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Analysis of Climate and Social Vulnerability in Paschim Medinipur District, West Bengal

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Abstract

Extreme weather events of climate will cause disaster if communities are exposed to those events and exposure to potentially damaging extreme events is accompanied by a high level of vulnerability. Vulnerability means the diminishing capacity of a person or a group to recover from the impact of a natural or man-made hazard. Paschim Medinipur is in the Southern portion of West Bengal with the Chota Nagpur plateau and rough physiography in the western portion of this district.

Natural hazards like (floods, droughts, cyclones) are very active in this district most of the year. Due to these events, this district is very much vulnerable.

This study computes and compares the social vulnerability index (SVI) with the climate vulnerability index (CVI), With the help of secondary data, understand how much this district is prone to vulnerability.

Keywords: *CVI, SAVI, DDM, DEM, SVI, Cyclone*

Introduction

Climate encompasses the atmosphere, oceans, land, and cryosphere, as defined by the NRC (2005), and can also refer to long-term weather statistics. Historical climatic data, such as tree ring analysis, informs our understanding of past changes. Currently, human-induced greenhouse gas emissions significantly contribute to climate change, which adversely affects both human populations and ecosystems, creating vulnerable conditions within society. In response to these challenges, the Indian government recently introduced a nationwide index to evaluate climate-related risks across states, developed by several prestigious institutions including IIT Guwahati and the Indian Institute of Science. Marginalized populations are particularly susceptible to climate change due to their limited adaptive capacity, as noted in the World Bank's World Development Report. The Climate Vulnerability Index (CVI) evaluates three dimensions of vulnerability: Exposure, Sensitivity, and Adaptive Capacity, while the Social Vulnerability Index (SVI) measures community resilience to external stresses such as health crises and natural disasters, encompassing socio-economic status, household composition, minority status, and transportation.

The Study Region

Paschim Medinipur, located in southwestern West Bengal, is bordered by Bankura to the north, Purba Medinipur to the south, and shares its western boundary with Jharkhand. The district is predominantly underdeveloped and home to tribal populations, comprising two distinct regions: the arid, lateritic western area and the agriculturally focused eastern alluvial plains.

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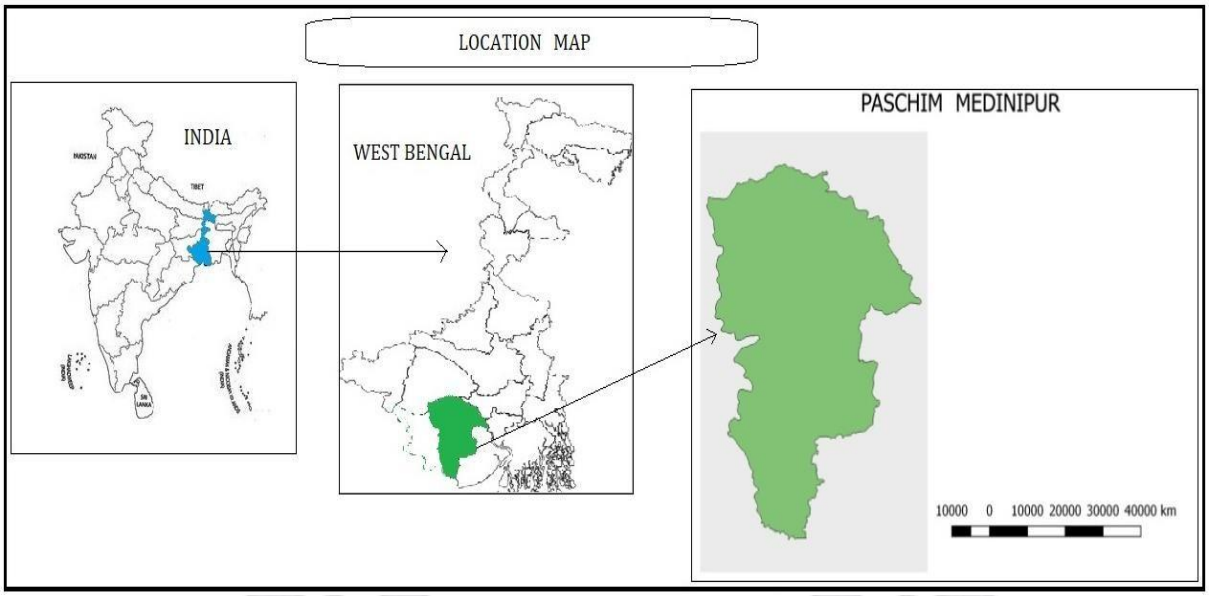
Geographically, this district can be divided into three sub-micro regions: (i) plain of Silai, (ii) lower Kasai plain, and (iii) upland of Medinipur. The district covers a geographical area of 9,368 sq. km. The coordinates of Paschim Medinipur are 22.4080°N and 87.3811°E. The rivers of Paschim Medinipur emerge from the Choto-Nagpur Plateau and then flow towards the east or southeast direction with the slope of the land and meet the Bay of Bengal. All the rivers in this region are rain-fed. There are many rivers; for example, the Rup Narayan is one of the most important rivers in this district, generated from the combined flow of the river Dwarakeswar and the river Shilabati/Silai. Subarnarekha is a transboundary river flowing through the states of Jharkhand, West Bengal, and Odisha. Another river is Silai, which is the largest tributary of the Rup Narayan River. Kangshabati, or Kasai, is one of the most important rivers of the district Paschim Medinipur. The climate of this district is tropical. The maximum temperature is 39°C and the minimum is 10°C, with hot summers, cold winters, humidity, and sufficient rainfall. The average rainfall in the district is around 1400–1500 mm. This district is affected by cyclones during the months of October–November.



Literature survey

Climate Vulnerability Index is being addressed to find out climate-related risk and understand how much vulnerable this situation is.

Disasters with social, economic, or environmental impacts adversely affect normal situations and communities. Extreme weather and various climatic events will occur as disasters if communities are exposed to those events, and exposure to potentially damaging extreme events is accompanied by a high level of vulnerability (Mandal et al.). The potential negative consequences of extreme events can be moderated in important ways by implementing corrective disaster risk management strategies that are reactive, adaptive, and anticipatory, and by sustainable development. In the lower catchment of the Shilai area, water overspilling in the study area and other causes of flooding are narrow river channels, over-sedimentation of channels, higher intensity of runoff, heavy rainfall, and very low elevation of flood-inundated areas (Mandal et al.).

The frequency of major floods is more than once in five years. The river brings heavy sediment load from the catchment and loses carrying capacity, which is responsible for causing floods (Laha et al., 2014).

In the lower part of flood plains, atmospheric extreme events, especially huge amounts of rainfall, are the primary causes of most flooding events (Fordham, 1993).

The Indian Institute of Technology at Guwahati, the Indian Institute of Science, the Swiss Development Corporation (SDC), and the Department of Science and Technology (DST) commissioned a study to assess the climate risks faced by states in India. This follows an assessment of the global warming risks faced by 12 Himalayan

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states, which found that states such as Assam, Arunachal Pradesh, Uttarakhand, and Jammu and Kashmir need a common methodology to determine how districts are equipped to deal with varieties of climate change (DST, 2019).

There is an additional misunderstanding: "global warming," which is an increase in the global annual average heat content measured in joules, is often incorrectly equated with "climate change." Global warming is just a subset of climate change. A bottom-up approach is more applicable than a top-down approach. Bottom-up, resource-based vulnerability assessment focuses on societally and environmentally key resources such as water, food, energy, human health and wellbeing, and ecosystem function (Jimmy Adegoke et al.,).

The Vulnerability Index for a specific sector is typically based on several indicators that determine the vulnerability of that sector to climate change. Construction of the vulnerability index for each sector involves: (1) identifying the indicators, (2) quantifying the indicators, (3) normalization,

$$\text{Si normalized} = \frac{\text{Si} - \text{Si min}}{\text{Si Max} - \text{Si min}}$$

(4) principal component analysis (PCA), (5) aggregation and categorization, and (6) plotting the pattern of vulnerability for each sector using GIS (Ravindranath et al., 2011).

Climate change and extreme events have adversely impacted the functioning of ecosystems and the provision of critical goods and services to mankind. This impact is much more pronounced for poor mountainous communities (Parmesan and Yohe, 2003) because they have limited livelihood options. Vulnerability = (Exposure, Sensitivity, Adaptive Capacity) (Smit and Wandel, 2006).

According to the Intergovernmental Panel on Climate Change (IPCC, 2014) report, changes and variability in temperature and rainfall trends are already affecting both biophysical and socio-economic systems, increasing vulnerability. Mountains are among the most fragile environments on Earth, and the Himalayan region will experience higher levels of climate change and its associated impacts on both biophysical and socio-economic systems (Indian Institute of Technology Guwahati, Indian Institute of Technology Mandi, Indian Institute of Science Bangalore).

The Intergovernmental Panel on Climate Change (IPCC, 2001) indicates that the global average surface temperature increased by about 0.6°C during the twentieth century, and that most of the warming observed over the last 50 years is attributable to human activities. IPCC climate model projections for the period indicate an increase of 1.4°C to 5.8°C, depending largely on the scale of fossil fuel burning. More recent modelling work indicates that temperature increases by 2100 may be larger than those estimated earlier (Stainforth et al., 2005; Lovelock, 2006).

Developing countries are generally considered more vulnerable to the effects of climate change than developed countries because of low adaptive capacity (Thomas and Twyman, 2005). Many developing countries in Africa are among the most vulnerable to climate variability and change (Slingo et al., 2005). The developing world has limited ability to adapt financially and institutionally, along with low per capita GDP, high poverty rates, and lack of safety (Thomas and Twyman, 2005).

Floods are caused singly or jointly by several factors. Common natural factors include intense storm precipitation, high antecedent basin soil moisture, rainfall over areas covered with snow, occurrence of medium to major storms in quick succession, and failure of dams resulting in a very rapid release of large quantities of water (Chapman, 1996). Other natural factors that cause river floods include high-intensity rainfall, meandering courses of rivers, extensive flood plains, breaks in the slope in the long profile of rivers, and blockage of free flow of rivers (Singh, 2009). Critical physiographic location is an important cause of floods in Ghatal block, and climatic conditions are another significant factor (Ghosh et al.).

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In developing climate change vulnerability profiles, it is assumed that climate change exposure will affect current sensitivity, either positively or negatively, and that farmers will respond to these changes in climate sensitivity (O'Brien et al., 2004).

General Circulation Models (GCMs) do not provide high-resolution information for small regions. Therefore, the impacts of climate change on regions like Northeast India are less explored and less known, making future scenarios more uncertain for vulnerability assessment and risk management. Although there are not very significant changes overall, subdivisions of Manipur, Nagaland, Mizoram, and Tripura have shown significant changes in seasonal rainfall, particularly in Tripura (Das et al.).

Objectives

1. To identify the various flood and drought prone blocks.
2. Create a climate vulnerability index and livelihood vulnerability index on Paschim Medinipur various blocks.
3. To find out the suitable strategy to handle the situation in future sustainably.

Methodology

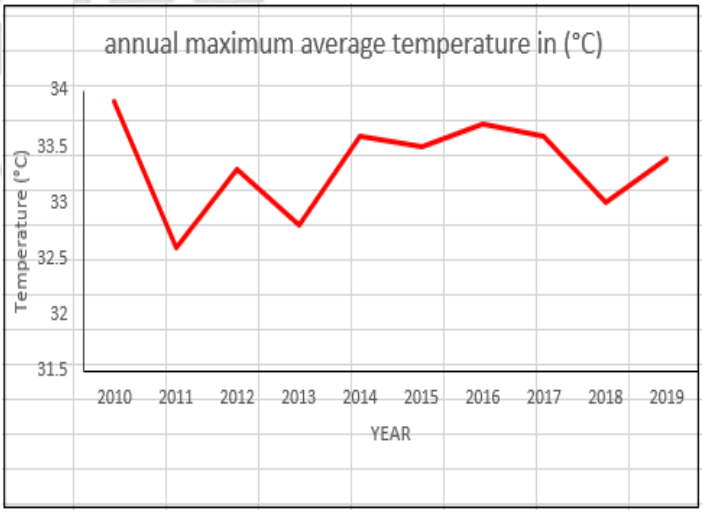
In this dissertation paper I have used QGIS software to prepare drainage density map and digital elevation model (collected from USGS Earth Explorer) for better understanding flood prone vulnerable area. To understand draught prone area, I have prepared SAVI map using QGIS software. Climatic data (rainfall, temperature) are collected from (world weather online) site and secondary data (for CVI &SVI index) are from District Human Development Report: Paschim Medinipur, District census Handbook.

A flood is an overflow of water that generally submerged the land, various properties, create a disaster like situation. There are various types of flood. Some district of West Bengal being a part of Ganga Brahmaputra delta, very much flood prone.

Causes of flood-

1. Excessive rainfall sometime increase river carrying capacity and occurs flood.
2. Landslides create a barrier of free flow of river and causes flood.
3. Intense rainfall, cyclone like situation occurs flood.
4. Poor natural drainage one of the causes of flooding.

YEAR	annual maximum average temperature in (°C)
2010	33.9
2011	32.6
2012	33.3
2013	32.8
2014	33.6
2015	33.5
2016	33.7
2017	33.6
2018	33
2019	33.4



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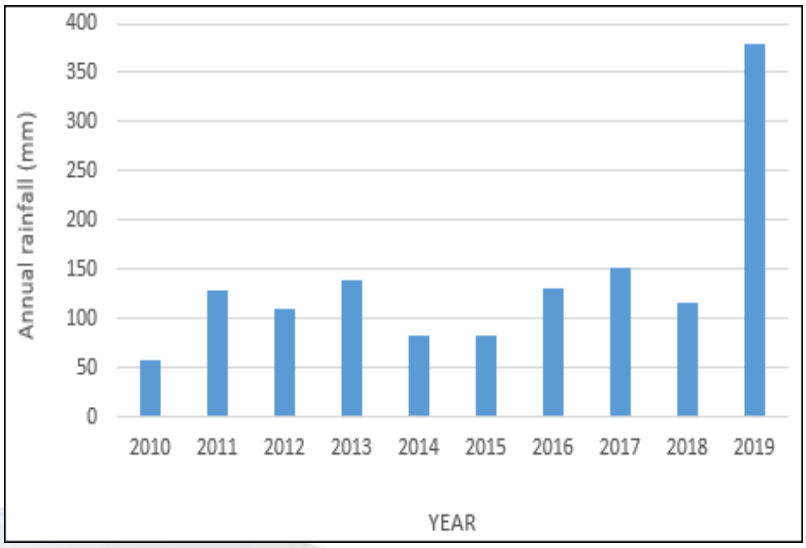
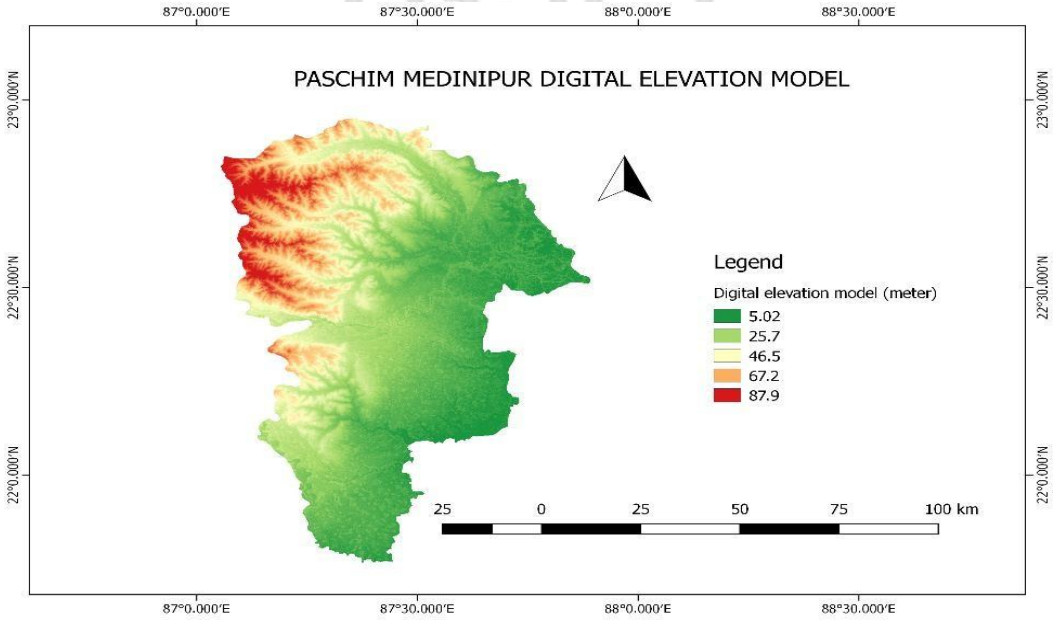
Year	Annual Rainfall in (mm)
2010	58.9
2011	128.8
2012	109.5
2013	138.3
2014	83.3
2015	82.3
2016	130.6
2017	152
2018	116.3
2019	378.6



Temperature data between (2010–2019) show that in 2010, the annual maximum average temperature is the highest and the total yearly rainfall is the lowest. So, this year indicates the maximum hot days in this district. In 2011, the rainfall amount is 128.8 mm, greater than in 2010, but the annual maximum temperature is much lower than in other years. So, this year is not as hot as 2010 and indicates a suitable year in terms of climatic composition. In 2013, there is a record of flood in Paschim Medinipur district because of heavy rainfall and the release of water from DVC. Rainfall in 2013 (138.3 mm) is greater than in 2010, 2011, 2012, 2014, 2015, and 2018. Cyclonic effects also played a role in the 2013 flood in Paschim Medinipur. In 2015, there is also a record of flood because of cyclonic effects. In 2017, rainfall indicates a considerable amount of rainfall. The annual maximum average temperature is also higher (33.6°C), which indicates the occurrence of flood. Cyclonic effects also played an important role in the occurrence of flood in this year. In 2019, rainfall data indicate the highest amount of rainfall compared to other years. Temperature is also higher, and cyclonic effects created heavy rainfall in the coastal low-lying areas of this district in this year.

The Digital Elevation Model indicates that the north-western portion of the district is highly elevated, and this elevation gradually declines towards the south-south-eastern portion.

The blocks of Garbeta-I, Garbeta-II, Garbeta-III, Salbani, Midnapore, and some portions of Keshpur are on high elevation, while the rest of the blocks are of moderate elevation. Daspur-II, Daspur-I, Mohanpur-I, and Datan-I are on very low elevation.



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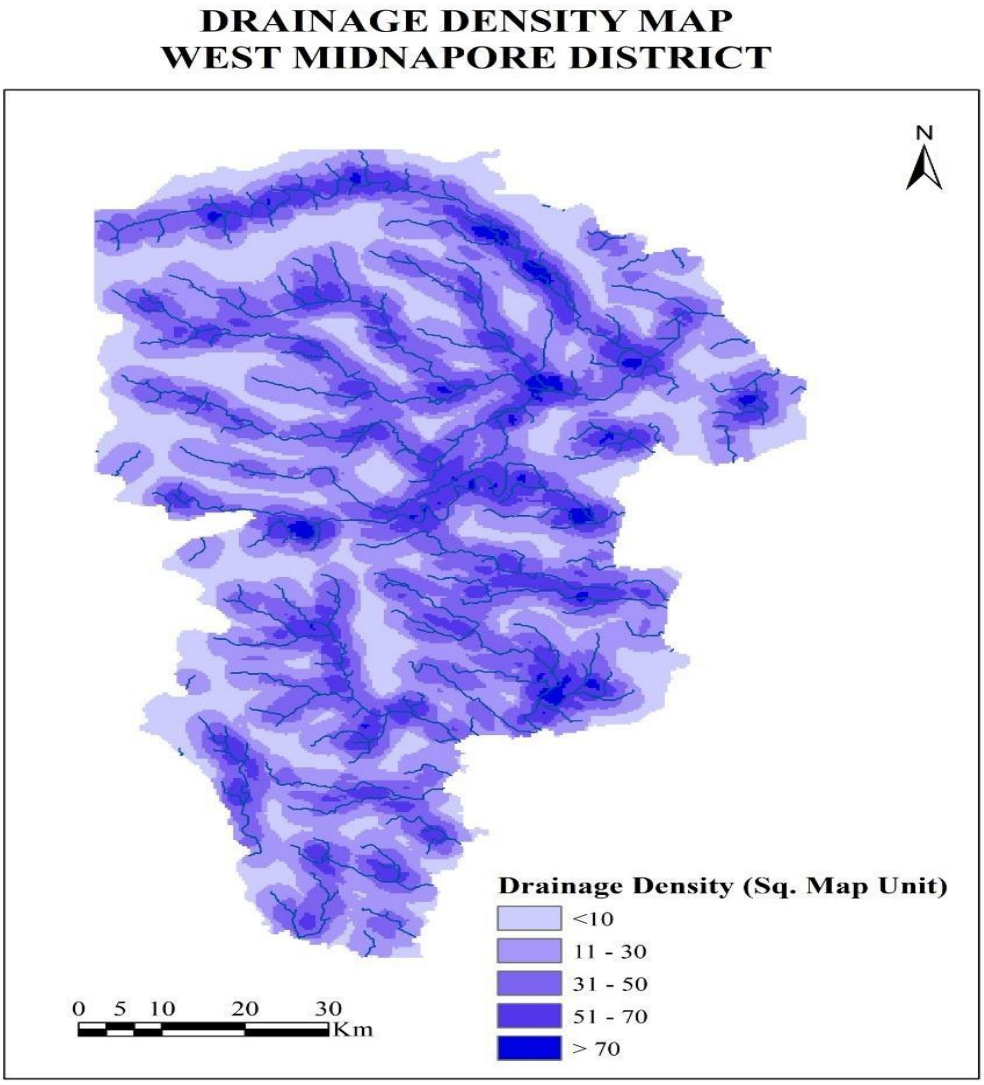
River Silai flows from the Chota Nagpur Plateau and, after passing through some districts, enters Paschim Medinipur district. It flows in the west and south-west direction through the C.D. blocks of Garbeta-I, Garbeta-II, Ghatal, Chandrakona-I, Keshpur, and Debra.

On the other side, the river Kasai originates from the Chota Nagpur Plateau and flows through the blocks of Kharagpur-I, Kharagpur-II, and Debra, after which it exits from Paschim Medinipur district.



There is also an important river named Subarnarekha, which flows through the southern portion of this district. The Subarnarekha originates from the Chota Nagpur Plateau and flows through the states of Jharkhand, West Bengal, and Odisha. After entering Paschim Medinipur district, it flows through the C.D. block of Dantan.

The low-lying areas of this district (from the Digital Elevation Model) have a high chance of flood occurrence, and these rivers also play a vital role in creating floods easily. The C.D. block of Ghatal is a very popular block in terms of devastating floods occurring every year due to the influence of the river Silai. So, this river-oriented, low-elevated area is vulnerable in terms of flooding situations.

We know that a high drainage density value indicates a high slope, high resistance, and hard, impermeable rock, whereas a lower value indicates low relief, permeable, and soft rock. This drainage density map of Paschim Medinipur indicates that Garbeta-I, Chandrakona-II, Ghatal, Daspur-I and II, Pingla, and Sabang blocks belong to high drainage density zones. High drainage density means the presence of impermeable rock and a higher chance of flooding, as there is an increase in surface runoff within a short period.

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Cyclone

Cyclone is a natural event. The coastal districts of West Bengal are more vulnerable to cyclonic events. West Bengal has two cyclonic seasons: (i) pre-monsoon and (ii) post-monsoon. Pre- and post-monsoonal storms are more violent than monsoonal season storms. Pre-monsoon cyclones occur during November–December.

Paschim Medinipur, Purba Medinipur, South 24 Parganas, Howrah, and Hooghly—all these districts have a high chance of being affected by cyclones, as they are very close to the coastal side. Purba Medinipur district is more vulnerable than Paschim Medinipur, as it is very close to the coast. However, most of the time, the whole Medinipur district suffers from cyclonic events and loses its livelihood, life, and property.

Cyclonic Year (2015-2019)

Year	Cyclone Name	Date of Formation	Date of Dissipation	Lowest Pressure	Impact On West Bengal (Paschim Medinipur)
2015	KOMEN	JULY 26, 2015	AUGUST 2, 2015	986 hpa	These storms create heavy to extremely heavy rainfall in the coastal and southern portions of West Bengal, creating flooding conditions in many districts of West Bengal, including Hooghly, Midnapore, Burdwan, Asansol, and 24 Parganas.
2016	ROANU	19 MAY,2016	23 MAY ,2016	983 hpa	It came with heavy showers in Odisha, West Bengal, and Andhra Pradesh, and became weaker before moving to Bangladesh. Its strength provided immense torrential rainfall all along the Indian east coast.
2017	MORA	MAY 28, 2017	MAY 31,2017	978 hpa	Coastal sides of west Bengal and Odisha faced a heavy rainfall. Made landfall in Bangladesh's Chittagong coast, north eastern statesalso faced a heavy rainfall. coastal side districts of west Bengal, IMD warned about squally winds.
2018	TITLI	MARCH 13, 2018	DECEMBER 17, 2018	960 hpa	This severe cyclonic storm didnot have so much effect on west Bengal, but the southern district of the state receivedheavy rain.
2019	FANI	26 APRIL ,2019	5 MAY,2019	932 hpa	Cycloic storm Fani entered west Bengal through Odisha's Balasore. It crossed Kharagpur with a wind speed of 70- 80 kmph, gusting to 90 kmph, occursa heavy rainfall in the coastal portion of this state.

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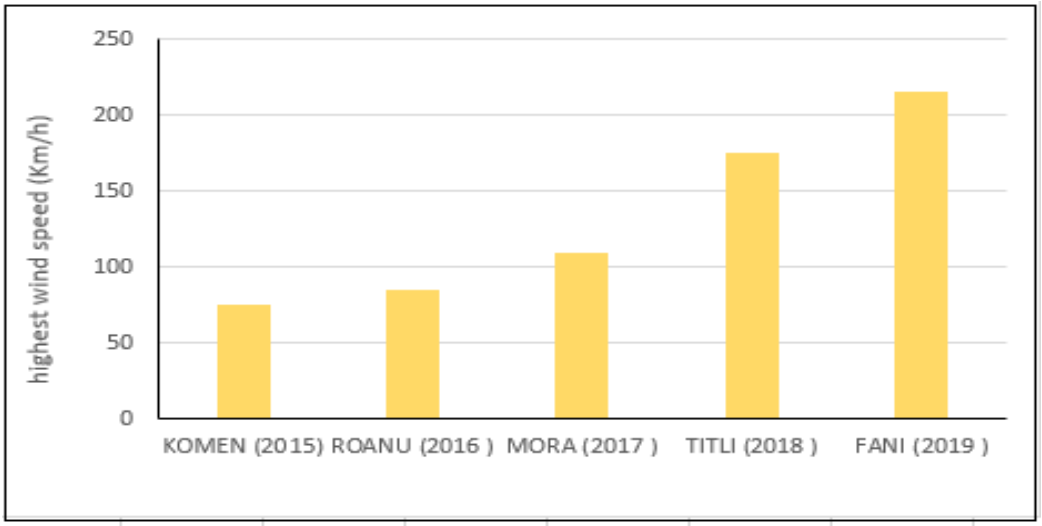
Name of the cyclone	Highest wind speed (Km/h)
KOMEN (2015)	75
ROANU (2016)	85
MORA (2017)	110
TITLI (2018)	175
FANI (2019)	215



Drought

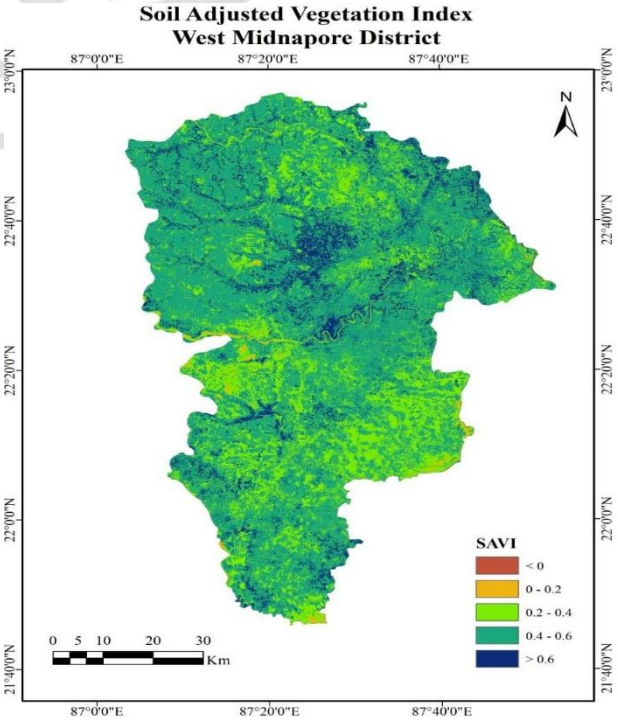
Drought is a natural event. Drought and its impacts are really two sides of the same coin. We cannot understand drought without understanding its impacts, which can affect the environment and our community. Some blocks of Paschim Medinipur are very drought-prone, which has a bad impact on the economy, environment, as well as the society of these blocks.

SAVI (Soil Adjusted Vegetation Index): It is useful for monitoring soils and vegetation. Here, remotely sensed data are later compared to known surfaces of various vegetation types. The Soil Adjusted Vegetation Index is prepared as a modification of the Normalized Difference Vegetation Index to correct the effect of soil brightness when the vegetation cover is low.

$$\text{The SAVI} = \frac{\text{NIR-RED}}{\text{(NIR +RED+L)}} *(1+L)$$

Where NIR is the reflectance value of near infrared, RED is the reflectance of the red band, and L is the soil brightness correction factor. L = 0 where vegetation cover is very high, and L = 1 indicates no green vegetation. Normally, L = 0.5 in most situations.

The SAVI of Paschim Medinipur district indicates that red, yellow, and light green colours represent very high vegetation cover. Some portions of Mohanpur, Datan-I, Garbeta-III, and Sabang, Pingla, Narayangarh, Kharagpur-I, and Chandrakona-II belong to areas of high vegetation cover. The rest of the blocks, such as some portions of Salbani, Keshpur, some portions of Keshiary, Garbeta-II, Medinipur, and Datan-I, indicate lower green vegetation cover.



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More vegetation can bring rain during the process of transpiration. During this time, plants lose water in the process of photosynthesis, and this water is added to the normal moisture of the air, making the air saturated faster and bringing rain. So, high vegetation means more rainfall, and loss of vegetation means the absence of sufficient rainfall. Day by day, deforestation creates this situation and makes the soil exposed to weathering. Therefore, the blocks of Paschim Medinipur that have low green vegetation cover have a high chance of experiencing drought.

CVI (Climate Vulnerability Index)

CVI is being address the climate change vulnerability. CVI is a composition of 3 basic feature. (i) Exposure (ii)Sensitivity (iii) Adaptive capacity.

Exposure: According to IPCC, the presence of people, livelihood, ecosystems, environmental function, services and resource infrastructure or economic, social or cultural assets that would be adversely affected.

Sensitivity: (IPCC), the degree to which a system or species is affected either adversely or beneficially by climate variability or change. The effect may be direct or indirect.

Adaptive capacity: The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantages of opportunities or to cope with the consequences.

	Major component	Sub component	Sub componentexplanation	Weightage	Information source
EXPOSURE	(i) Natural disaster	(A) - Effect of extreme event 1. drought 2. cloud bust 3. landslide	Medinipur ranks as the most flood and major drought prone district. (The rivers are not perennial in nature and the levees are not well maintained. The water channel hasnot been desilted inthe last 25 years, asa result the carrying capacity of these water channel decreased, causing overflow during the monsoon and post monsoon phase.	0.90	
		B. Effect of extreme event on social infrastructure 1. flood 2. drought 3. cloud bust. 4. landslide	2007, flood in Paschim Medinipur 2990 people were affected because ofthe floods 30 houses heavily damaged, 425 houses partially damaged, death in paschim medinipur district 38. destroying 900 ha of crops around 28km of morum road 38 km of kancha road were damaged, 95 tube well were put out of service.	0.85	Damage of flood 2007

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	(ii) Climate variability	C. Rainfall in hot months	Midnapore witnessa hot summer frommarch to June. Maximum temperature at times may settle in the early forties, making it uncomfortable for visitors. Like 2019 and 2020, march month rainfall is lower than (93.8mm, 18.9) April and June. according to 2019, 2020 data May months occurs maximum rainfall.April months rainfall varies yearwise.	0.34	Accu Weather Medinipur, West Bengal
		D. Precipitation about hail storm	Nor wester accompanied by hailstorm may injure lives, uprooted trees along with lightning and strong wind. (25th Feb, 2019., Jan 3, 2020)	0.25	Lightning strikes hailstorm and intense rain in Kolkata parts of west Bengal, Sky met Weather. com.
SENSITIVITY	(i) Agriculture	A. Impact of changing climate on agricultural sector.	Paschim Medinipur district,west Bengal is such a drought prone area where more than 80% people are depending on agriculture. Rice and potato in Rabi season are the two most important stable crops in this region. All climatic vagaries impose negative impact on the production of bothrice (rainfed) and potato (irrigated water fed).	0.32	Impact of climate change on the production of rice and potato in Paschim Medinipur, west Bengal .
		B. Use of pesticide in agricultural sector	Consumption of fertilizer per hector has increased for Boro paddy day by day. but also, a impact on animal health hazard, huge impact on ecosystem (from 1990- 2008) use of pesticide was increased.	0.22	Dept. of Agriculture, Govt. of. West Bengal

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	(ii) Water	A. Use of potable drinking water	Drinking water quite satisfactory throughout the study area. In post monsoon pingla and Medinipur block face slight alkalinity in water. variation of pH level may cause some biological problem in human body.	0.65	Water quality – Shodhganga
		B. Use of water for irrigation sector	Block Sabang , Debra shows low (Ec) Electric conductivity values and under good quality in case of irrigation. Rest of the Blocks suffers from comparatively high salinity condition. It may be due to the saline water intrusion in the groundwater aquifer lying close to the Bay of Bengal.	0.40	Water Quality, Shodhganga
	(iii) Health	A. Stress dueto climatic factor	Sometimes the temperature of the season is very hot. Due to the increased temperature peoplegradually become sick. Due to decreasing rainfall some area become dried up and scarcity of water is the major problem during summer days. Due to changing weather condition spreading of some mosquito borne diseases are very frequent.	0.24	Influence of climate change on the Biodiversity of the medicinal plants for the sustainability of the santal and Lodha tribal people in the district Paschim Midnipur, W.B, India

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		B. Any new disease due to climatic factor	There is no newdisease but have some common diseases due to climate change (i) malaria (ii) A.C. Diarrhoeal diseases Heat stress and its related impact	0.17	West Bengal State action plan Climate change.
ADAPTIVE CAPABILITY	(i) Socio Demographic attributes	A. House type diversity	Pucca and Kancha both	0.30	District census Handbook (Paschim Medinipur)
		B. Distribution of working division	According to 2001 census cultivator 29.99% Agricultural labors 35.12% Household Industry workers 7.69% other worker 27.20%.	0.31	District Human Development Report (Paschim Medinipur)
		C. Migrated member	Medinipur showing moderate rate to high rate of rural male outmigration since 1981 – 2001 because it is near to plateau fringe region characterised by less fertile soil, agriculturally depressed, industrially backward.	0.22	District Human Development Report (Paschim Medinipur)

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	(ii) Social Network	A. Suitable transport facility	Metal and un- metal roads maintained by the different municipalities in Paschim Medinipur district out of all municipalities Medinipur has the maximum number of metalled roads and Kharagpur has the maximum number of roads considering both metal and unmetalled surfaces.	0.65	District Human Development Report (Paschim Medinipur)
		B. Social network facility 1. Government 2. NGOs	Government manage every sector in a proper way. and there are also some kind of NGOs.	0.32	

(i) $$\text{Index sv} = \frac{\text{SV- S min}}{\text{S max - S min}}$$

Where, SV is the total subcomponent or indicator Value.

S max and S min is the maximum and minimum Value of subcomponent.

After standardization of all sub components each major component wascalculated as

$$\text{Mv} = \frac{\sum_{i=1}^{n} Index\ Sv}{n}$$

Where Mv is the one of the major components for CVIIndex sv, is the ith subcomponent value belonging to Major component.

n is the number of subcomponents.

$$\text{In case of Exposure} = \frac{\text{Sv} - \text{S min}}{\text{S max} - \text{S min}} = \frac{2.34 - 0.25}{2.34 - 0.25} = 3.21$$

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Sensitivity = 3.81

Adaptive capacity = 2.95

$$(iii)\ CVI = \ 1 - \left[\left\{\frac{N1Exp\ -\ N2\ Ada.\ cap}{(N1+N2)}\right\}\right] * \frac{1}{Sen}$$

Where, N1 AND N2 IS THE Exposure and adaptive capability value.

Sen is the sensitivity value.

$$\text{So CVI} = 1 - \frac{3.21-2.95}{3.21+2.95} * \frac{1}{3.81} = 0.98$$

Result and analysis

CVI value varies between 0-1, 0 indicates very less vulnerability,1 indicating the highest possible level of vulnerability. From the calculation CVI value is 0.98which indicates high level of vulnerability. We know that assist with high sensitivity and low adaptive capacity are more susceptible to impacts and therefore have an overall high vulnerability. From the calculation we get Exposure value 3.21, Sensitivity 3.81, Adaptive capacity 2.95 so here sensitivity is greater than adaptive capacity., means high vulnerability.

So, from the CVI index analysis we can easily understand that natural disaster like event especially flood and drought and cyclone play a vital role in Paschim Medinipur which make this district more vulnerable. In respect to this climatic variable the adaptive capacity like socio demographic attributes and social networking facilities are not so much active in this district – for this inactivity of adaptive capacity felt a huge impact in agriculture, irrigation, water, human health like sensitive sector. So, there are need a high adaptive capacity making management in every sector. Like in case of house, there are both kancha and pucca house the low-lying area of this district which are very much prone to flooding event – must be avoided to build any kind of kancha low height house. In Paschim Medinipur 80% people are depend on agricultural land, so most of the worker are agricultural worker (65.11 % ,2001) in respect west Bengal (48.48%) household industry worker (7.69) inrespect to west Bengal (7.37%). This indicates that economically this district is not so much active and industrial business, multipurpose sector also not so much progressive in this region. so, there are need industrial business making facilities by which local people can get job and make themselves economically stronger. There are also needing to improve transport communication, increasing no of metal road especially flood prone block. There is need to improve healthcare service, health related facilities properly from gram panchayat or municipality level. There are also need a proper treatment from Government sector to maintain whole aspect of this district. The no. of NGOS are not enough in this district, so there are also needing to increase NGOs facility and improvement and involvement of NGOs should be encouraged.

SVI (Social Vulnerability Index)

Social vulnerability indicates a measure of well communities may responseabout some external stresses or how well the community fares in a disaster.

To understand SVI, with the help of some secondary data, here I have selected 4parameter of census 2001 & 2011. These main 4 parameters are –

(i) socio economic and demographicStatus.
(ii) working composition and disability.
(iii) minority status in case of education.

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(iv) Housing.

These 4 main parameters include some sub parameter. These are –

1. Socio economic and Demographic status
   - (i) Below poverty
   - (ii) Male literacy
   - (iii) Female literacy
   - (iv) population growth
   - Working composition & disability
     - (i) work participation
     - (ii)child proportion (0-6)
2. Minority status in case of education
   - (i)literacy rate in Schedule cast.
   - (ii) literacy rate in Schedule tribe
3. Housing
   - (i) Urban population

Parameter	2011 (%)	2001 (%)
Child proportion (0-6)	11.58	14.48
Female literacy	70.50	59.11
Male literacy	85.26	81.28
Urban population	12.22	13.44
Population growth	13.86	15.76
Work participation	42.4	41.0
Literacy rate schedule cast	58.96	47.10
Literacy rate schedule tribe	62.15	47.97
BPL population	40.3 (2008)	44.53

Source: Paschim Medinipur population census 2011, DistrictHuman Development Report Paschim Medinipur.

BPL population 2011 (data not available, last data2008 is available).

Calculation

2011 (%) x	2001 (%) y	Rank of x	Rank of y	D=(x-y)	D^2
11.58	14.48	9	8	1	1
70.50	59.11	2	2	0	0
85.26	81.28	1	1	0	0
12.22	13.44	8	9	-1	1
13.86	15.76	7	7	0	0
42.4	41.0	5	6	-1	1
58.96	47.10	4	4	0	0

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62.15	47.97	3	3	0	0
40.3	44.53	6	5	1	1

$= \sum D^2 = 4$

$$1 - \frac{6 * \sum D^2}{N\,(N^2 - 1)} = 1 - \frac{6 * 8}{9 * (9^2 - 1)} = 0.97$$

In this SVI calculation, here I have applied spearman rank correlation. 1st I have given somerank for the various sub parameter later with the help of equation I get a value that is 0.97.

SVI value varies between 0-1. 0 indicates less vulnerability ,1 indicates mostvulnerability. so, the result value (0.97) indicates this district Paschim Medinipur socially highly vulnerable.

Conclusion

This district in West Bengal is sensitive to climate change with increasing temperature, altered rainfall regimes and frequent extreme events like floods, drought, and cyclones. The tropical humid climate makes this district susceptible to environmental degradation, loss of agricultural land, deforestation. The rivers in low lying areas are very much prone to natural hazards. Here sustainable agricultural practices, water management system community engagement livelihood support, afforestation programme and educational awareness are mmuch required. Also strengthening the capacity for climate risk management system through the help of local governance and needs a strong collaboration between NGOs, local government and local communities.

Reference

Mondal, P. (2014). Vulnerability of flood-prone communities in the lower reaches of the Shilai River, Ghatal Block, Paschim Medinipur District, West Bengal, India. *International Journal of Development Research, 4*(7), 1393–1400. https://www.journalijdr.com

Laha, A. (2014). Flood hazard cause assessment and mitigation options using geo-informatics technology. *International Journal of Scientific and Research Publications, 4*(8). https://www.ijsrp.org

Lumbroso, D. (2013). Flood risk management in the United Kingdom (pp. 79–87). https://doi.org/10.1016/B978-0-12-811891-7.00006-2

Indian Institute of Technology Mandi, Indian Institute of Technology Guwahati, Indian Institute of Science, & Department of Science and Technology. (2019–2020). *Climate vulnerability assessment for adaptation planning in India using a common framework*. https://dst.gov.in

Adegoke, J. (2013). *Understanding and addressing threats to essential resources* (1st ed., Vol. 1). Academic Press. ISBN: 978-0123847041

Shukla, P. R. (2003). *Climate change and India: Vulnerability assessment and adaptation*. https://hdl.handle.net/11718/3959

Füssel, H. M., et al. (2006). Climate change vulnerability assessments: An evolution of conceptual thinking. *Climatic Change, 75*, 301–329.

Mattoo, A. (2010). Equity in climate change: An analytical review. *World Bank Policy Research Working Paper* (WPS5383), 26(2), 103–120.

Ghosh, S. (2013). Flood and its effects: A case study of Ghatal Block, Paschim Medinipur, West Bengal. *International Journal of Scientific Research, 11*(9). https://doi.org/10.36106/ijsr

O'Brien, K. (2004). Mapping vulnerability to multiple stressors: Climate change and globalization in India. *Global Environmental Change, 14*(4), 303–313. https://doi.org/10.1016/j.gloenvcha.2004.01.001