

ORIGINAL ARTICLE



Role of SSDMA in relief and restoration of disaster-affected areas in the state of Sikkim

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ABSTRACT

Sikkim is located in the Eastern Himalayas and is bordered by China, Nepal, and Bhutan. The mountain is young, fragile, and susceptible to disasters such as landslides, GLOFs, and flash floods. Thus, timely intervention and initiatives by disaster relief institutions and the state have become imperative. The Sikkim State Disaster Management Authority (SSDMA) is a key institution in disaster relief activities in the State of Sikkim and is responsible for the first-hand response to disasters in the state. The SSDMA is a dynamic and robust institution for tackling state disasters. With initiatives such as Satellite Communication, Common Alert Protocol (CAP), ERSS, emergency operational centers, and automated weather stations, the 'SSDMAs' approach to disasters is scientific and aligned with current technological innovations. The actions taken by the SSDMA in the past demonstrated a strong commitment to enhancing Disaster Management capabilities in the state. Through strategic collaborations and technological interventions, Sikkim made significant progress in disaster-related areas. This paper examines the role of the SSDMA in responding to disasters, providing relief to affected people, and restoring disaster-affected areas in the state of Sikkim.

KEYWORDS

Sikkim; Mountain; Disaster; SSDMA; Relief; Restoration; Disaster management

ARTICLE HISTORY

Received 12 February 2026;

Accepted 23 March 2026; Published 30 March 2026

Introduction

Sikkim, a hilly and fragile mountainous region, is prone to frequent natural disasters such as earthquakes, landslides, flash floods, and GLOF, which disrupt normal life by affecting people and their resources. Climate change, steep slopes, and seismic activity play a dominant role. Sikkim, located in the Eastern Himalayas, falls under seismic zones IV/V and has experienced devastating disasters in recent decades, resulting in loss of lives, property, and environmental damage.

According to the report extracted from "Government of Sikkim Law Department no.38/LD/06 dated 4.7.2006", to tackle such disasters, the Government of Sikkim has established SSDMA under the Disaster Management Act 2005, which was passed in the Sikkim Legislative Assembly on the 15th of June 2006.

The State Disaster Management Authority is a nodal institution that is responsible for the declaration of disasters in the state, and it also determines the areas that are impacted by disasters.

The SSDMA is a part of the State Government and a nodal institution for planning, coordination, and monitoring for disaster prevention, mitigation, preparedness, and management.

This study examines the role of the SSDMA in declaring emergencies during disasters and tackling the impact of such emergencies/disasters in the state.

Definitions and meanings

Disaster

The term disaster refers to a sudden calamity/event that leads to property and environmental destruction, the loss of human life, and the loss of other natural beings. A disaster is caused by hazards such as landslides, earthquakes, and floods, which disrupt normal life as they affect people and their resources. Disasters are classified into three types: natural, man-made (human-induced), and biological [1].

According to the UNDRR 2017. Sendai Framework Terminology for Disaster Risk Reduction. "A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity,

leading to one or more of the following: human, material, economic and environmental losses and impacts" [2].

Disaster management

Disaster Management is the systematic process of preparing, responding, mitigating, and recovering from disasters to minimize their consequences on people and infrastructure.

According to the reduction, the organization, planning, and application of measures to prepare for, respond to, and recover from disasters is known as Disaster Management.

Study Area

This study is based on the state of Sikkim, which is "a small



Figure 1. District map of Sikkim.

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northeastern state in India, renowned for its natural beauty and rich cultural heritage". Nestled in the eastern Himalayas at 27°20'N 88°37'E, it is a landlocked state in India" [3]. The landscape of Sikkim is generally harsh and steep, as it lies around 300m to more than 8500 metres above sea level. It lies in northeastern India and is surrounded by three different countries: Nepal, Bhutan, China, and the Indian state of West Bengal. The state has four districts: East, West, North and South, with Gangtok as its capital, which comes under the East district. Sikkim is said to be prone to frequent disasters such as earthquakes, landslides, and flash floods, which are mainly caused by fragile geology, sheer slopes, recurring rainfall during monsoons, and an increasing population. Consequently, Sikkim provides an appropriate setting for assessing the functioning and efficiency of the SSDMA in mitigating the consequences of a disaster.

Source: SSDMA, Government of Sikkim.

Methodology

This study uses a mixed-methods approach that incorporates both qualitative and quantitative data to analyze the role of SSDMA in disaster relief and restoration.

Research design

Qualitative analysis

Data from various government authorities and government websites were used to understand the role of the SSDMA in implementing initiatives and digital interventions during the mitigation process in disaster-affected areas.

Quantitative analysis

Data related to financial support and ex gratia provided to the disaster-affected families/individuals were used to understand the norms established by the government.

Data collection

The data used for this study were based on secondary data collected from official reports and surveys in government organizations such as SSDMA. Government websites such as the official portals of the Government of Sikkim and the United Nations Office for Disaster Risk Reduction (UNDRR) were also used. Existing literature from various authors was also considered for the academic contextualization of the study.

Action Taken by SSDMA in Relief and Restoration

The state of Sikkim faces many frequent disasters, and to address these disasters, SSDMA has collaborated with state, central, and outside experts. The aim of the SSDMA initiative is to enhance the preparedness and disaster response skills of Disaster Management teams working in the state.

Key actions taken

Satellite communication

SSDMA has deployed eight satellite phones across every district in the state, SSDMA headquarters, and Chungthang to maintain a reliable communication/communication lifeline in every district of the state during an emergency/disaster. This communication will help disaster teams in relief operations and in circulating information.

CAP sachet for SMS based warnings

The SSDMA has introduced a state-wide SMS-based warning system that provides people with real-time warnings about disasters in the state. The CAP automatically sends messages to the public of disaster-affected areas, which will be helpful in reducing risks and response times.

Emergency Response Support System (ERSS 112)

ERSS is a national initiative for emergency services, which is a 24/7

helpline number (112), which is responded to by trained personnel and coordinates with local authorities and emergency services to provide faster responses to the public. This ensured that assistance was readily available during emergencies.

Emergency operational centres

Emergency centres equipped with modern technology have been established in every district (DEOC). The SEOC is in Gangtok, which operates 24/7 and serves as a central hub for Disaster Management in the state. It is equipped with state-of-the-art facilities that will help with coordination and response during disasters and emergencies.

Technological interventions

SSDMA has installed Automatic Weather Stations (AWS) for early warning of a glacial lake outburst flood (GLOF) at the South Lonak Glacial Lake and Sako Chu Glacial Lake. The Avalanche Monitoring Radar has also been installed in North Sikkim (at an altitude of 15,000 feet), which can detect an avalanche within 3 seconds of triggering.

Aapda mitra training programme

It is an NDMA-notified scheme (11th Aug 2016) to train community volunteers in basic relief and rescue tasks during a disaster or emergency. The training institutes for this programme are the Central Training Institute, Civil Defence and Home Guards, and Shillong, Meghalaya. The MoU was signed between the SSDMA and NDMA in March 2017.

Early warning and monitoring systems

The SSDMA has developed a state-wide real-time Early Warning System for rainfall-induced landslides in collaboration with the Geological Survey of India (GSI), which aims to predict landslides triggered by rainfall. SSDMA has also collaborated with Amrita Vishwa Vidyapeetham, South India, and has installed a real-time Early Warning System for rainfall-induced landslides at Chandmari, Gangtok, which provides a potential warning 24 h prior.

Deployment of disaster response forces

The SSDMA has deployed both the National Disaster Response Force (NDRF) and the State Disaster Response Force (SDRF) all over the state to increase the on-ground response during disasters. One force of NDRF is stationed in Pakyong, which is ready to respond during major disasters, while the forces of SDRF are stationed in Gangtok, Pangthang, Piple, and Manglay. SDRF comprises home guards, civil defence, Sikkim armed police, and the Indian Reserve Battalion. These forces are readily available for managing rescue and relief operations during disasters/emergencies.

Relief Assistance and Financial Support (Ex-gratia)

According to the State Disaster Response Fund (SDRF) and National Disaster Response Fund (NDRF) norms (2022-2026), financial support/ex-gratia are provided to those affected by natural disasters in the state. As per notification a) ex-gratia of 4 lakh is provided per deceased person, b) Assistance for permanent disability 74,000 if the disability is between 40%-60% and if the person is fully disabled then ex-gratia of 2,50,000 will be provided, c) Grievous injury requiring hospitalization will be provided 16,000 per person (if hospitalized more than a week) and 5400 per person (if hospitalized less than a week), d) Damage to houses- if the house is fully damaged then ex gratia of 1,20,000 (for pucca house) and 95,000 (for kutcha house) will be provided and 5000-10,000 per household will be provided if the house is partially damaged, e) Damage to clothing and household items- 2,500 per family will be provided, f) Loss of crops- If the loss is more than 33% then the ex gratia of 6,800 per hectare (rainfed) / ₹13,500 per hectare (irrigated) will be provided, g) Loss of livestock-ex gratia of 37,500 will be provided for milch animals such as buffalo/cow/camel/yak/Mithun etc, and 4,000 for sheep/goat/pig, 32,000 will be provided for draught animals like camel/horse/bullock etc, and 20,000 for calf/donkey/pony/mule/heifers and if there is loss of poultry then the ex gratia of 100 per bird (max up to 10,000) will be

provided. h) Assistance for artisans and small traders- compensation of 4,100 per artisans/traders will be provided for the loss of tools, raw material, or business assets [4].

Source: Ministry of Home Affairs

Table 1. Ex-gratia/economic relief provided by the government during the disaster.

Reason	Amount
Loss of life	4 lakhs
40 – 60 % injured	74,000
Injured above 60 %	2,50,000
Adults (for food)	60 per day
Children (for food)	45 per day
Damage/loss of the house	1,20,000 (pucca house) 95,000(kutchha house)
Loss of clothing	1800
Loss of household goods	2500 per family
Loss of buffalo, cow, yak or camel	37,500
Loss of sheep, goat or pig	4000
Loss of calf, donkey, pony or horse	32,000
Loss of land	6800 per hector
Loss of irrigated land	13500 per hector
Loss of cock	100 Maximum amount of Rs 10,000

Source: Author's compilation.

Results and Discussion

According to this study, the role of the SSDMA is very important for the improvement of disaster preparedness, response, and mitigation in Sikkim. Strategies such as CAP SMS warnings, satellite communication emergency response support systems (ERSS-112), and emergency operation Centres (SEOC and DEOCs) have enabled SSDMA to strengthen communication and coordination during disasters.

The study further indicates that technological strategies such as avalanche monitoring radar, Automatic Weather Stations (AWS) in glacial lakes, and landslide warning systems have enabled pre-emptive detection and response. Aapda Mitra training has also enabled community volunteers to operate during emergencies.

Assistance from the SDRF and NDRF norms (2022-2026) has financially aided families who have been impacted by disasters through reimbursement for loss of life, sustenance, and property.

Case study example from a recent disaster in Sikkim

GLOFs are disasters that lead to catastrophic repercussions in Himalayan regions, such as Sikkim. Global climate change, resulting in the thinning of glaciers, leads to the formation of glacial lakes that are susceptible to outbursts [5]. On 3rd October 2023, Sikkim faced a glacial outburst which was caused by a breach in the embankment of South Lhonak lake, which travelled 385 kms along the Teesta River. This caused large-scale damage where 55 deaths and 74 missing persons were reported, more than 25,900 buildings were affected, 31 important bridges were damaged, ~270 km² of agricultural land were

impacted, the Teesta III Hydropower dam was destroyed, and many other dams were damaged [6, 7]. Following the swelling of the Teesta River, the SSDMA had issued a flood alert, and many homes along the Teesta River were evacuated. Several schools were turned into temporary shelter homes, where relief facilities were provided. A swift response to alert messages by local communities was effective in reducing the impact of the disaster. The mock drills conducted with locals were deemed effective and highlighted disaster preparedness in Sikkim [6].

The role of SSDMA during this disaster was:

- informing locals with alert messages.
- collaborating with locals to address the challenges during and after the disaster.
- collaborating with NGOs and governmental authorities to provide relief facilities.
- collecting data on specific requirements.
- providing short-term as well as long-term recovery planning



Figure 2. GLOF impact in Sikkim (Oct 2023).

Source: Author's compilation.

Recommendations

- Installing Early Warning Systems and disaster monitoring systems in every disaster-prone zone.
- Encouraging more community volunteers during / post disaster.
- Awareness of disasters should be given in every educational institution and community, for example, through mock drills.
- Implementing training programmes like Aapda Mitra for communities in every district.
- Introducing basic disaster training classes in educational institutions.

Conclusion

The SSDMA has successfully become a strong authority during disasters. It can use technology, community, and financial assistance in handling disasters, mitigation, and rehabilitation. This assistance has helped improve the response and restoration. Furthermore, consistent measures and campaigns, such as community awareness and participation, indigenous volunteers, better coordination between SSDMA, district, and national authorities, etc., are needed to improve indigenous capability, vigilance, and cooperation to make Sikkim resilient against disasters.

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