



Earthquake and Landslide Mitigation Best Practices in Sikkim

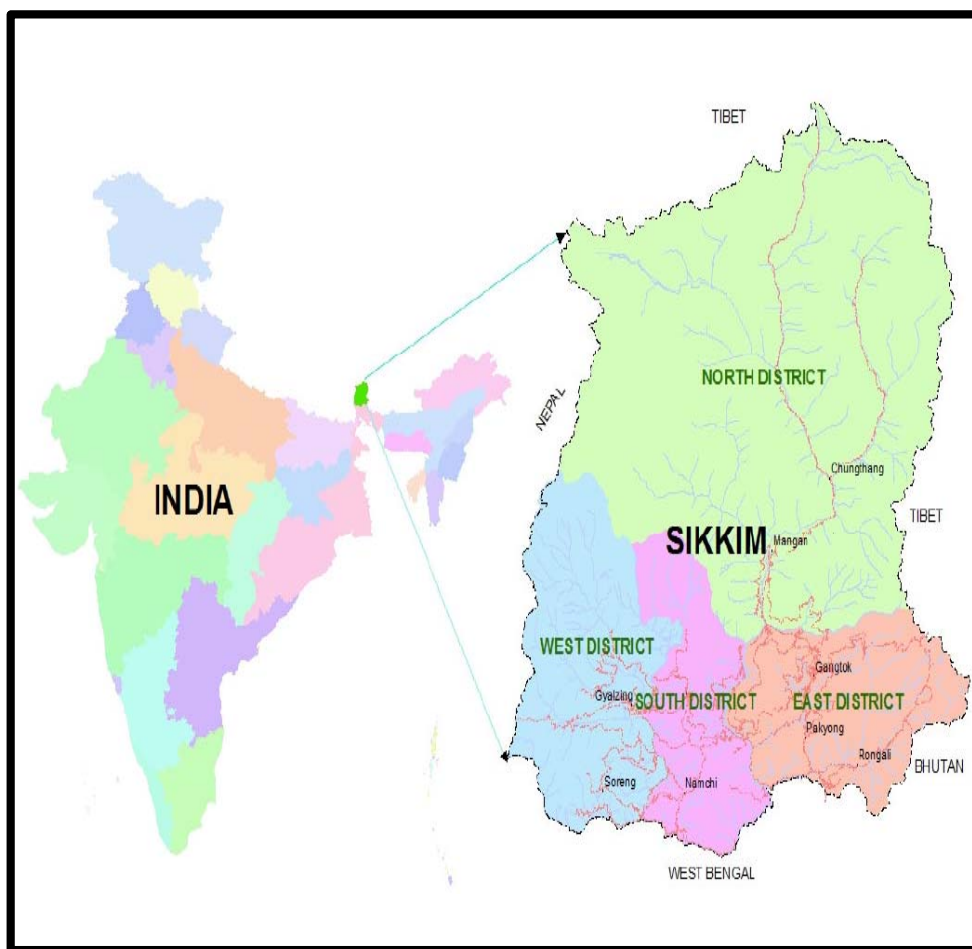
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Deputy Secretary

Land Revenue and Disaster Management Department

Government of Sikkim

Brief Information on Sikkim



Parameter	Value
Geographical Area	7096 Sq Km
Population (Census 2011)	6.10577 Lakhs
District	04 (East, West, North and South)
Main Drainage	Teesta, Rangeet and its Tributaries
Forest Cover	47.69% of the total geographical area of the State.
Geographical Location	27° 00'46" to 28° 07'48" N latitude and 88° 00'58" to 88° 55'25"E longitude
Vulnerabilities	Earthquake, Landslides, Flash-Flood, Fire (Forest, Household), Windstorm, Hailstorm and Avalanches.

Disasters affecting Sikkim

Earthquake, Landslides, Hailstorm



Earthquake in September 2011



Landslide in North Sikkim in August 2016



Landslide in Pakyong in July 2017



Hailstorm in Pendam in April 2018

Disasters affecting Sikkim

Forest Fire, Flash Flood



Flash Flood in Chungthang in September 2012



Flash Flood in Rolep in June 2013

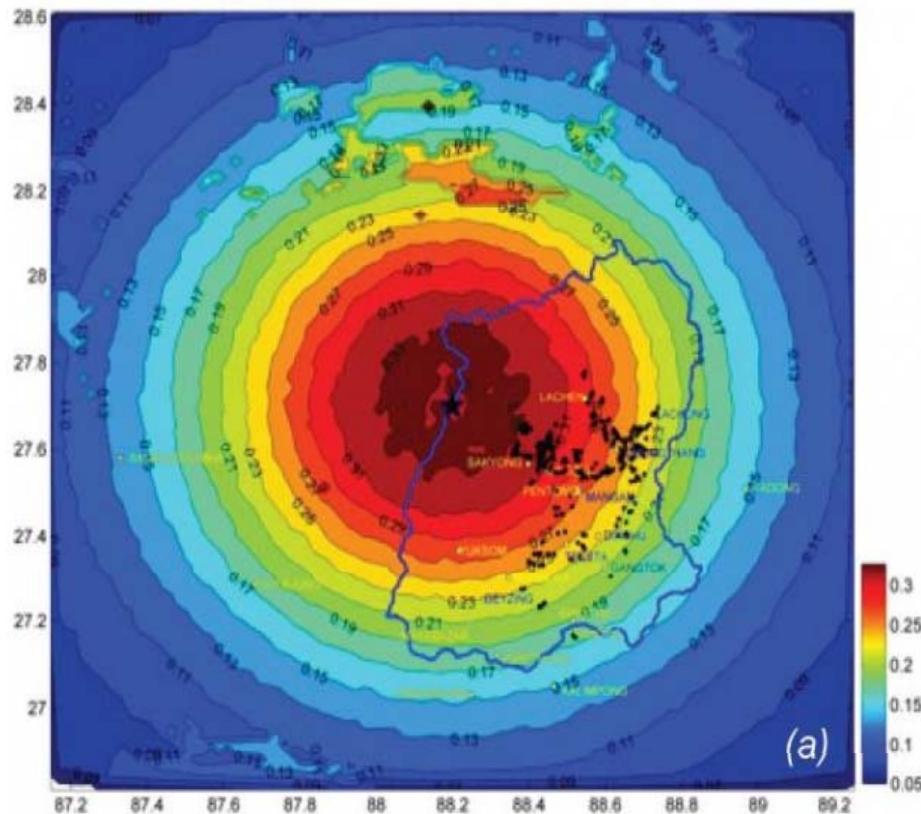


Forest Fire in Tinjurey in February 2017



Forest fire in Bhaledunga in December 2017

Sikkim Earthquake 2011



MODELLED PEAK GROUND ACCELERATIONS

Parameter	Value
Magnitude	6.8
Date-Time	18:10 IST, 18th Sept, 2011, Sunday
Location	27.72°N, 88.06°E
Depth	19.7 km (shallow depth)
Duration	30-40 seconds
Extent	<p>India, Nepal, Bhutan, Bangladesh and China</p> <p>In India, in Sikkim and northeast, West Bengal, Bihar, Jharkhand, UP, Rajasthan, Chandigarh and Delhi</p>
<i>Source: USGS / IMD</i>	

Extensive damages in the State



Damage to houses



Damage to government buildings



Damage at Chungthang



Damage to Char Dham, Namchi

Response

Massive rescue and relief operations was launched in the State.

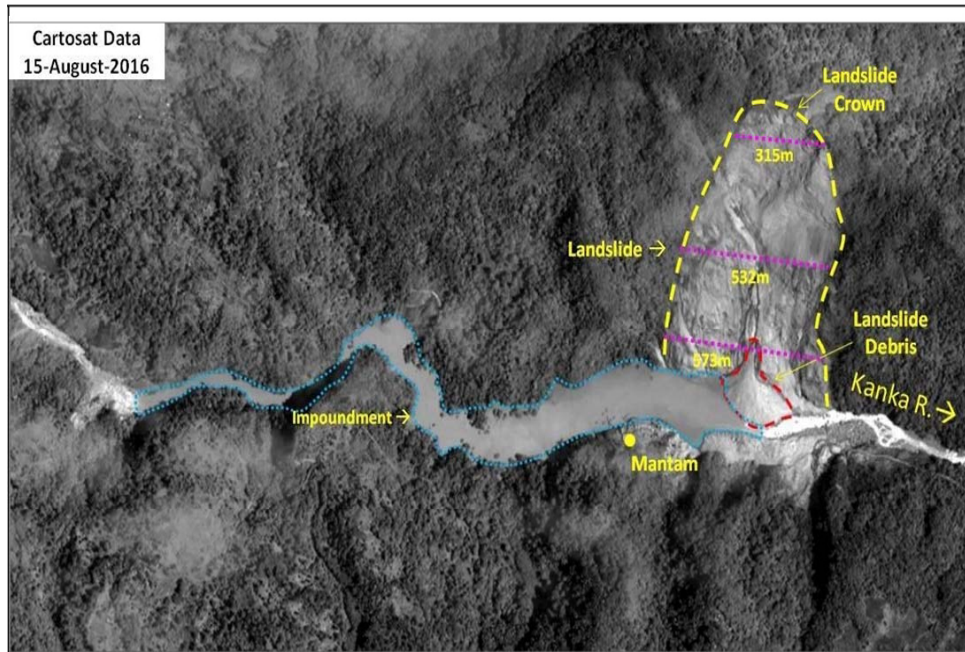


Reconstruction

Reconstruction of Earthquake Damaged Rural Houses (REDRH)

Best Practice: Houses were constructed at the site of damage thereby avoiding dislocation of people





Mantam Landslide (13th August 2016)



Mitigation of Mantam Landslide, North Sikkim (13th August 2016)



Controlled breaching of artificial lake to prevent lake burst situation

Mitigation of South Lhonak Lake, North Sikkim (August 2014 and September 2016)

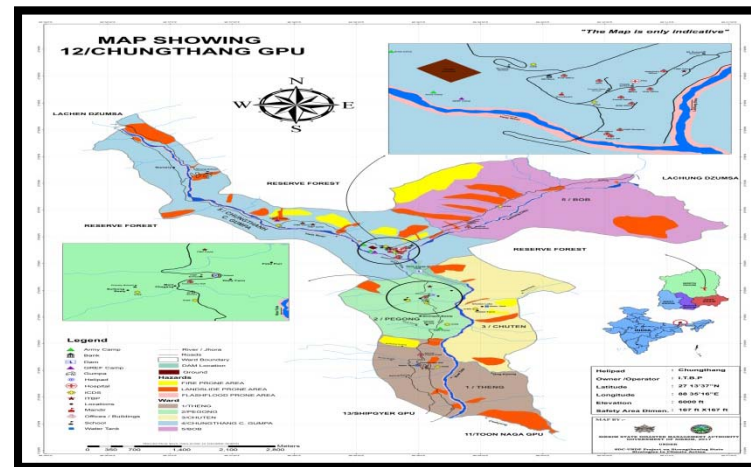


Siphoning of lake water using heavy duty HDPE pipes

Early Warning System for Landslide

- ✓ Early Warning System for Landslide is currently being installed at Chandmari, Gangtok in collaboration with Amrita University, South India.
- ✓ Once this Early Warning System is successful, it will be replicated in other landslide prone areas in the State.

Formation of 16 Model GPUs in Disaster Management through Participatory Rural Appraisal Exercise



Formation of 16 Model GPUs through Participatory Rural Appraisal Exercise during May – December 2017

Activities of SSDMA



Mason training on safe construction practices in November 2010



Amendment of Building Bye Laws in January 2012



Mock drill in Namchi College in March 2012



Release of State Disaster Management Plan in September 2015

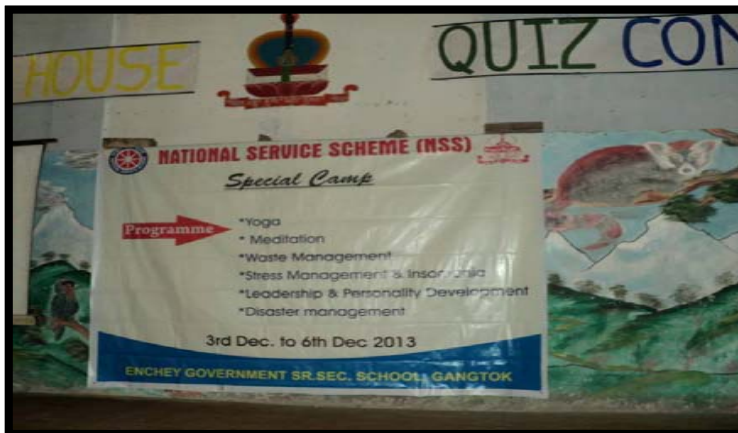
Activities of SSDMA



Training on Rapid Visual Survey to BDOS and Panchayats in February 2016



Basic First Aid Training in April 2013



Training on Disaster Management in December 2013



Orientation programme at SMIT, Rangpo in October 2016

Activities of SSDMA



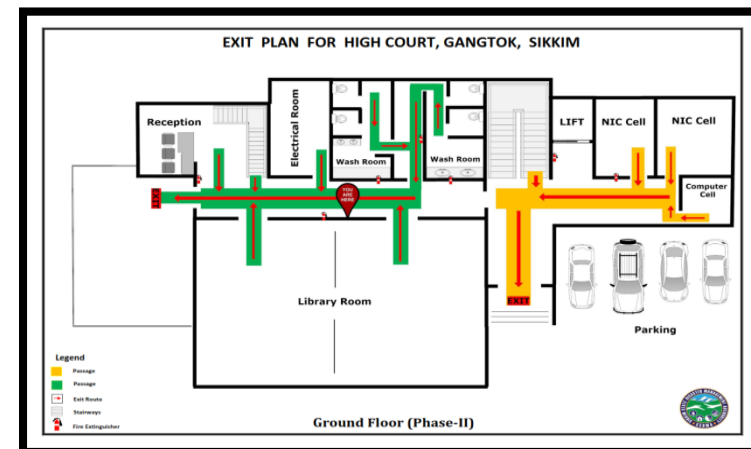
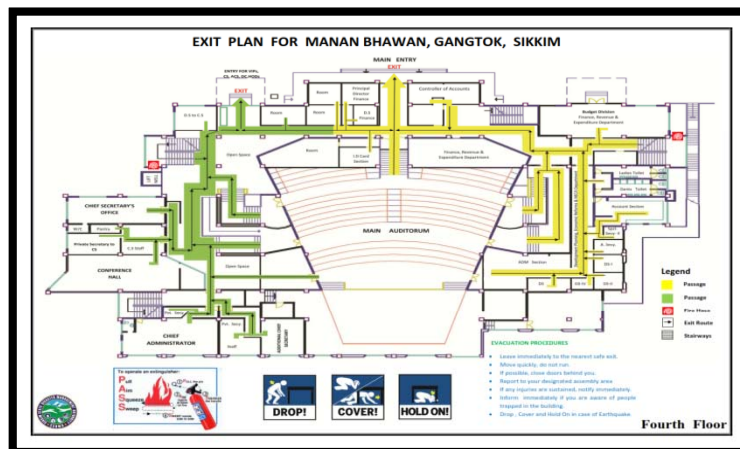
Review meeting with line departments and stakeholders for monsoon preparedness in April 2017

Activities of SSDMA



Mock Exercise on Earthquake, Landslide, Fire scenarios in October 2017

Activities of SSDMA

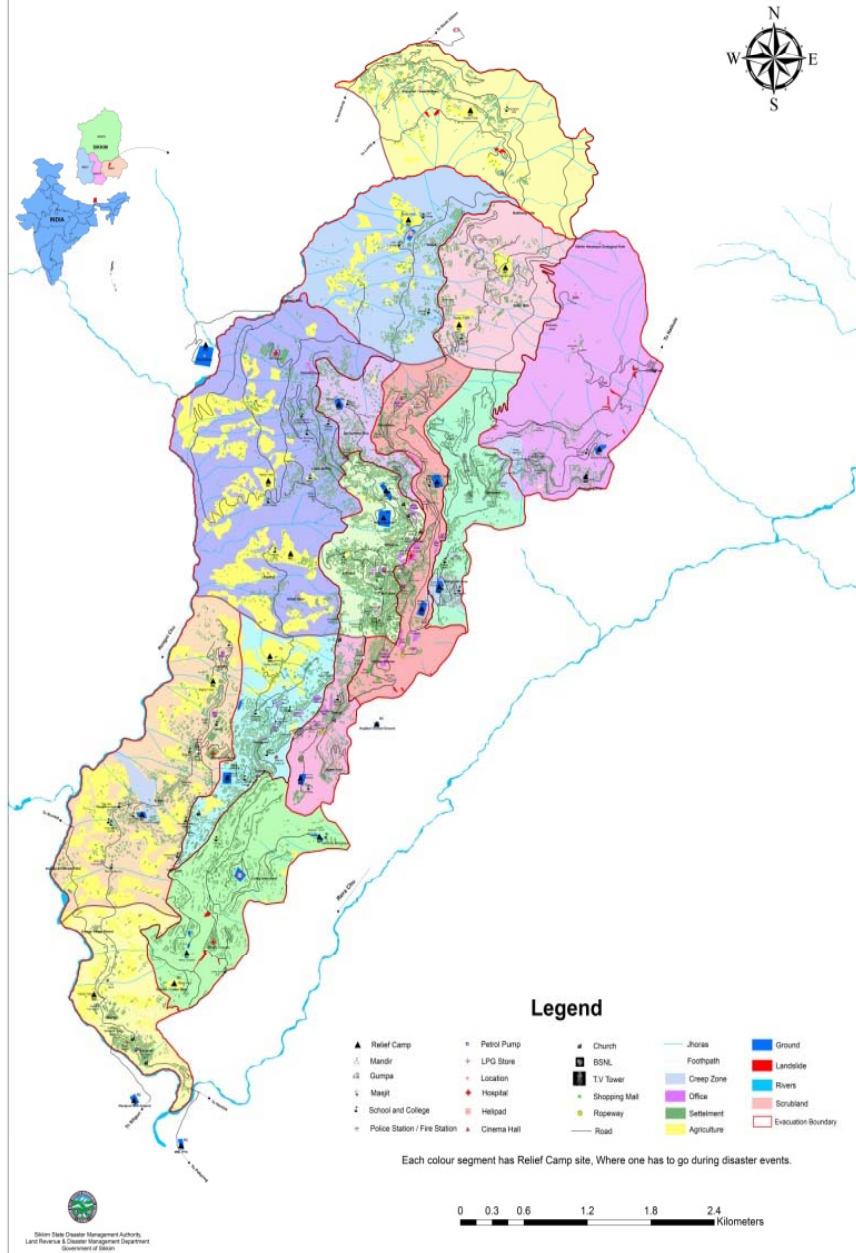


Office evacuation at AG office in March 2016 and
Manan Bhawan in October 2017

Activities of SSDMA

- ✓ 52 Portable Inflatable Light System distributed to SDM offices and Police stations
- ✓ 7 bike mounted mist fire fighting equipments given to Fire and Emergency Services
- ✓ National Disaster Management Service (NDMS) from BSNL VSAT communication between EOCs of South and North districts with SEOC
- ✓ Basic Disaster Management Equipments are being distributed to all GPUs in the State

Disaster Evacuation Map of Gangtok Municipal Corporation, East Sikkim



Disaster Evacuation Map of Gangtok Municipal Corporation in April 2017

Legend



Each colour segment has Relief Camp site, Where one has to go during disaster events.

National School Safety Programme



Orientation Programme on School Safety in December 2013



Preparation of School Disaster Management Plan in February 2014



Training on Rapid Visual Survey in March 2015



Demonstrative retrofitting of Paljor Namgyal Girls Senior Secondary School September 2014

Multi Hazard Risk Vulnerability Assessment of Gyalshing, Mangan and Namchi in 1:15000 scale



Release of Multi Hazard Risk Vulnerability Assessment of Gyalshing, Mangan and Namchi at 1:15000 scale in June 2017

Thank You!



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