DEVELOPING DISASTER RESILIENCE ACTION PLAN FOR SHILLONG AND GANGTOK

STAKEHOLDER WORKSHOP PROCEEDINGS

"Developing Disaster Resilience Action Plan through GIS and Prioritizing Actions for natural Disaster Risk Reduction in Shillong"

12th June, 2018
At
ICSSR, NEHU Campus, Shillong

Project Proponent:

15 YEARS IRADe Integrated Research and Action for Development

Supported by:

Consortium Partners:

NESAC GBPNIHESD NDR

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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.

AIM

To provide decision-supporting tools for disaster risk reduction in the urban areas of the North East Region. It includes development of cadastral maps for micro zonation of hazard and action plan for disaster resilience for Shillong & Gangtok.

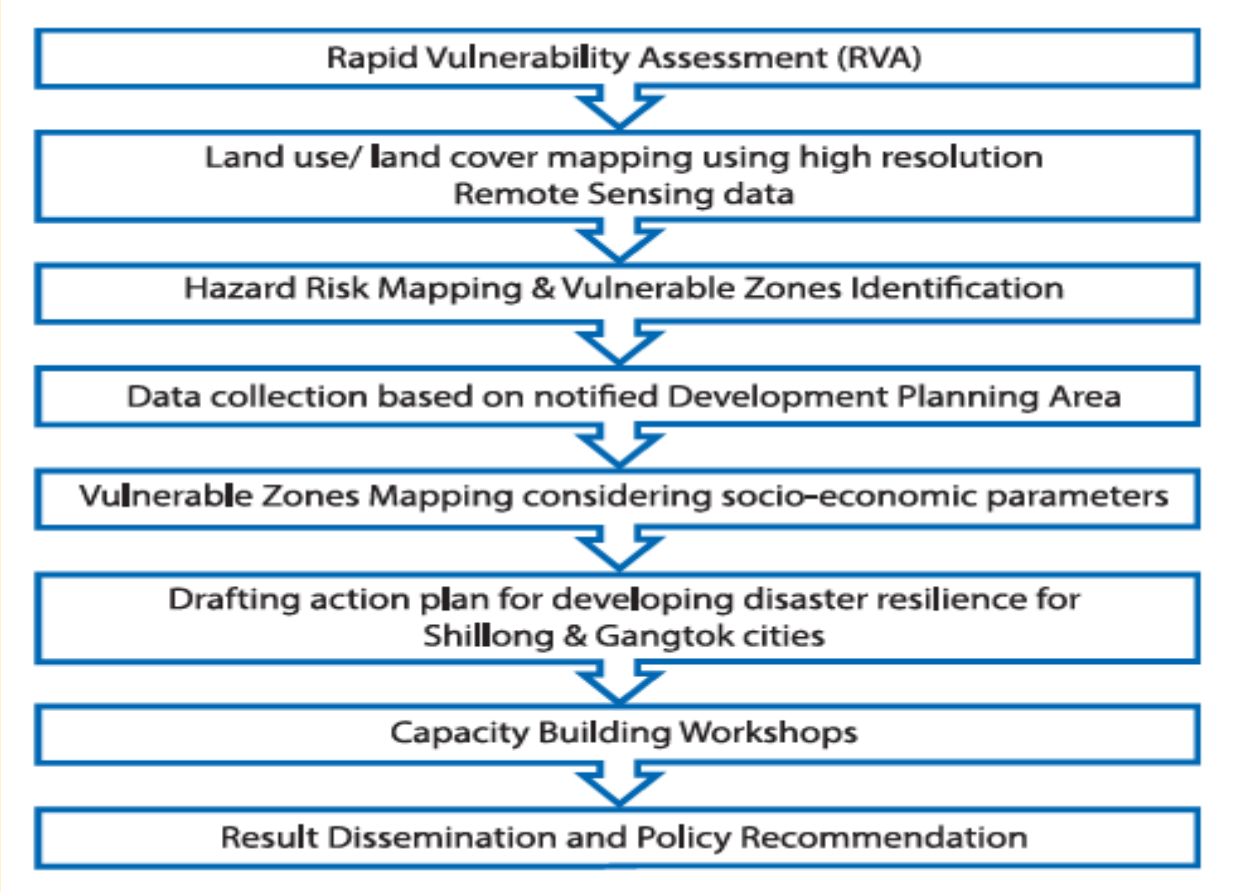
OBJECTIVES

- 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.

PARTNERS

The research is led 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.

PROJECT APPROACH



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.

STAKEHOLDER WORKSHOP

A stakeholders' workshop for the project "**Developing Disaster Resilience Action Plan through GIS and Prioritizing Actions for natural Disaster Risk Reduction in Shillong**" was organized at North Eastern Hill University (NEHU), Shillong, Meghalaya on 12 June 2018. 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 workshop was to bring together all the stakeholders from Shillong city at the same platform to understand the aim of the project, which is to provide decision-supporting tools for disaster risk reduction in the urban areas of the North East Region of India, development of maps at the scale of 1:4000 for micro zonation of hazard and action plan for disaster resilience for Shillong and Gangtok.

The workshop was attended by participants from various departments of the urban local bodies and organizations viz., Meghalaya State Disaster Management Authority (MSDMA), Shillong, Meghalaya, United Nations Development Programme (UNDP), Central Water Commission (CWC), Department of Urban Affairs, Government of Meghalaya, and Indian Meteorological Department (IMD), Shillong, Geological Survey of India (GSI) etc.

WORKSHOP PROCEEDINGS

INAUGRAL SESSION

Please provide list of session participants alongwith their designation

Dr. Ajit Tyagi welcomed all the delegates to the workshop. In his welcome address, Dr. Tyagi provided an overview of the project and highlighted the problems of urbanization in Himalayan cities. He stressed on developing resilience of Himalayan cities to natural disasters and emphasized on providing decision supporting tools to the policy makers. He added that the project is an effort in this direction and shall provide vulnerability maps of the cities showcasing the areas of the city prone to different disasters. He also emphasized on the uniqueness of the maps, as they will be the first maps developed at the scale of 1: 4000 in India. He also mentioned that both the municipal and state government would be part of the action plan. He thanked all the delegates for making it to the workshop in spite of recent disturbances in the city.

All the participants then introduced themselves.

In his opening remarks, **Mr. PLN Raju** emphasized the importance of space technology for disaster management. He said that disasters have affected nearly 4.4 million people in our country and also have damaged property worth 2 billion dollars. Satellite remote sensing technology is extremely useful for providing necessary data for disaster management. Govt. of India has allocated more than 10000 crores for launching satellites which will

provide near real time data for disaster management. He specially emphasized that GISAT satellite will provide 50 m resolution data for disaster management. He further highlighted the importance of developing early warning systems for predicting disasters like earthquake, flood and thunder storm. Some of the early warning systems have already been developed at North Eastern Space Applications Centre (NESAC).

Mr. Rohit Magotra briefed about the project and highlighted the importance of GIS (Geographic Information System) in disaster management and the importance of digital data. He also echoed the concerns of the Ministry of Environment and Forests about the need to prioritize the research about disaster resilience in the Himalayas as the Himalayan cities are urbanizing rapidly. Research to assist the planning of new cities in high disaster prone areas are being promoted in the MoEFCC's national Mission for the Himalayas. He said that GIS has an important role to play in all the three stages of disaster management, viz., rescue, relief and rehabilitation. Mr. Magotra emphasized the importance of critical infrastructure mapping for providing quick relief to disaster struck communities. As an example, he cited 2014 flood in Srinagar during which there were losses of telecommunication services in the city for almost 20 days hampering the relief efforts, which in turn led to increased loss of life. He used this example to highlight the need to ensure resilient planning of cities, so that hospitals, fire stations and other emergency operation centres essential for disaster management are not constructed in areas prone to immediate damage during calamities.

The Guest of Honour, **Mr. H B Marak** in his address welcomed the project. He informed that a meeting of North-eastern states happened recently in NESAC to deliberate on the topic of how to make north east disaster resilient. He insisted that along with frequency, severity of the disasters is also increasing which in turn makes it all the more necessary to develop resilience of the city dwellers. He cited the flash floods in Shillong in 2014 which was also concurrent with several landslides incidences. He expressed his pleasure that the current project and its deliverables are much-needed steps for improving the disaster management not only in the city but also for the entire state. He emphasized on the large population residing in Shillong and that the loss to human lives as a result of disasters in Shillong would be very high. He suggested that GSI has also been involved in several such projects related to landslides and earthquakes and should be consulted during the future course of actions. In addition, he predicted that the outputs of the project shall also be useful for other Himalayan cities. He also shed light on the importance of gathering accurate data about the disasters and strengthening the critical infrastructure in the state.

Mr. P W Ingty delivered the Inaugural Address as the Chief Guest. He expressed that it's a privilege to be associated with the event. He emphasized the importance of developing resilience to disasters in advance as

disasters happen at a time and at a place where we do not expect it or expect it the least. He expressed dissatisfaction that we don't have any comprehensive disaster management plan for Shillong or any other city in the state. And that there is no infrastructural arrangement at the city level to minimize damage from disasters. He suggested that it is extremely important to include local communities as important stakeholders in the project right from the beginning as they are the most affected ones in the case of a disaster. He also mentioned that it is crucial to have the involvement of the Deputy Commissioner and incorporate his inputs/ suggestions in the project. In addition, he assured all the help from his department for successful execution of the project.

Dr Ashish Pandey Research Associate, GBPNIHESD, offered the vote of thanks to conclude the session.

PRE-LUNCH SESSION – Disaster Management Initiatives in Meghalaya

Chair: Prof. Ajit Tyagi, Senior Advisor, IRADe

The first presentation was made by **Mr. Surajit Bordoloi**, Consultant, MSDMA. He talked about various hazards and associated problems in the Shillong City. He shared that earthquakes, landslides, flash floods, urban floods, thunderstorms, have affected the city frequently in the past. He informed the participants that being in a highly seismic zone, earthquakes are very frequent in the region. Even a day before the workshop, on 11 June 2018, there was an earthquake in nearby Nagaon area at 10.30 AM which measured 5.1 on Richter Scale. However, such quakes don't get noticed much as their intensity remain low. However, the earthquakes with higher intensities have wreaked havoc in the city in the past. He highlighted that Shillong has very steep slopes with intense urban development, which makes the region very unstable. He noted that incidences of Tree Falls' have become very common in the last 2-3 years, due to which damage to infrastructures and traffic jams have been reported. Mushrooming of concrete buildings in the city in the recent decade, replacing the traditional Assam type of houses, has in turn made the whole area more vulnerable. With ever-increasing population, there are frequent traffic jams in the city. There are narrow lanes and by-lanes with inhabiting population. All of this has increased the vulnerability of the city to disasters and the need of the hour is to have a hazard risk and vulnerability analysis (HRVA) of the city highlighting the pockets within the city where people are more vulnerable to particular disasters. He suggested that HRVA work carried out by North East Institute of Science and Technology (NEIST), Jorhat and NIT, Shillong should be looked at to synergize with the project outputs.

The second presentation was by **Mrs Maitreyee Mukherjee**, Shillong City Coordinator, UNDP. She presented the work carried out so far in the project "Developing Risk Resilient Cities through Risk Reduction in the Context

of Disasters and Climate Change". which is implemented by United Nations Development Program (UNDP). The project is of four years duration (2017-2020) and six cities have been selected for the project, viz., Shillong, Cuttack, Visakhapatnam, Vijaywada, Shimla and Navi Mumbai. She informed that a Hazard-Risk-and-Vulnerability-Analysis (HRVA) of the city has been done by a Delhi based agency called RMSI and a risk atlas of the city has been produced. All these reports have been uploaded on East Khasi Hills website. IA city portal has been planned to be developed in collaboration with Indian Institute of Human Settlements (IIHS), Bengaluru which will provide information about disasters to all the stakeholders.

The chair thanked the speakers for their insightful presentation and recommended that capacity-building programmes for developing disaster resilience should be conducted jointly by various agencies involved in such work like; IRADe, MSDMA, UNDP etc. In addition, there should be city level EOCs (Emergency Operations Centre) for providing relief and information during the time of disasters.

POST-LUNCH SESSION – Interactive session with Stakeholders - Project Approach, Methodology and Progress achieved by partners.

Chair: Mr. PLN Raju, Director, NESAC

Co-Chair: Prof Devesh Walia, Head, Department of Environmental Sciences, North-Eastern Hill University, Shillong

First presentation of the session was by **Mr. Mohit Kumar**, Senior Research Associate, IRADe and **Mr. Rohit Magotra**, Deputy Director, IRADe. IRADe team presented the Rapid Climate Vulnerability Assessment of Shillong City. The vulnerability assessment of the city was done using HIGS framework. HIGS stands for H- Hazard Exposure, I – Infrastructure, G- Governance and S-Socio-economic variables. The framework has been developed at IRADe and is very useful for rapid climate vulnerability assessment of the cities. The presenters also highlighted that the city has been expected to experience an increase of 10-15 % in rainfall in 2050, and needs to be prepared in advance. Presently, there is no sewerage system in the city and storm water is mixed with sewage while draining out and heavy winds also make the situation more difficult. Therefore, there is a need to have separate systems for draining out storm out and sewage. In addition, there should be a sewage treatment plant in the city for treating the sewage before draining out. IRADe team also presented and distributed questionnaire developed for 'assessing the impact of urbanization on natural ecosystem through community surveys'. The participants were requested to send their feedback on the questionnaire developed.

Next presentation was by **Dr Diganta Barman**, Scientist, NESAC. Dr. Barman highlighted the methodology developed for mapping the vulnerability of the city to various disasters at a very fine scale of 1:4000. He informed that for achieving the purpose, a range of very high resolution satellite images have been procured. These images include the ones obtained from recently launched Cartosat 2 F to World View 3 (WV-3) satellites. He began by giving a general summary of his presentation which included an overview of the parameters being used in assessing the vulnerability of Shillong and Gangtok, project methodology, and the status of progress of the project, schedule and the support required from the other stakeholders. The seven stages of the methodology for developing city vulnerability maps at the scale of 1:4000 include:

- Literature Review: This would go parallel with other stages
- Vulnerability assessment
- Land use and Land Cover mapping
- Identification of Hazard zones and Vulnerable zones
- Data collection: Grassroots organizations will be roped for surveying
- Vulnerable zone mapping considering socio-economic parameters
- Action Plan and Capacity Building

While describing the progress of the work, he emphasized on the quality and resolution of datasets which would be used for developing high resolution maps for both Shillong and Gangtok. He also described some tools which will be used for the hazard mapping for urban floods and flood plain topography (digital elevation model and hydrodynamic parameters). He echoed the thoughts of other members, that due to increase in rainfall, the increase in discharge has to be anticipated. He requested the water resources department to provide data which would help validate and check the outputs of their modelling. The risk map will be created by combining the socio-economic vulnerability map and hazard map. For the landslide hazard mapping, the hazard maps for landslides will be prepared with the help of an inventory of historic landslide occurrence data, high-resolution remotely sensed data, fieldwork and ground verification. He urged various stakeholders to support the project such as UNDP city coordinators for both the cities. He also requested the GSI team for providing landslide zonation maps of Shillong and Gangtok cities.

The last presentation of this session was by **Dr Devendra Kumar**, Scientist, GBPNIHESD. He presented the plans for assessing the socio-economic vulnerability of Shillong to disasters. He informed that a stakeholder's workshop has already been conducted in Gangtok earlier, and primary surveys have been conducted in the two cities for assessing the socio-economic vulnerability.

Open floor discussion

The discussion commenced after the presentations. Mr. Marak, Secretary, Revenue and Disaster Management Department, State Disaster Management Authority, Shillong, Meghalaya asked what the project suggests for improving the storm water drainage in the city. Mr. Magotra replied that the storm water drainage should be separate from sewage and there should be a sewage treatment plant in the city. Mr. Manoj Kayastha, of GSI wanted to know how correct are the predictions of increase in rainfall in 2050. Dr. Tyagi replied that these projections are taken from IPCC RCP Scenarios and of course there are uncertainties in the projections, they are accepted largely by the global community. There are efforts to reduce the uncertainties as the models are being downscaled from regional to local scales. The co-chair of the session, Dr. Walia commented that though there is already a disaster resilience action plan prepared by Meghalaya Government, the climate change angle is missing in it. The present project fills this gap as it looks at climate change aspects also and proposes to develop disaster resilience of the cities with respect to that.

There was also interest among the participants regarding landslide vulnerability analysis of the city. Mr. Marak suggested consulting GSI with regards to the work on landslides. Mr. Kayastha of GSI informed that GSI has been carrying out a project named “National Landslide Inventory Programme” to map the landslide vulnerable areas of entire country. He assured that GSI would help the project by providing reports, and knowledge base generated in NLIP project. He also informed that landslide inventory map of Shillong shall be available by next year. Co-chair Dr. Walia suggested that the project should specially focus more on areas which are vulnerable to disasters within the city. He informed that NEIST (North East Institute of Science and Technology) has already completed GPS survey of Shillong city, and should be contacted for GPS survey data. In addition, he also suggested that epidemics in the city should also be studied through ground surveys. The chair Mr. Raju expressed his satisfaction at the fruitful discussion and hoped that the project will be able to reduce the loss of life and property in disasters in Himalayan cities and the outputs of the project shall be valuable and replicable for other Himalayan cities as well.

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

ANNEXURE

ANNEXURE A: AGENDA OF THE WORKSHOP

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

Date:12th June, 2018, Venue: ICSSR, NEHU Campus, Shillong

Time	Sessions
10:00 AM - 10:30 AM	**Registration**
10:30 AM - 11:30 AM	**Inaugural Session**
10:30 AM - 10:35 AM	Felicitation of the dignitaries **Prof. Ajit Tyagi, Mr. PLN Raju, Mr. Rohit Magotra**, Chief Guest, Guest of honour
10:35 AM - 10:45 AM	Welcome address by **Prof. Ajit Tyagi**, Former DG, IMD & Senior Advisor, IRADe
10:45 AM - 10:50 AM	Self-Introduction by all participants
10:50 AM - 11:00 AM	Opening remarks by **Mr. PLN Raju**, Director, NESAC
11:00 AM - 11:10 AM	Remarks by **Mr. Rohit Magotra**, Deputy Director, IRADe
11:10 AM - 11:20 AM	Address by the Guest of Honour, **Shri H B Marak**, Secretary, Revenue and Disaster Management Department
11:20 AM - 11:30 AM	Inaugural address by Chief Guest, **Shri P W Ingty**, Additional Chief Secretary, Revenue and Disaster Management Department, SDMA, Shillong, Meghalaya
11:30 AM - 11:35 AM	Vote of Thanks by **Dr. Ashish Pandey**, Research Associate, GBPNIHESD
11:35 AM - 11:50 AM	**High Tea**
11:50 AM - 1:00 PM	**Pre-Lunch session - Disaster Management Initiatives in Meghalaya** Chair: **Prof. Ajit Tyagi**
11:50 AM - 12:05 PM	Talk on relevant hazards and other associated problems in Shillong city by **Mr. Surajit Bordoloi**, Consultant, MSDMA
12:05 PM - 12:20 PM	Talk on relevant work done previously for Shillong City by **Mrs Maitreyee Mukherjee,** City Coordinator, UNDP
12:20 PM - 1:00 PM	Open floor for discussion
1:00 PM - 2:00 PM	**Lunch**
2:00 PM - 3:30 PM	**Post-Lunch session - Interactive session with Stakeholders - Project Approach, Methodology and Progress achieved by partners** Chair: **Mr. PLN Raju**, Director, NESAC / Co Chair: **Dr Devesh Walia**, Head, Department of Environmental Sciences, North-Eastern Hill University, Shillong
2:05 PM - 2:30 PM	Rapid Vulnerability Assessment of Shillong **Mr. Mohit Kumar,** Senior Research Associate, IRADe
2:30 PM - 2:50 PM	Presentation on Hazard mapping component and project progress by **Dr. Diganta Barman**, Scientist, NESAC
2:50 PM - 3:10 PM	Socio-economic vulnerability of Shillong to disasters **Dr. Devendra Kumar**, Scientist, GBPNIHESD
3:10 PM - 3:30 PM	Open floor discussion
3:30 PM - 4:00 PM	Concluding Remarks and Way Forward (By the chairs)
4:00 PM - 4:05 PM	Vote of Thanks (**Dr Diganta Barman**, NESAC) + Evening Tea

ANNEXURE B: PHOTOGRAPHS OF THE WORKSHOP


DEVELOPING DISASTER RESILIENCE ACTION PLAN THROUGH GIS
&
PRIORITISING ACTIONS FOR NATURAL DISASTER RISK REDUCTION
SHILLONG & GANGTOK
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