the flood in Daspur-I Block. The study is based on a field survey conducted in different Gram Panchayats in the Daspur-I Block and datacollected from different Gram Panchayet Offices, Daspur-I Block Office, Department of Irrigation, Census record (2011) and Block Disaster Management Hand Book 2022 and tabulated to prepare different diagrams of the average rainfall, total rainfall, maximum water level and different flood affected characteristics. Descriptive Statistics, Quantitative and Qualitative methodological principles are adopted for this study.

Different Causes of Flooding in Daspur-I Block under Ghatal Subdivision in the District of Paschim Medinipur, West Bengal:

Flooding can occur due to a variety of environmental and societal causes. These can be natural or human-induced, and they often interact with each other, compounding the risk and severity of flooding. Here are the main causes:



Heavy Rainfall:

One of the most common causes of flooding is heavy and continuous rainfall. When rainfall exceeds the capacity of the land or drainage systems to absorb or carry it away, the result is surface runoff, which can flood streets, rivers, and low-lying areas. Heavy rainfall occurred from **June to September,** which is one of the main causes of floods in the study

area.

Table 4: Month wise average rainfall

Month	Average rainfall over last 11yrs (mm)
January	9.99
February	30.06
March	31.18
April	89.85
May	169.43
June	294.12
July	406.55
August	360.45
September	284.24
October	122.15
November	26.36
December	26.27

Fig 3: Average rainfall over last 11yrs (mm)

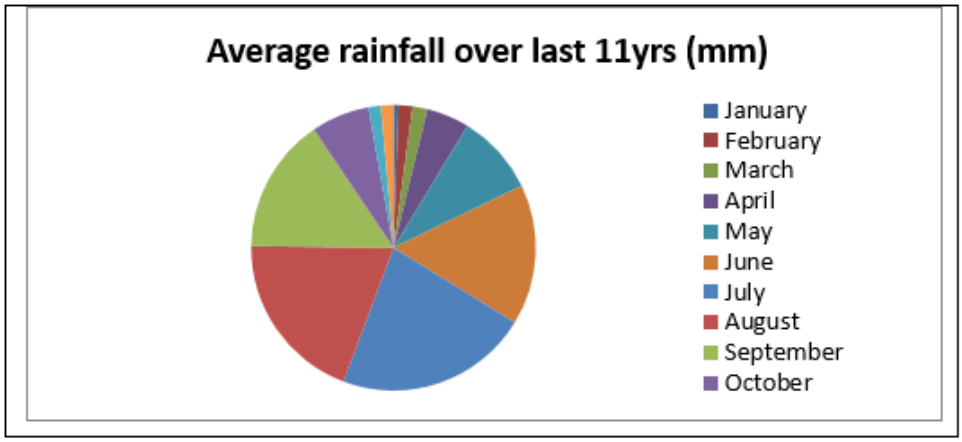
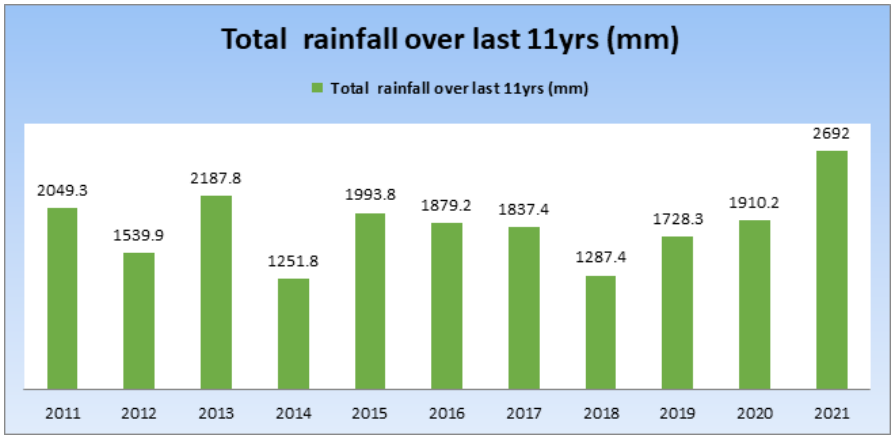


Table 5: Year wise total rainfall

Year	**Total rainfall over last 11yrs (mm)**
2011	**2049.30**
2012	1539.90
2013	**2187.80**
2014	1251.80
2015	1993.80
2016	1879.20
2017	1837.40
2018	1287.40
2019	1728.30
2020	1910.20
2021	**2692.00**

Fig 4: Total rainfall over last 11yrs (mm) 2011-2021



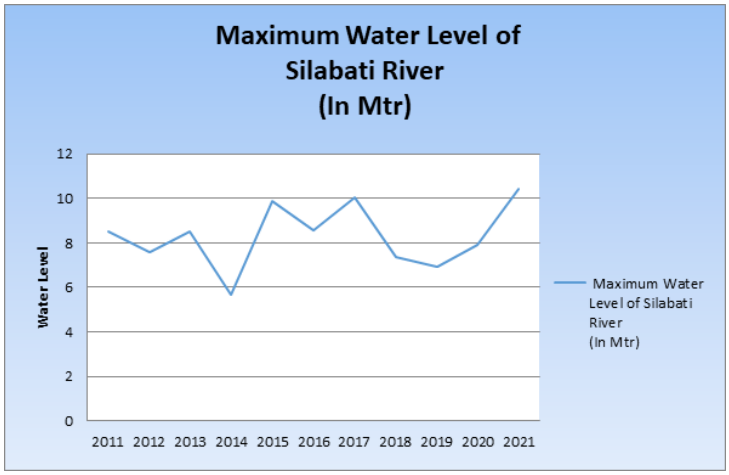
Year wise Maximum Water Level 2011-2021:

Due to the heavy rainfall, the water levels of the river Silabati have significantly fluctuated. Monitoring these changes is crucial to understanding the river's behavior, the impact of the rainfall, and the potential risks of flooding or other water-related issues. Below is a table presenting the maximum water levels of the Silabati river over last 11 (Eleven) Years. This data can help in assessing trends, predicting future water levels, and making informed decisions regarding flood management and infrastructure planning.

Table 6: Year wise Maximum Water Level 2011-2021

Year	Maximum Water Level of Silabati River (In Mtr)
2011	8.53
2012	7.56
2013	8.53
2014	5.67
2015	**9.90**
2016	8.59
2017	**10.02**
2018	7.34
2019	6.95
2020	7.92
2021	**10.42**

Fig 5: Maximum Water Level over last 11yrs (mm)



Sedimentation of River:

Rivers naturally carry sediment (sand, silt, clay, etc.) from upstream areas to downstream locations. After a long time sediments build up on the riverbed, raising its elevation. As the riverbed rises, the capacity of River to hold water decreases, meaning the river is more likely to overflow during heavy rain or snowmelt which causes flood.

Pic-1 : Sedimentation of Silabati River near Sujanagar under Daspur-I Block

Heavy water discharge from D.V.C and Kangsabati Dams:

A large amount of water is discharged from the DVC and Kangsabati Dam every year due to the abundant rainfall during the monsoons. From June to September, the rivers and canals are already full and floodingoccurs due to the release of large amounts of water from the DVC and Kangsabati Dam.

Reduce the depth of the river and its capacity to hold water:

Floods are created due to reduced water holding capacity. For this reason, Silabati and its tributaries cannot carry so much discharged water. As a result, water overflows and floods occur.

Lack of maintenance of the River Embankment:

The lack of maintenance of river embankments is a reason for the flooding of Daspur-I Block under Ghatal Sub-Division. A large part of the river embankment has been forcibly occupied. Big buildings have been built on several river embankments, including the Shilabati and Kangsabati. This encroachment must be removed if the Ghatal Master Plan is to be implemented. The illegal construction on the river embankment should also be removed. Some 30 and 50-year-old houses are illegally built over the river embankment. Some houses are two stories and some are three stories. Not only that there are eye-catching new restaurants are being built after lifting the government ban. As a result, the river embankment is being damaged. Digging big holes in the river embankments weakens the dam. So it breaks easily under low water pressure. River dams have undergone many changes over the past decade. The course of the river has also changed a lot.

Pic. 2 : Unauthorised construction on the River Embankments near Nimtala

Change of direction of River Course

The change of direction of a river course refers to a shift in the natural path or channel of a river. This change can occur gradually over time or suddenly due to natural events or

human activities. Such changes can significantly affect the surrounding environment, including causing flooding, altering ecosystems, and changing the course of water flow to areas that may not have been previously vulnerable.

High antecedent Basin:

The term "**antecedent**" refers to the conditions that existed before the current event. A **high antecedent basin** refers to a basin or watershed that has already received significant rainfall or has been saturated with water before a new water flow occurs. A "high antecedent" causes flood as because the basin's soil, rivers, and other features are already at or near full capacity in terms of water retention. As a result water overflow and flood occurs.

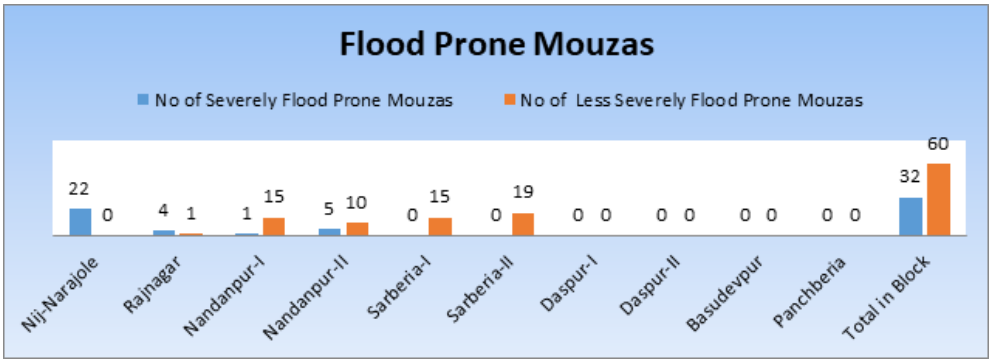
Climatic Variability:

Climatic variability can lead to change the weather patterns, resulting in more frequent or intense rainfall events. This may be due to changes in atmospheric situation, the heavy warming of oceans, or other climate-related factors that affect regional precipitation. When intense rainfall occurs over a short period, the ground may not be able to absorb all the water, especially if the soil is already saturated. As a result, surface runoff increases, which can overwhelm drainage systems and rivers, leading to flash flooding or river floods.

Table 8: No of Flood Prone Mouzas

Name of Gram Panchayat	No of Mouzas	No of Severely Flood Prone Mouzas	No of Less Severely Flood Prone Mouzas
Nij-Narajole	22	22	0
Rajnagar	19	4	1
Nandanpur-I	16	1	15
Nandanpur-II	15	5	10
Sarberia-I	15	0	15
Sarberia-II	20	0	19
Daspur-I	14	0	0
Daspur-II	12	0	0
Basudevpur	13	0	0
Panchberia	16	0	0
Total in Block	162	32	60

Fig 6: Category of Flood Prone Mouzas



Methodology for prevention of Flood:

A multifaceted strategy is needed to prevent flooding, and governments are essential in coordinating efforts across many sectors. Planning, infrastructure investment, public education, early warning systems, ecosystem restoration, and climate adaption techniques

are all necessary for efficient flood management. Governments can drastically lower the danger of flooding and lessen its effects on vulnerable people by putting in place comprehensive flood management regulations, bolstering infrastructure, including communities, and making plans for climate change.

Conclusions:

Flood occurred 7 times in the last 11 years in Daspur-I Block under Ghatal Sub-Division. Out of 10 No. of Gram Panchayats under Daspur-I Block, 6 No. of Gram Panchayats are most vulnerable. They are Ni-Narajole, Rajnagar, Nandanpur-I, Nandanpur-II, Sarberia-I and Sarberia-II Gram Panchayat. 50% of Mouzas are flood affected and inundated by flood water during the period from July to October. Heavy rainfall and heavy water discharge from dams are the main causes of flooding in Daspur-I Block. Flood causes huge damage including public house, School building, Electric equipment, Tube-well, Motor, Pump, Agricultural Crop, Road and communication system. Flood also affects highly commercial activity. Flood is a natural phenomenon,it is neither possible to stop nor eliminate flood damage. However, it is possible to minimise the severity of the impact and damage potential. Flood Prone Mouzas are identified for alerting the villagers of that area before the occurrence of a flood.

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