

Disaster Management in the face of Extreme Climatic Conditions in Papumpare District of Arunachal Pradesh: Critical Issues and Strategic Response

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Abstract

Disaster management is one of the key areas that one needs to understand as the various nations of the world have witnessed the severe devastation caused by natural and human-made disaster, which claims and damages several lives and properties, etc. Understanding the disaster management issue is a pertinent and prerequisite in this fast-changing, technology-driven modern world, as it has far more serious consequences that need to be addressed. The disaster management framework needed the circle notion of good preparedness, mitigation, disaster response, and recovery, and thereby again came to the preparedness aspect. Thus, a well-integrated and systematic disaster management framework is a prerequisite to save many vulnerable species on this planet. Even Goal No. 13 by the United Nations Sustainable Development Goals (UNSDGs) in the year 2015 initiated by its member nations pledges to meet such like issues by 2030. Papumpare district in particular and Arunachal Pradesh in general too went through various severe disaster management crises from time to time. Hence, this paper is an attempt to study Disaster Management in the Papumpare District of Arunachal Pradesh along with its other significant aspects. The findings of the study will enhance the academic understanding of the problem under study on the one hand and the other hand, contribute to policymakers in framing an effective policy to deal with the Disaster Management issue in the study area.

Key Words: Disaster Management, Extreme Climatic conditions, vulnerable, SDGs & UNO

Introduction

India is considered to be one of the risk-prone and vulnerable nations in the world (Revi, 2012). There is a need for more inclusive and effective sustainable developmental policies to deal, prevent and reduce the disaster issues that induced by natural and human made. Disaster management and climate change are very much interrelated aspects that need to be understood as understanding the former without understanding the latter may lead to a failure of understanding both. Disaster refers to certain unexpected disruption that affects the normal functioning of human life and its nearby environment that resulting severe magnitude of suffering and loss of human lives and properties, along with devastating impact on infrastructure and environment, which may be human-made or natural (Sharma, 2019). Disaster management can be defined as the proper utilization of organization and management of resources to lessen the emergency crisis's impact and initiate certain actions to deal with various aspects of emergencies relating to humanitarian aspects while keeping in mind the

notions of well preparedness, response, recovery and measuring or assessing the catastrophic impact (Patil, 2019, p-19). The significant linkage between development and disaster is are well known and complex one (McEntire, 2004). Some people in the area relied upon indigenous traditional knowledge to prepare and deal with the disaster that caused by flood water in the Lakhimpur and Dhemaji of Assam (Singh, et. al. 2018). There is significant need of a different comprehensive and innovative approach in dealing with the disaster risk management at current context (Prabhakar, Srinivasan, & Shaw, 2009). Importantly, there are two types of disasters such as Man-Made Disaster and Natural Disaster. Man-Made Disaster: A disaster caused by wreck less human activity like chemical and biological attack, hazardous industrial wastage and materials spills, explosion, etc.. Natural Disaster: A disaster caused by natural phenomena like Earthquakes, Tsunami, severe storm, floods, wildfire, hurricanes, draught, landslide, volcanic eruptions, etc. (*Source: Ministry of Environment, Forest and Climate Change, GoI, 2010*).

Extreme climatic condition on other hand refers to a type of climatic condition that give rises the ground temperature very high and heats up the air temperature in the summer season and huge temperature falls and cool down air pressure very low in the winter, therefore it has unusual weather events in term of magnitude, timing events and location that posed severe challenges for the survival of human existence (World Meteorological Organization, 2021). Extreme climatic condition usually refers to those climatic condition that have a severe devastating impact upon the communities, agricultural production and natural ecosystem, etc. (U.S. Department of Agriculture, 2022). Climate changes gradually, but if unchecked, severe and unpredictable changes and damages may occur. Climate change has a consequential effect upon various aspects of our lives as it has a complex nature of occurrence and life-threatening consequences. Although climate change is considered to be a natural phenomena but it is augmented by various reckless human actions. Therefore, a need based holistic and innovative policy and programme must be initiated to deal with the serious catastrophic challenges posed by unchecked climatic changes. Scientifically, it is evident that human-induced climate change shall have larger environmental changes and consequences like extreme weather changes, sea level rise, disrupt the agriculture practices and lead to coastal floods (Linnenluek, Stathakis & Griffiths, 2010). Rapid growth of population along with high densities, low quality infrastructure and public service, poverty and inaccessible housing, etc. contributed more towards the increasing cases of vulnerability over the last few decades, especially in urban centres in India (Revi, 2012). Hence, Disaster Management in extreme climatic conditions is a very challenging issue that needs to be addressed in a disaster-prone region like Arunachal Pradesh. According to Singh (2016) Arunachal Pradesh falls under a danger risk seismic prone zone; therefore, landslide and earthquake hazards mitigation is utmost required to prevent and deal with natural hazards. The ecological system of Arunachal Pradesh is more complex, fragile and vulnerable due to its physiographic conditions; hence it got easily affected and disturbed by global climatic conditions (Maiti Et al., 2015). As geography and physiography of Arunachal Pradesh vary with the variation of its mountain ranges. The climatic conditions of the state (AP) are highly humid in the lower belt of the state and extremely cold at higher altitudes and the average rainfall of the state is 350 cm and receives 2500-3000 mm average rainfall annually (Department of Economics and Statistics, GoAP, 2019). The climate of the

Papumpare district is mainly influenced by its varying natural geographical terrain, valleys, riverine, stream, and elevation, etc.

As per as the Papumpare district is concerned it is more prone to heavy rainfall, landslide, floods, flash flood, fire accident and earthquakes, etc., which leads to loss of many lives and properties (State Disaster Management Authority, 2020). Therefore, the active involvement of the State Disaster Management Authority and District Disaster Management Authority is mostly required in the Papumpare district. The increasing cases and intensity of natural and man-made calamities have time and again posed for redefined and rethought policy, strategy action.

Objective of the study

The proposed study consists of the following objectives:

1. To know the role of Disaster Management Authorities in dealing with the Disaster problem in the face of Extreme Climatic conditions in the study area,
2. To find out the major issues and challenges in managing Disaster in the in the study area that faced by the concern authorities and general public, and
3. To assess the People's perceptions in dealing with the Disaster Management issues in the study areas.

Methodology

The present study is both qualitative and quantitative in nature. However, based on the nature of study it is more qualitative in nature. The exploratory research design has been used to make the study more rational and organized. The researcher remains neutral and unbiased throughout the research. For the present study the primary and secondary data have been used. The Primary data has been collected via semi-structured interview schedule while Secondary data has been collected via district data handbook, journal, newspaper, magazine, state gazetteers, official website and official documents in hard and soft copies, etc. The reason behind selecting Doimukh block is that it is conveniently more easier for the researcher to carried out research in the adjacent locality. Based on the suitability of the study total of 100 respondents were randomly selected from the Doimukh town area, with majorly focus on the tribal populations, and purposive sampling techniques were employed in selecting the concerned authorities dealing with the Disaster Management issues in the State. The data for the present study have been collected for 17 days time period w.e.f. 26.08.2024 to 13.09.2024. The analysis of the present study has been done through various tables, pie charts, graphs and , etc., and based on the finding of the study certain important recommendations are suggested.

Area of the study

Papumpare district was created by bifurcating Lower Subansiri District in the year 1992, and it is situated in the South western part of Arunachal Pradesh. The district headquarters of Papumpare district is located at Yupia, and it is just 22 kilometres away from the state capital, Itanagar. As per the 2011 census, the district has a total 1,76,573 populations out of which 89,182 were males and 87,391 were females. It has a population density of 51 people per. Sq. Km. The Papumpare district got its name from two significant rivers, that is

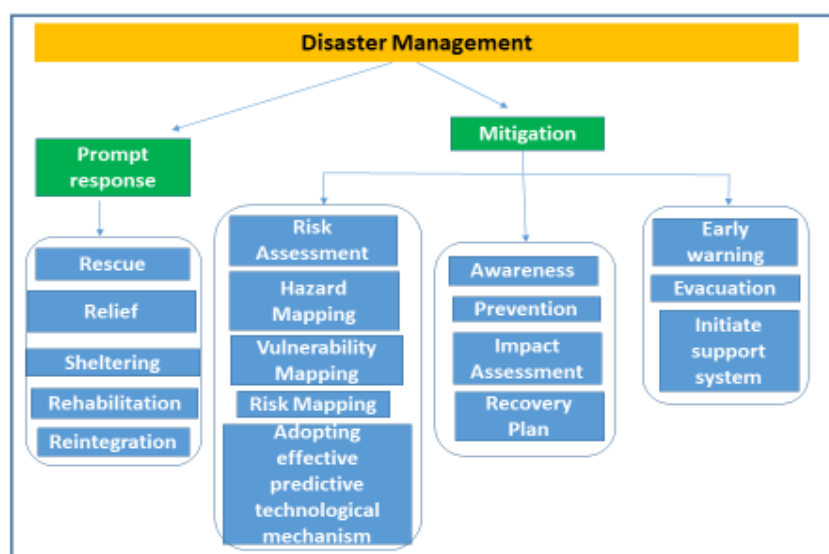
Papum river and the Pare river. The district has a total geographical area of 3462 sq km. and it is located at the East longitude of 92° 40` and 94° 21`, and 26° 55` and 28° 40` North latitude. Papumpare district has a total of four subdivisions and six blocks. The four subdivisions of the Papumpare are, namely; Sagalee, Kimin, Doimukh and Balijan. The six blocks are Kimin, Doimukh, Borum, Balijan, Sagalee and Mengio. It has hills and mountain ranges that vary approximately from 45 to 1200 meters above sea level. The district is surrounded by beautiful hills, forests and deep gorges, etc. (Department of Economics and Statistics, Govt. of Arunachal Pradesh, 2023).

Arunachal Pradesh: Integrated Disaster Management Planning

The tribal population of Arunachal Pradesh display indigenous knowledge system and practice that vital for the management and conservation of forest that balance the eco-system (Saikia, et al., 2020). Climate change in the eastern Himalayan Forest of Arunachal Pradesh has affect the both livelihood of local communities and their biodiversity as the majority of local people mostly depend upon the natural resources of their nearby environment (Khan and Bharali, 2011). The major climatic changes in the region includes temperature rising, changes in intensity and frequency of rainfall pattern, extreme hots and colds in their respective seasons. The extreme climatic condition in the region impact upon the agricultural crops and horticulture planting seasons, extinction of many vulnerable species, heavy floods and landslide, changes in vector diseases, etc. Further, the annual mean and maximum temperature in the region increase by 0.04° C and +0.11°C per decades respectively (State Disaster Management Authority, 2019). The extreme precipitation event such as heavy rainstorm and cloud burst, have fragile impact upon the fragile geomorphology of the regions (SDMA, 2029).

Integrated Disaster Management Planning: there is a need of well-prepared integrated Disaster Management Planning to deal with the Disaster Management issue efficiently.

Table: Integrated Disaster Management Planning



(Source: Field study: 2024)

Finding and discussion

The finding and discussion of the present study are discussed one by one in the below:

Analysis of objective I

The role of Disaster Management Authorities in dealing with the Disaster problem in the face of Extreme Climatic conditions in the study area is a pertinent issue to deal with, and accordingly, they are discussing it below:

Rescue teams' details are located/placed in Arunachal Pradesh

1. National Disaster Response Force (NDRF): Its Headquarter is located at Doimukh, Papumpare District of Arunachal Pradesh.
2. State Disaster Response Force (SDRF): SDRF is headed by the Commandant and Deputy. Commandant and it has a total of 05 (five) Regional Centre in the State (AP) and they are furnished below:

Sl. No.	District Hq.	Designation	Contact No.
1.	Bomdila	Constable (CT)	8787614591
2.	Ziro	Constable (CT)	8730999410
3.	Pasighat	SI & H/Constable	7002933457 & 7005101150
4.	Tezu	Head Constable & HSG	8731884727 & 9862246344
5.	Khonsa	Head Constable	8837025671

(Source: Computed from Disaster Management Authority, 2019)

Financial Implications/Arrangement

1. State Disaster Response Fund: The SDRF carried out emergency relief and rehabilitation, etc, activities under the recommendation proposed by the 13th Finance Commission, that recommended the Disaster Management. As per the Disaster Management fund implication for Arunachal Pradesh is concerned, it is 90: 10 ratio where 90% is Centrally sponsored and 10% is borne by the State Government. The total fund allotted for Arunachal Pradesh for the year 2015-2020 was 2430/- crores, out of which 1822.50 crores was Central share and 607.50 crores was State share.

Finance and Budgeting

Sl. No.	Agencies	Purpose	Finance Arrangement	Nodal Agency
1	NDRF	Relief Assistance	100 % Central Govt.	NDMA/SEC/ Dept. of DM/DDMA/DA/Executing Agencies
2	SDRF	Relief Assistance	90 % Centre & 10 % State	SDMA/SEC/ Dept. of DM/DDMA/DA/Executing Agencies

3	District Planning Fund	Any public works	MP & MLA aid and grants	DA, Local Bodoes and Line Departments
4	CSR	Corporate	3 % of profit	SDMA/SEC/DDMA/DA/GADA

(Source: Computed from State Disaster Management Plan, 2019)

Identified a safe shelter

Identified a safe shelter for emergency situations in Dimukh Sub-Division

Sl. No.	Name of Circle/Location	Name of building	Capacity
1.	Doimukh	Rono Ground	200
		Govt. HSS. Doimukh	100
2.	Yupia	General Ground, NIT Building, Court Building	N/A
3.	Gumto	Circle Office, Gumto	N/A

(Source: SDO, Doimukh, GoAP, 2024)

Storage of Food at Doimukh Sub-Division

Sl. No.	Circle	No. of FPS	Location	Stock	Capacity	In-Charge
1.	Doimukh	14 Nos	Doimukh Township	700	1400	SDF & CS

(Source: SDO, Doimukh, GoAP, 2024)

Thus, the above-mentioned highlights the some of roles of Disaster Management Authorities in dealing with the Disaster problem in the face of Extreme Climatic conditions in the study area.

Analysis of objective II

Issues and challenges

Local bases Issues and challenges are one of the most pertinent issues that need to be understood and addressed to tackle disaster management at such extreme climatic conditions which are discussed below:

Loss of lives due to landslides, floods and Fire in Arunachal Pradesh

Sl. No.	Place	Date	Loss
1.	Itanagar	1993	25 people were buried alive
2.	Itanagar	2005	8 lives lost
3.	Naharlagun	2009	4 lives lost
4.	State	2010	44 lives lost

5.	State	2011	47 lives lost
6.	State	2012	70 lives lost
7.	State	2013	52 lives lost
8.	State	2014	61 lives lost
9.	State	2015	29 lives lost
10.	the State	2016	42 lives lost
11.	State	2017	60 lives lost
12.	State	2018	7 lives lost

(Source: Computed from the State Disaster Management Act, 2019)

Hazards and their seasonality in the Papumpare district

Sl. No.	District		Vulnerability to Earthquake	Vulnerability to landslide	Vulnerability to flood/Flash Flood	Vulnerability to Fire/ Forest Fire
1.	Papumpare	Urban	Very High	Very High	Very High	High
		Rural	Very High	Very High	Very High	High

(Source: Computed from the State Disaster Management Act, 2019)

Issues and challenges in managing Disaster in Papumpare District by the concerned authorities

Sl. No.	Types of Hazards	Time of occurrence	Vulnerable areas	Potential impact
1.	Earthquakes	Anytime	Entire district	Loss of life, livestock and infrastructure
2.	Flood	June-September	Tarasso, Doimukh, Kimin and Sangdupota	Loss of life, livestock and crop
3.	Fire-accident	Mostly during winter	Entire district	Human loss and house damage/property
4.	Epidemics a	Anytime	Entire district	Loss of human life
5.	Drought	October-January	Toru/Sagalee circle	Crop loss, water scarcity
6.	Cyclone	June-October	Sangdupota and Toru circle	Loss of life, crop, infrastructure and animals

(Computed from SDMA, 2020 & field study, 2024)

Showing Rainfall, Temperature and Weather patterns

Sl. No.	Minimum Temperature/Rainfall	Maximum Temperature/Rainfall	Month
1.	11.00/11.8 mm/Winter	38.52/212.1 mm/Summer	July-January/ June-January/ Summer-Winter

(Computed from SDMA, 2020)

Hazard, Vulnerability and Risk Assessment that occurred in Papumpare district

Heavy rainfall: Heavy rainfall refers to continuous and uninterrupted rainfall for three days or more in a quantity of 64.5 mm to 124.4 mm per day. The people of the study area, every year, due to heavy rainfall, face problems of damage of private and public infrastructures, loss of agricultural and horticultural land and crops, problems in transport and communications, etc.

Hailstorm: comparatively hailstorm involves less loss of lives and properties, but it also sometimes poses significant challenges in the occasional manner in the region. Here, the major concern is not only hailstorms but due to the heavy torrential rainfall and high winds associated with hailstorms, which added more devastation in the district.

Flood: The Doimukh river, along with its tributaries, during the rainy season (June to October) causes certain flood in the region which more accelerated by the heavy rainfall in the region. Flash flood more often resulted severe damages to road, drainage, and communication network, water supply, electricity and horticulture and agriculture sector, etc. in the study area.

Landslide: Landslide is one of the most occurring phenomena in the summer or rainy season due to heavy rainfall in the study area. Landslide leads to the disturbance of the transportation and communications network, water and electricity supply, loss of agriculture and horticulture lands and crops, etc. Sometimes, a landslide has resulted in acute shortages of basic needs of human survival. Landslide problems more tend to happen during the summer season in the district which leads to loss of private and government properties in the study area.

Earthquakes: Earthquakes, which is caused by natural tectonic interactions suddenly strikes thereby it is unpredictable. Thus, such unpredictable incident may be tackled by ensuring certain preventive measures and mechanism such as to adopt safety protocol of building huge structures, water supply lines, communication facilities, high tension electricity supply lines, etc. in the study area. Further, the study found that more focus approach should be oriented towards lifesaving priority in the region.

Fire accident: Compact housing pattern and settlement, electricity short circuit, lightning and thunder, etc. in the study area leads to more damages in the study area. It is found that though more frequent cases of fire incidents occurred in the traditional pattern constructed household by thatched roofs, bamboo and timbers materials, etc. in the study area but more damages of lives and properties are caused by large scale fire accident in the concrete buildings. In the study area the more incidents of fire accidents occurred in the month of summer and winter resulted in the loss of lives and properties and induced homeless like situations.

Tornado: Tornado are local storms or thunderstorm that occurred very less in the district with low intensity as it induce less damages. Thus, it has less impact upon the lives and properties in the study area.

Urban Population: Urban population is expected to grow by around 500 million in the next 50 years in India, and due to rapid urban population growth, there tend to be more cases of human-made hazards and subsequently natural hazards (Revi, 2012). Rapid urban population growth and high population density have culminated in the problem of housing management, poverty, public services and disaster-prone tendencies in the various parts of India, including Papumpare

district of Arunachal Pradesh (*Source: Ministry of Environment, Forest and Climate Change, GoI, 2019*). The study also found that haphazard and unchecked population settlement in the study area contribute more to human made disaster as more people settlement lead to more deforestation, pollution and unchecked earth cutting, etc.

Hence, some of the above man-made and natural disasters that contributed the severe affect on local dweller and it became more worst during the extreme climatic conditions, such as heavy rainfall and storms, etc. As such heavy rainfall and storms, floods, etc. damages the roads, drainage, bridges, private and public infrastructure, telecommunication infrastructure, etc. in the study area.

Analysis of objective III

Almost all the respondents stress for ‘short’ and ‘long term strategies’ to deal with the Disaster Management. The study found that despite many disaster management approach that initiated by the concern authorities all the respondents stated that they lack even basic disaster management amenities at their houses and locality to save themselves from such sudden crisis. The study found that due to nature of disaster an Indigenous knowledge based system can also be limitedly practiced as people lacking the modern technological facilities to deal with such issues. However, Local adaptation strategies like planting more trees at the flood areas, constructing community barricades and warning signals at accidental, disaster and flood-prone areas, etc., are found in the study area. Native dwellers were also of the opinion that building traditional local/tribal housing good earthquake (field data. 2024). The study found that people in the study area are gradually more aware of natural and man-made disasters. However, the majority (85 %) of the respondents did not initiate any preventive approach to tackle such an unexpected disaster in their native area. Only 10 per cent (%) of the respondents stated that they have one way or another way acted to prevent any untoward disaster that may damage their lives and properties. 5 per cent (%) of the respondents showed ignorant attitudes towards such pertinent context as they were not much concerned about those issues. The study found that the dwellers of Doimukh town area who are more aware of such disaster issues emphasize the need for proper storage of food, water, medicine and other important item that may very much needed at the time of severe crisis.

The study found that the designated authorities, with the help of those native dwellers have bring impactful result in preventing, saving and proposing effective policies and planning to check the disaster management in the crisis time in the study area. The study pertinently found that peoples’ participation may play a key role in dealing with the emergency situation that occurred due to natural and man-made disaster. It is found that there is very less involvement of Gram Panchayat Members (GPMs) in dealing with disaster management crisis and distribution of relief works, etc. in the study area where most of the such activities are carried out by the concerned designated governmental department. So, less community participation or involvement is found in the study area in the field of relief and rehab distributions. Moreover, less involvement of Non-Governmental Organizations (NGOs) also fund in the study area in dealing with the disaster management issue.

Provide strategic response to critical issues and challenges

In the below base on the finding of the study some key short term and long term solution has been meted out.

Short terms solutions	Long term solution
1. Local approach to solve local problem. 2. Need based prompt response. 3. Role of media in Disaster management. 4. Provide 24x7 mobile and landline numbers. 5. Community participation: role of NGOs/CBOs and general publics. 6. Adopt user friendly help line approach. 7. Emergency Operation Center. 8. Institutions for prompt Climate Responsive team. 9. Emergency response / relief and rehabilitation, medical response: Set up of relief camp at earliest manner: initiate or increase demand of relief and recovery process. 10. Role of CBOs/NGOs: community based Disaster Management Programme: at village level like safe housing/bunkers, resource mapping, conducting awareness at village level, disaster management plan at village level. 11. Role of ICT/technological orientation. 12. Disaster Management and Relief manual for the state. 13. Emergency response center: 14. Emergency transport and communication.	1. Proposal for safety and sustainable developmental approach. 2. Need to conduct more inclusive and effective Awareness programme at Schools, colleges, Universities, rural and urban areas. 3. Responsive government: political decision and will power. 4. Adopt more advanced technological equipment to detect and warn people in advance about a disaster crisis. 5. Introduction of Disaster Management syllabus at different educational institutional levels. 6. Provide basic Disaster Management training to all the stakeholders. 7. Urban disaster prevention and mitigation. 8. Development of a better Disaster Resource Management Network: regional response centres. 9. Need-based legal and policy framework: at the national and state levels. 10. Set up well well-designated Disaster Management institution or task force to assess immediate damages and control. 11. Learn from past failures and success. 12. Reform minded adapted to change and challenge. 13. Manage poverty: poverty may impose as barrier in effectiveness of disaster risk reduction approach. 14. Check population explosion 15. Check industrial wastages. 16. Check land use patterns. 17. Preserve the eco-system. 18. Preserve natural habitat and biodiversity. 19. Check hazards and disaster risks: desertification, flood, landslide, drought, earthquakes, deforestation-forest fire, mining, epidemic/pandemic, industrial hazards, etc. 20. Risk reduction approach: afforestation; water and soil management like control of soil erosion, wasteland management; check housing design and settlement pattern; change of appropriate crop diversification, etc.

15. disaster management plan & guidelines/preparedness. 16. bottom up approach. 17. early warning system. 18. impact and damage assessment system.	21. Augmented towards developmental goals: opt towards renewable and natural resources; provide better employment opportunities; reduction of poverty; planned housing and urban development approaches; adaptation of safer transport and communication mode; check economic inequality, better nutrition and healthcare facilities; opt for agriculture production and sustainability resources. 22. Impart innovative and comprehensive training/capacity building Programme for search, rescue and Medicare operation at the local level. 23. Research orientation to know the ground level. 24. Checking of unscientifically approved housing construction.
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(Source: fieldwork, 2024)

Conclusion

A needs-based disaster management approach and readiness programme need to be initiated by the concern authorities and public to overcome unexpected catastrophic. A proper study and understanding of any developmental approach needs to be done so as to avoid any untoward catastrophe. Vulnerable areas must be identified and shared with mass public for awareness. Concerned authorities must make most of the decision in consulting with the native dwellers. Proactive decisions and action are most effective modes to overcome such crisis. Paradigm shift of considering lenient approach towards dealing disaster issue need to be change while taking the pertinent steps to have short-term and long terms strategies to deal with the disaster crisis.

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