

DEVELOPING DISASTER RESILIENCE ACTION PLAN FOR SHILLONG AND GANGTOK

PROCEEDINGS OF EXPERTS' CONSULTATION

on

Developing Disaster resilience Action Plan through GIS and Prioritizing Actions for Natural Disaster Risk Reduction in Urban Agglomerations of Shillong and Gangtok



30 JULY 2019

At

NORTH EASTERN SPACE APPLICATION CENTRE, SHILLONG

Project Proponent:

Supported by:

Consortium Partners:



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BACKGROUND

Himalayan cities are particularly vulnerable to disasters and extreme events like earthquakes, landslides, flash floods, thunderstorms and cold waves. The magnitude of hazards and extreme events in the region may vary depending on the risk exposure of the city.

Physical risks and vulnerabilities in the Himalayan cities are often accompanied by difficult terrain, lack of necessary resources – financial, human and institutional – as well as lack of access to relevant scientific information on the coping mechanism. This necessitates a thrust on improving the knowledge base and adaptive capacity of the cities by integrating disaster risk reduction measures in the urban planning.

In addition, rapid urbanization and climate change could exacerbate environmental stress in the region. Thus, there is a need to collect and review evidence to assess the vulnerability and likely impact of disasters in the region. IRADe with support from Ministry of Environment, Forests & Climate Change (MoEFCC) under National Mission on Himalayan Studies (NMHS) aims to develop Disaster Resilience Action Plans for Shillong and Gangtok cities.

PROJECT OBJECTIVES

- Develop cadastral maps at the scale of 1:4000 and map hazard/ risk wise vulnerable zones of Shillong and Gangtok urban agglomerations.
- Conduct ground survey to Identify and map critical infrastructure – telecommunication installations, emergency operation centers, shelter homes, slums, hospitals & schools,
- Develop disaster resilience action plan for the identified cities and prioritize actions for disaster risk reduction through multi-stakeholder consultations involving citizens, government, public and private sector.
- Spread awareness and raise capacity of the citizens as well as city, district and state authorities.

EXPECTED OUTPUTS

- Land use/land cover maps for Shillong &Gangtok cities at the scale of 1:4000.
- Hazard wise vulnerable zone maps of the identified cities.
- Vulnerability assessment of Shillong &Gangtok cities to natural disasters.

- Critical infrastructure risk mapping for the project cities.
- Disaster resilience plans for Shillong & Gangtok.
- Capacity building of city, district and state authorities on disaster resilience.

OUTCOMES

The outcomes of the project will help in developing policies for reducing the risk of losses in the events of natural disasters in the two cities. In addition, the project will:

- Generate awareness amongst stakeholders such as policy makers, state government, local governing bodies, government departments, NGOs, communities/citizens about the disaster risk reduction to reduce losses.
- Address lack of coordination and bring all stakeholders to one platform, leveraging IRADe's experience, expertise and strong local network.
- Craft and prioritize city-specific actions for disaster risk reduction.
- The project will lead to capacity building of the local mountain communities to reduce disaster risk by imparting them the necessary knowledge and information through social networking and public participation in workshops.

PARTNERS

The research is lead by Integrated Research and Action for Development (IRADe), a leading research institute and think tank with consortium members including North-Eastern Space Applications Centre (NESAC), Shillong, Meghalaya and G.B. Pant National Institute of Himalayan Environment & Sustainable Development, (GBPNIHESD), Sikkim Unit, Gangtok, Sikkim.

MINUTES OF THE CONSULTATION

EXPERTS' CONSULTATION

An *“Experts’ Consultation on Developing Disaster Resilience Action Plan through GIS and Prioritizing Actions for natural Disaster Risk Reduction in Urban Agglomerations of Shillong and Gangtok”* was organized at North Eastern Space Applications Centre (NESAC), Shillong, Meghalaya on 30 July 2019. The project is supported by the **Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India under the NMHS Programme.**

The primary objective of the consultation was to bring together various sectoral experts, and discuss the work done so far in the project. The meeting was attended by experts from Geological Survey of India (GSI), Indian Meteorological Department (IMD), State Disaster Management Authority, North Eastern Space Applications Centre (NESAC) and North Eastern Hill University (NEHU).

INAUGURAL SESSION



Figure 1 Expert consultation deliberations

Prof Ajit Tyagi welcomed the dignitaries and provided a background of the project. He thanked all the dignitaries for making it possible to attend the meeting in-person given the current situation of flood in the region, and regretted his unavailability. He highlighted that the current project is very important in the context of developing disaster resilient cities and expected that the dignitaries will enrich the project by adding their expert knowledge.

Shri P L N Raju, Director, NESAC in his opening remarks, suggested that the project should look into developing strategies to prevent casualties due to lightning which is a major cause of deaths in mountainous areas. He even graciously offered the help of group working on lightening in NESAC. Mr. Magotra assured that we will look into what we can do with in the project scope.

Shri Rohit Magotra elaborated on technical background of the project. He emphasized that it's the first time not only in India but in entire South Asia, that mapping is being done at a scale of 1:4000 using advanced state-of-the-art technologies. He urged the municipal authorities to further support provisioning required data and support in organizing a stakeholders' meeting in Shillong.

Project Proponent:



Supported by:



Consortium Partners:





Figure 2: Dr Raju addressing the gathering at Experts' Consultation

Dr J Rajeshwar, in his special address as the Guest of Honour, informed that GSI is developing Landslide Susceptibility maps, but at 1: 50,000 scale, for the entire country. This project is expected to be completed by 2020. He further informed that few site-specific mapping might be taken up at 1:10,000 scale by GSI. However, it is in the mandate of GSI to survey each and every landslide event and a ground report of each and every landslide is available with GSI. He suggested to explore the GSI web-portal for further detail.

SESSION - URBAN FLOOD HAZARD ZONATION AT 1:4000 SCALE

Dr. Diganta Barman, while initiating discussions in the session on urban floods, provided an overview of the work done so far. He elaborated on the satellite data used for the work and the methodology followed.

Shri Santanu Das, presented the results of urban flood hazard zonation carried out for Gangtok and Shillong. He elaborated on various GIS layers prepared to show the vulnerability of the municipal wards in the project cities to urban floods. The various layers prepared so far are:

1. Land use and land cover maps of Gangtok and Shillong agglomerations at a scale of 1:4000
2. Potential areas to be impacted by flash flood in the two project cities
3. Place mark map of Gangtok and Shillong



Figure 3 Shri Santanu Das, Scientist, NESAC, speaking on flood hazard zonation

In the discussion, following points were suggested by experts:

1. Past flood inundation maps should be collected from District Disaster Management Authority, Shillong.
2. Satellite data can also be used to map the flood inundations in the past.
3. Central Water Commission (CWC) should be approached for procuring data on past flood occurrences and historical drainage discharge.

4. Highest level of water inundation occurring in the past can be taken as the reference to develop potential flood inundation maps.
5. The office of the concerned District Magistrate (DM) should be contacted for procuring details about flood events that have happened in the past.
6. UNDRR (UN Office for Disaster Risk Reduction) may be approached for data related to past flood occurrences.
7. As Cartosat DEM is of relatively coarse resolution, potential of high resolution DEM like TanDEM-X may be explored for project purposes.
8. IMD should be consulted as a project titled “South Asia – Regional Flash Flood Guidance System (SAsiaFFGS)” which is a Global Initiative Project for Flash Floods is currently being undertaken at IMD.

SESSION - “LANDSLIDE HAZARD ZONATION & EARTHQUAKE HAZARD ZONATION”



Figure 4 Dr Barman speaking during the discussion on landslide and earthquake hazard zonation

Shri Santanu Das and Ms Nikita Lahiri of NESAC presented the landslide hazard zonation and earthquake hazard zonation being carried out using remote sensing data. Dr. Mayank Joshi presented the survey carried out by GB Pant National Institute of Himalayan Environment and Sustainable Development in Gangtok city for assessing the vulnerability of the city to landslides and earthquakes.

The various points of discussion and suggestions provided are as follows:

1. In Gangtok, the areas of Upper Burtuk (ward no.1), Chandmari (ward no.6) and parts of Syari (ward no.17) were found to be highly prone to Landslides.
2. Some parts of Gangtok Urban Agglomeration, which are out of the municipal boundary, were also found to be highly susceptible to landslides.
3. In Shillong, the municipal areas are relatively less affected by landslides. The areas along NH 40 and adjoining the river Umshyrpi were, in particular, found to be more susceptible to landslides.
4. For accessing the details about past landslide events, GSI and Office of the District Magistrate should be consulted.
5. For the work related to earthquake hazard zonation, Prof. S K Nath of IIT-Kharagpur may be consulted.
6. National Centre of Seismology, New Delhi should be consulted for data and guidance related to earthquake hazard zonation.

SESSION - “DEVELOPMENT OF DISASTER RESILIENCE ACTION PLAN FOR SHILLONG AND GANGTOK”



Figure 5 Shri Magotra presenting the Disaster Resilience Framework

A disaster resilience framework was presented by Shri Rohit Magotra. He elaborated different building blocks of disaster resilience action plan. He highlighted the key objectives of Disaster Resilience Action Plan are to ensure that the cities preparedness for disaster and its ability to get back to the normal with minimal losses can be achieved. Disaster resilience action plan will have disaster wise resilience plans, early warning systems, decision support framework for implementing the plans. So far we have made assessment of the city vulnerability which covers the following components -

1. Physical Vulnerability: Includes the population exposed, those actually affected (morbidity/mortality)

2. Hazard Vulnerability: Such as average annual occurrences of different hazards, changes in hazard frequency, if any
3. Demographic Vulnerability: deals with population density and rate of growth
4. Economic Vulnerability: Includes allocation of funds for disaster risk reduction and its optimum utilization
5. Social Vulnerability: deals with identification and mapping of vulnerable population near areas having high potential of hazard occurrence and their rehabilitation to safer grounds; taking more care of women, children and elders/senior citizens.
6. Infrastructure Vulnerability: Taking care of infrastructure such as hospitals, schools, power centres, telecom towers, water supply, sanitation etc.

The disaster resilient framework was positively received at the meeting. Given that vulnerability maps will be completed by November, 2019, IRADe will further put together the disaster resilience action plan for Gangtok and Shillong.

Way Forward:

The expert consultation meeting held for developing a disaster resilient Action Plan was successfully organized with the support of partners, funders, and delegates. The meeting helped in generating awareness amongst stakeholders, carved city specific priorities and capacity building of stakeholders.

An improved coordination amongst the stakeholders developed through this consultation must be taken forward. This includes carrying a thorough analysis of the potential hazards and its relation with climatic parameters. Which is:

- Accumulate data on the inventory of hazards from District Disaster management officer
- Climatic parameters to be procured from IMD Shillong
- Satellite imagery to be procured from ISRO

Further to develop informative stepson building a disaster resilient plan using GIS, following are the required future coordination:

- Past flood inundation maps - District Disaster Management Authority, Shillong.
- Central Water Commission (CWC) - past flood occurrences and historical drainage discharge.
- District Magistrate (DM) – flood events history.
- UNDRR (UN Office for Disaster Risk Reduction) -flood events history.
- TanDEM-X may be explored for project purposes.

- Prof. S K Nath of IIT-Kharagpur may be consulted for earthquake hazard zonation.
- National Centre of Seismology, New Delhi –earthquake zonation data and guidance.

In addition, IRADe in collaboration with the Government of Meghalaya plans to organize stakeholder workshop in October for disseminating the results of the project

The meeting ended with Vote of Thanks by **Dr.Diganta Barman**.

ANNEXURE

ANNEXURE A: AGENDA

Experts' Consultation on

Developing Disaster Resilience Action Plan through GIS and Prioritizing Actions for Natural Disaster Risk Reduction in Urban Agglomerations of Shillong and Gangtok

Date: 30th July, 2019

Venue: NESAC Outreach Facility, NESAC, Umiam, Shillong

Agenda

Time	Sessions
9:00 AM - 9:30 AM	Registration
9:30 AM - 10:30 AM	Inaugural Session
9:30 AM - 9:45 AM	Welcome address by Prof. Ajit Tyagi, Former Director General, IMD & Senior Advisor, IRADe
9:45 AM - 10:00 AM	Remarks by Shri Rohit Magotra, Deputy Director, IRADe
10:00 AM - 10:15 AM	Opening Remarks by Shri P L N Raju, Director, NESAC
10:15 AM - 10:30 AM	Special Address by Dr J Rajeshwar (Guest of Honour), Deputy Director General, GSI
10:30 AM - 11:30 AM	Session - "Urban Flood Hazard Zonation at 1:4000 Scale"
10:30 AM – 10:45 AM	"Flood Hazard Zonation for Urban Agglomerations of Shillong and Gangtok" – by Shri Santanu Das, Scientist, NESAC
10:45 AM – 11:15 AM	Discussion & Feedback on Flood Hazard Zonation
11:15 AM – 11:30 AM	High Tea
11:30 AM - 12:30 PM	Session - "Landslide Hazard Zonation and Earthquake Hazard Zonation at 1:4000 scale"
11:30 AM – 12:00 PM	"Landslide Hazard Zonation for Urban Agglomeration of Shillong and Gangtok" by Shri Santanu Das, Scientist, NESAC and Dr Mayank Joshi, Scientist, GBPNIHESD-Sikkim Regional Centre
12:00 PM – 12:30 PM	Discussion & Feedback
12:30 PM - 1:15 PM	Session - "Development of Disaster Resilience Action Plan for Shillong and Gangtok"
12:30 PM – 12:45 PM	Format of Disaster Resilience Action Plan by Shri Rohit Magotra and Dr Mohit Kumar
12:45 PM – 1:15 PM	Discussion & Feedback
1:15 PM – 2:00 PM	Lunch
2:00 PM- 2:30 PM	Way Forward
2:30 PM- 2:35 PM	Vote of Thanks

ANNEXURE B: LIST OF PARTICIPANTS

Name	Designation	Organization
Prof AjitTyagi	Senior Advisor	IRADe
Shri P L N Raju	Director	NESAC
Dr J Rajeshwar	Deputy Director General	GSI
Shri Rohit Magotra	Deputy Director	IRADe
Shri Manoj Kaistha	Director, EG & Landslide, NLSM and Earthquake Division	GSI-NER
Dr Diganta Barman	Scientist/Engineer 'SF'	NESAC
Dr Mohit Kumar	Research Analyst	IRADe
Shri Santanu Das	Scientist/Engineer 'SD'	NESAC
Dr Mayank Joshi	Scientist	GBPNIHESD-SRC
Ms Nikita Lahiri	Junior Research Fellow	NESAC
Shri Rivertis Pariong	Meteorologist	Met Centre, IMD, Shillong
Dr A C Lyngdoh	Scientist 'E'	NCS, IMD, Shillong
Prof Sunil Kr De	Head	Department of Geography, NEHU
Dr Kuntala Bhushan	Scientist	NESAC
Dr K KSarma	Scientist	NESAC
Smt P Lyngba	District Disaster Management Officer	SDMA, Shillong
Dr B K Handique	Scientist	NESAC
Shri Shonbor Kurban	Scientist	NESAC
Dr Arjun B M	Scientist	NESAC
Dr Arup Borgohain	Scientist	NESAC
Shri R K Das	Scientist	NESAC
Shri Jayanta Ghosh	Trainee	NESAC

ANNEXURE C: PHOTOGRAPHS FROM THE MEETING



Figure 6 Speakers actively participating in the session discussions



Figure 7 Speakers actively participating in the session discussions



Figure 8 Speakers actively participating in the session discussions