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An Analysis of Cyclone Disaster Management in Gangetic West Bengal from 2001 to 2020

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Abstract:

Cyclonic storms and depressions that impact West Bengal develop and strengthen over the Bay of Bengal, primarily between the months of May and November. Typically, their movement direction is towards the west-northwest as they make their way over the coastline. Storms and depressions lose strength when they move onto land. Therefore, due to its location on the eastern coast of India, the state frequently endures the intense force of severe storms and depressions originating from the Bay of Bengal. Tropical cyclones (TCs) which are accompanied by very heavy to extremely heavy rain, gales and storm surges are the most devastating phenomena among all natural disasters. The extensive coastal belts of India are exposed to TCs, which originate in the North Indian Ocean (NIO) including the Bay of Bengal and the Arabian Sea every year. Cyclone warning is one of the most important functions of the India Meteorological Department and it was the first service undertaken by the Department as early as in 1865. Disaster management plays a significant role in combating cyclones. The objective of disaster management activities is to exert authority over catastrophe and emergency circumstances and establish a framework for assisting individuals in danger to prevent or recuperate from the consequences of the disaster. This paper reflects an analysis of Cyclone Disaster Management in Gangetic West Bengal from 2001 to 2020.

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I Introduction:

Cyclones, in meteorological terminology, are expansive air masses that revolve counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere around a powerful centre of low atmospheric pressure. This particular meteorological occurrence is designated as a cyclone due to the inward spiralling winds that encircle a region of reduced pressure. On the synoptic scale, polar vortices and extratropical cyclones are the most sizable low-pressure systems. Moreover, tropical and subtropical cyclones, which have warm interiors, are included on the synoptic scale. Mesoscale phenomena consist of dust vortices, mesocyclones, and tornadoes.

Cyclonic storms and depressions in the Bay of Bengal, which impact the weather conditions of West Bengal, result in the occurrence of storm surges and strong gale winds in the coastal areas. The magnitude of storm surges and wind intensity along the shore escalates as the systems draw near the region.

The storm surges and gale winds, particularly linked to storms, result in significant loss of life and extensive damage to homes, properties, and crops in the low-lying agricultural areas. As the storms or depressions draw near the coast, an increasing amount of harm is inflicted against both human lives and physical assets. The

catastrophic impact culminates as the storms make landfall.

Cyclones in West Bengal:

Cyclonic storms and depressions that impact West Bengal develop and strengthen over the Bay of Bengal, primarily between the months of May and November. Typically, their movement direction is towards the west-northwest as they make their way over the coastline. Typically, storms and depressions lose strength when they move onto land. Therefore, due to its location on the eastern coast of India, the state frequently endures the intense force of severe storms and depressions originating from the Bay of Bengal. The state experiences the highest number of storms throughout the months of July and August. While in motion, the systems occasionally veer or deflect towards the north or northeast. The point of transition gradually moves towards the west until September. For instance, the systems in May exhibit re-curvature when they are still located in the Bay of Bengal. Consequently, only a small number of these storms that make landfall and move inland have an impact on the weather in the state throughout May. Cyclones that occurred in Gangetic West Bengal from 2001 to 2020 were Amphan , Aila , Titli, and Fani.

Tropical cyclones (TCs) which are accompanied with very heavy to extremely heavy rain, gales and storm surges are the most devastating phenomena among all natural disasters. The extensive coastal belts of India are exposed to TCs, which originate in the north Indian Ocean (NIO) including the Bay of Bengal and the Arabian Sea every year. Considering these, cyclone warning is one of the most important functions of the India Meteorological Department and it was the first service undertaken by the Department as early as in 1865.

Cyclone is the region's most destructive natural disasters, wreaking havoc on property, crops, and infrastructure while also being among the deadliest. Most Asian countries have been concerned about the long-term effects of cyclone and the damage they cause. Disaster risk reduction appears to be the only long-term viable solution to reducing the impact of disasters and building the resilience of communities and nations to disasters in the Asia and Pacific region.

Disaster management is the field concerned with addressing and mitigating hazards, encompassing the activities of preparing for, assisting during, and facilitating recovery from natural or human-induced calamities. Disaster management is the ongoing procedure through which individuals, groups, and communities effectively handle dangers to prevent or reduce the effects of catastrophes caused by these hazards.

The objective of disaster management activities is to exert authority over catastrophe & emergency circumstances and establish a framework for assisting individuals in danger to prevent or recuperate from the consequences of the disaster.

Objective of Study:

To examine the cyclone disaster management in Gangetic West Bengal during the period 2001-2020.

Limitations of the Study:

i) The Scope of study is limited to Gangetic West Bengal (Sundarban & Sagar Island of South 24 Parganas and Digha Region of Purba Medinipur district) .

ii) On account of time and cost constraint, data of 350 samples have been included in this research.

iii) Data relating to the cyclones occurred before 2001 are not included.

iv) Regarding the aspect of secondary data, research work has referred Government reports, journals, newspapers, website review.

Delimitation of the Study:

The present study is delimited to the respondents of Sundarban and Sagar Island of South 24 Parganas and Digha Region of Purba Medinipur district.

Ii Research Methodology:

The study is a descriptive and analytical based on primary and secondary data collection. Both primary and secondary data have been collected for investigating the objectives framed for this research. The secondary sources of data have been collected from the Books, Journals, Government Reports, Publications, and Manuals. The secondary data relating to profile of study areas in West Bengal, data on Cyclone disaster management in West Bengal have been collected

The descriptive research includes fact-finding inquires on the cyclone disaster management in the selected study areas of Gangetic West Bengal from the period 2001 to 2020. The analytical research has been used to make evaluate facts on Cyclone Disaster Management in West Bengal

Sample Population:

Sample Population of this research work is the respondents of Sundarban and Sagar Island of South 24 Parganas district and Digha Region of Purba Medinipur in Gangetic West Bengal.

Selection of the sample:

350 respondents have been selected from study areas for collecting primary data and accordingly 350 questionnaires have been filled up.

Among these 350 samples, 100 samples have been collected from Digha Region, 100 samples from Sundarban, 100 samples from Sagar Island and remaining 50 samples are from near to Digha region of Purba Medinipur district.

Sampling Method:

Convenience and Judgement Sampling methods have been applied.

Data Collection:

Primary Source:

“Interview Schedule” was designed to elicit information from respondents on cyclone disaster Management in Gangetic West Bengal from 2001 to 2020.

Secondary Source:

Secondary sources of data were collected from government publications, published materials from various books, journals, magazines, newspapers and website reviews. Data from non-governmental organizations was also used as a secondary source of data.

Techniques of Data Collection:

“Interview Schedule” was designed to collect primary data from respondents. Questions were clarified and elaborated by interviewing the respondents of study areas. The two tools conform to two different paradigms of research: the quantitative and the qualitative.

Types of Research:

Quantitative Research: The collected data are analyzed by statistical methods. For analyzing data through

quantitative research, here, descriptive statistics have been applied as a statistical technique.

Qualitative Research: Qualitative research is defined as a market research method that focuses on obtaining data through open-ended and conversational communication.

Statistical Package for Social Sciences (SPSS) Software (IBM SPSS statistics Version 26) has been used for analysis of Primary data.

Qualitative data has been collected through Focus Group Discussions (FGDs) with respondents.

Iii Data Analysis:

3.1 ANALYSIS OF QUANTITATIVE DATA:

Table 1. Gender of the Respondents

Gender	**Numbers of Respondents**	**Percentages of Respondents (%)**
Male	160	46
Female	190	54
Other	0	0
Total	350	100

Source : Primary Data compiled through SPSS 26

From the above table, it is observed that the male respondents were 46% and the female respondents were 54%. Nearly equal numbers of respondents were male and female.

Table 2 : Age Group of the Respondents

Age (in years)	**Numbers of Respondents**	**Percentages of Respondents (%)**
Below 30	20	5
31-40	60	17
41-50	85	24
51-60	100	28
Above 60	85	24
Total	350	100

Source : Primary Data compiled through SPSS 26

From the above table, it is observed that the highest respondents' age group was 51– 60 years, and the lowest respondents' age group was below 30 years. The other respondents' age groups were 31–40 years, 41–50 years, and above 60 years, respectively. The majority of respondents belong to the age groups of 41-50 years, and 51–60 years.

Table 3. Area wise division of Respondents:

Area wise division of Respondents	**Numbers of Respondents**	**Percentages of Respondents (%)**
Digha	100	29
Sundarban	100	29
Sagar Island	100	29
Adjacent areas of Digha	50	13
Total	**350**	**100**

Source : Primary Data compiled through SPSS 26

From the above table, it is observed that the respondents belong to the areas of Digha, Sundarban, Sagar Island and adjacent areas of Digha. Data related to the above table reflect that except, adjacent areas of Digha, equal numbers of respondents are from remaining study areas.

Table 4 : Occupation of Respondents

Occupation of Respondents	**Numbers of Respondents**	**Percentages of Respondents (%)**
Students	64	18
Teachers	72	21
Businessmen	66	19
Doctors	10	3
Engineers	17	5
Software Professionals	11	3
Others	110	31

Total	350	100

Source : Primary Data compiled through SPSS 26

From the above table, it is observed that 18% of respondents were students, 21% of respondents were teachers, 19% of respondents were businessmen, 3% of respondents were doctors, 5% of respondents were engineers, 3% of respondents were software professionals and 31 % of respondents were others.

Table 5. Issue of Concern Regarding Disaster Management

Issue of Concern regarding disaster management	**Numbers of Respondents**	**Percentages of Respondents (%)**
Very Concerned	190	54
Somewhat Concerned	150	43
Neutral	10	3
Not Concerned	0	0
Not Very Concerned	0	0
Total	**350**	**100**

Source : Primary Data compiled through SPSS 26

From the above table, it is evident that 54% of respondents were very concerned about disaster management, 43% of respondents were somewhat concerned about disaster management and 3% of respondents were neutral .

Table 6. Sources of Information Regarding Cyclones

Sources of Information regarding Cyclones	**Numbers of Respondents**	**Percentages of Respondents (%)**
Newspapers	119	34
Televisions/Radios	25	7
Family/Friends	52	15
SMS in Mobile Phones	22	6

Internet/Social medias	124	36
Others	8	2
Total	**350**	**100**

Source : Primary Data compiled through SPSS 26

From the above table, it is observed that most of the respondents have gotten information regarding cyclone disaster management from Newspapers and Internet/social medias. Few of them have gotten information from Televisions/Radios, SMS in Mobile Phones and others.

Table 7. Sources of Support for preparing Disaster Management Plan:

Sources of Support for preparing Disaster Management Plan	**Numbers of Respondents**	**Percentages of Respondents (%)**
Government	140	40
NGO/Voluntary Organisation	100	29
Both Government & NGO/Voluntary	110	31
Total	**350**	**100**

Source : Primary Data compiled through SPSS 26

From the above table, it is evident that out of 350 respondents, 40% of respondents have gotten support from the government, 29% of respondents have gotten support from an NGO or Voluntary Organisation and the remaining 31 % of respondents have gotten support both from an NGO or Voluntary Organisation & the Government.

Table 8. Pre-Disaster Support before Cyclone

Pre-disaster Support before Cyclone (Yes/No)	**Numbers of Respondents**	**Percentages of Respondents (%)**
Yes	350	100
No	0	0

Source : Primary Data compiled through SPSS 26

From the above table, it is evident that all respondents had gotten pre-disaster support before cyclones occurred.

Table 9. Availability of Resources before Aila and Amphan

Availability of Resources before Aila and Amphan	Numbers of Respondents	Percentages of Respondents (%)
Alternative sources of Shelter	123	35
Food facilities	56	16
First Aid Kits	256	73
Water Supply	300	86
Disaster Kit	251	72

Source : Primary Data compiled through SPSS 26

From the above table, it is evident that all respondents have gotten necessary resources like Alternative sources of Shelter, Food facility, First Aid Kits, Water Supply, Disaster Kit before Aila and Amphan.

Table 10. Evacuation of Locality before cyclone struck

Evacuation of Locality before cyclone struck	Numbers of Respondents	Percentages of Respondents (%)
Yes	150	43
No	40	11
Can't Say	160	46

Source : Primary Data compiled through SPSS 26

From the above table, it is evident that 43% of respondents reported that the locality was evacuated before the cyclone struck.

Table 11. Post-Disaster Support after Aila and Amphan

Post-Disaster Support after Aila and Amphan (Yes/No)	Numbers of Respondents	Percentages of Respondents (%)
Yes	340	97

No	10	3

Source : Primary Data compiled through SPSS 26

From the above table, it is evident that 97% of respondents reported that they had gotten pre-disaster support after Alia and Amphan.

Table 12. Issue Regarding Communication to the Authority for Reporting Problems and Effectiveness of Responses

Statements	**Numbers of Respondents**	**Percentages of Respondents (%)**
We did not try to contact any local authority/helpline number	31	9
We tried to contact authorities, but could not reach them/did not get any response	21	6
We could contact the authorities, but their responses were NOT helpful	15	4
We could contact the authorities, and received helpful responses	260	74
Other	23	7
Total	350	100

From the above table, it is evident that 74% of respondents reported that they had gotten helpful responses from authority.

Table 13. Issue Regarding Availability of Resources after Aila and Amphan

Availability of Resources	**Numbers of Respondents**	**Percentages of Respondents (%)**
Alternative sources of Shelter	200	57
Food facilities	320	91
Facilities of Light	210	60
First Aid Kits	200	57

Water Supply	350	100
Money	220	63

As per the above table, 57% of respondents had received Alternative sources of Shelter, 91% of respondents had received the food facilities, 60% of respondents had received the facilities of light, 57% of respondents had received the First Aid Kits, 100% of respondents had received the water supply and 63% of respondents had received the money.

Table 14. : Issue Regarding Satisfaction Level , with Respect to Disaster Management Plan

Satisfaction Level with respect to Disaster Management Plan	**Numbers of Respondents**	**Percentages of Respondents (%)**
Strongly Satisfied	121	34
Satisfied	132	38
Neither Satisfied nor Dissatisfied	44	13
Dissatisfied	21	6
Most Dissatisfied	32	9
Total	350	100

Source : Primary Data compiled through SPSS 26

As per the above table, 34% of respondents are strongly satisfied with the cyclone disaster management plan, 38% of respondents are satisfied with the cyclone disaster management plan, 13% of respondents were neither satisfied nor dissatisfied, 6% of respondents were dissatisfied, and 9% of respondents were most dissatisfied.

3.2 ANALYSIS OF QUALITATIVE DATA:

Based on Focus Group Discussions (FGDs) with respondents it is evident that the funds available was insufficient for paying for the bare necessities for those impacted by Amphan and Alia. For this reason, it was not possible to allocate money to cyclone affected areas. Local Authorities like Municipal Corporation, Zilla Parishad, Panchayat Samity, Gram Panchayat, Gram Sansad played active role in providing resources during cylones. In some areas Voluntary Agencies including NGOs and UNICEF also took initiatives in providing assistance. Also, our state government gave prior alert through messages and announcement in respective coastal areas which were cyclone prone. Most of the respondents were satisfied with the resources that were available to them before and after the cyclones. Local authorities also played key roles in rescuing people from cyclone affected areas. To minimize damage from cyclones in the near future, concerned authorities took initiatives and started necessary action.

4. Conclusions :

It has been observed that when suitable preparation measures have been taken, the loss of life and property has been significantly decreased. The region's overall disaster management was greatly aided by preparedness measures like training community members and other role players, developing sophisticated forecasting

systems, and, most importantly, having a sound national policy and an institutional framework that was well-connected and included government agencies, educational and research institutions, the armed forces, and non-governmental organisations. Eventually, it resulted in the much-needed shift in focus from relief and rescue to readiness.

Analysis of Survey Data based on selected respondents of study area, reflect following:

a) Most of the respondents were concerned about Cyclone disaster Management

b) Respondents have got information regarding cyclones from Media

c) Respondents have got support from Governments and NGOs.

d) Before Cyclones, respondents were in a position to fulfil their basic needs.

e) Before Cyclones, respondents were in a position to fulfil their basic needs.

f) Due to shortage of fund, all respondents were not in an opposition to get money.

g) Except few percentages of respondents, most of the respondents were satisfied with Disaster Management Plan.

It is important to note that effective safety and security measures must be incorporated into industrial disaster management. Including the community in the action will give it greater significance.

The data clearly demonstrates that families living in the surrounding coastal areas were promptly evacuated to the cyclone shelter. Some of them had bags stuffed with personal items. To guard against viruses, it has been made sure that they are all wearing face shields. Using a loudspeaker, government representatives inform the villagers against the storm.

Also, it has been revealed that the community as an institution in itself had emerged as the most powerful in the entire mechanism of disaster management. In the event of actual disasters, the community, if well aware of the preventive actions it was required to take, can substantially reduce the disaster damage. Awareness and training of the communities particularly useful in areas which are prone to frequent disasters.

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