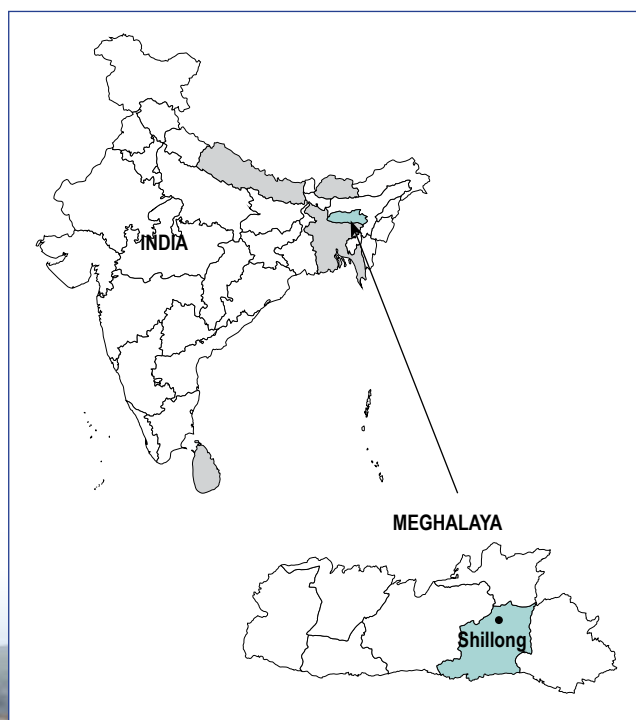


## City Resilience Strategy: Shillong

Shillong is the capital city of the state of Meghalaya as well as the district headquarters of East Khasi Hills District. It is the most urbanized and the largest city in the hill state of Meghalaya. Shillong lies in the Northeastern part of India and occupies the northern slopes and foothills of Shillong peak at an average an altitude of 1,496 m above sea level at 25.57°N and 91.88°E. The city is spread over an area of 10.36 sq. km. The population of Shillong municipality was 143,229 in 2011. The



economy of Shillong is primarily agrarian. Small scale industries like handicrafts, handloom items and mineral based industries also make an important contribution.

Shillong is highly vulnerable to earthquakes as it falls under the high risk seismic Zone V. Flash flooding is also quite common. Other than earthquakes and flash floods, it is also vulnerable to landslides, cyclones and fire accidents.
















### Climate Risks

The two climate risks identified through the ICLEI ACCRN Process (IAP) for Shillong are:

Changing Climate Conditions	Climate Scenario Summary Statements
Decreased Rainfall 	There is a high level of confidence of an expected change of $940 \pm 149$ mm to $1330 \pm 174.5$ mm in rainfall and an increase in the annual precipitation of 0.3-3% in the North East by the year 2030.
Increased temperature 	There is a high level of confidence of an increase by $1.8 \pm 0.8^\circ\text{C}$ to $2.1 \pm 0.9^\circ\text{C}$ in temperature in the North East by the year 2030 with respect to the 1970s. Minimum temperatures are likely to rise from $1^\circ\text{C}$ to $2.5^\circ\text{C}$ and maximum temperatures may rise by $1^\circ\text{C}$ to $3.5^\circ\text{C}$ .

## Vulnerability Assessment

The fragile urban systems and their corresponding climate fragility statements for Shillong are:

Fragile Urban Systems		Climate Fragility Statements
		<ul style="list-style-type: none"> <li>Can lead to increased demand for water thereby, posing stress on the water supply system and hence the water resources available in the region. It can also lead to increased evaporation and lower the volume of water in the streams/river impacting the supply of water.</li> </ul>
		<ul style="list-style-type: none"> <li>Can lead to less water recharge thereby posing additional stress on water resources in the region.</li> </ul>
		<ul style="list-style-type: none"> <li>Can lead to a greater health risk, as waste and standing water provide a breeding ground for vector-borne diseases.</li> </ul>
		<ul style="list-style-type: none"> <li>Will have health impacts since the open drains and the water bodies polluted by septage are ideal breeding grounds for harmful bacteria and other pathogens.</li> </ul>
		<ul style="list-style-type: none"> <li>Will lead to high concentration of pollutants/septage in the water bodies which eventually will pose additional impact on health system and ground water contamination.</li> </ul>
		<ul style="list-style-type: none"> <li>Will further increase the energy demand and pose additional pressures on the system.</li> </ul>
		<ul style="list-style-type: none"> <li>Will lead to water scarcity thereby posing additional stress on power generation and consequently more power crisis in the city.</li> </ul>
		<ul style="list-style-type: none"> <li>Will lead to increased private vehicle use and hence, more GHG emissions.</li> </ul>

Through the vulnerability assessment, the adaptive capacity of the key actors identified in the IAP was scored based on three parameters: capacity to organize and respond, availability of resources, and access to information. Actors who receive a low adaptive capacity score are classified as vulnerable while those who receive medium and high scores are classified as supporting and can aid the local government in resilience building activities. The table below presents an overall analysis of actors across the different fragile urban systems.






### Actor Analysis for Shillong

Vulnerable Actors	Supporting Actors
<ul style="list-style-type: none"> <li>Tenants</li> <li>Students in Hostel</li> <li>Slum Dwellers</li> <li>Floating Population</li> <li>Children</li> <li>People staying close to market areas and river banks</li> <li>Educational Institutes</li> </ul>	<ul style="list-style-type: none"> <li>Public Health Engineering Department</li> <li>Dorbar Shnong (local self government)</li> <li>State Pollution Control Board</li> <li>NGOs</li> <li>Urban Development Department</li> <li>District Council</li> <li>Meghalaya Energy Corporation Limited</li> <li>Industries</li> <li>Commercial Establishments</li> <li>Traffic Police Department (</li> <li>Meghalaya Urban Development Authority</li> <li>Policy Makers</li> </ul>

Water supply and solid waste management are under the jurisdiction of Shillong Municipal Board (SMB) along with the relevant state department. For these systems SMB has access to resources, and the ability to organize & respond, although access to information varies from low to medium. In the case of the other systems, SMB is a vulnerable actor as it has no administrative control over the system.

The adaptive capacities of the fragile urban systems are assessed on the basis of five broad categories – economic, technology/ infrastructure, governance, social, and ecosystem services. Each of these five categories was rated as high/medium/low and averaged across all the urban systems to generate an overall score for each parameter in the city as detailed in the following table.

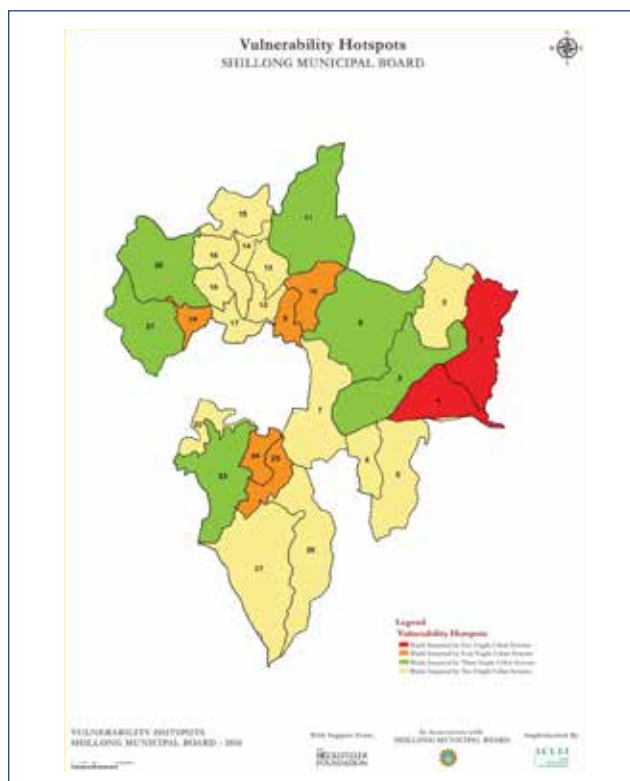
### Overall Adaptive Capacity of Systems in Shillong

Adaptive Capacity Parameters		Adaptive Capacity Score		
		Low	Medium	High
	Technological/ Infrastructural			
	Economic			
	Governance			
	Societal			
	Ecosystem services			



In Shillong wards 3, 7, 10 and 16 were identified as the vulnerable hotspots (refer map). These wards are located close to the *jhoras* (drains) which are blocked by waste thus making the area very susceptible to landslides. Furthermore, the *jhoras* have been encroached upon by some sections of the population making them even more vulnerable to events of flooding.

Among soft measures identified through the IAP, enforcement of building by-laws should take precedence as it has direct benefits on almost all fragile urban systems if implemented properly. As the community is willing to participate, awareness generation activities should focus on engaging them in disaster risk management and better maintenance of the basic infrastructure. In case of infrastructural measures, catchment restoration and protection, decentralised systems for solid waste and sewerage management, and improvement of drainage infrastructure should be undertaken on priority basis.





## Key Interventions Identified for Shillong

Infrastructural Measures	Non-Infrastructural/ Policy Measures
<b>Water Supply</b>	
<ul style="list-style-type: none"> <li>Rejuvenation of natural springs and spring management through soil and water conservation measures.</li> </ul> <p><b>Costs associated</b> (Civil and construction costs, planning costs, staff, labour, materials, trainings): INR 20 lakhs per spring.</p> <p><b>Co-benefits:</b> Can improve soil and forest management.</p>	<ul style="list-style-type: none"> <li>Capacity building and awareness generation programmes on rainwater harvesting, water conservation behaviour, etc.</li> </ul> <p><b>Costs associated</b> (Cost of materials, cost of meetings, trainings, logistics, staff costs): INR 2.5 lakhs per community training.</p> <p><b>Co-benefits:</b> IEC can be used for other systems together.</p>
<b>Solid Waste Management</b>	
<ul style="list-style-type: none"> <li>Implementation of mandatory source segregation through the distribution of bins for wet and dry waste.</li> </ul> <p><b>Costs associated</b> (Promotion costs, costs for separate collection of waste, supply of bins, staff costs, policy formulations, optional preparation of secondary collection unit): INR 30 lakhs per ward.</p> <p><b>Co-benefits:</b> Income generating opportunities.</p>	<ul style="list-style-type: none"> <li>Public awareness programmes on the 3R principle and the impacts of poor hygiene on health. This can be done through the radio, rallies, or newspaper ads.</li> </ul> <p><b>Costs associated</b> (Trainings, IEC materials, staff costs, meetings, logistics): INR 2.5 lakhs per community training.</p> <p><b>Co-benefits:</b> Can be used for other systems together.</p>
<b>Sanitation</b>	
<ul style="list-style-type: none"> <li>Construction of community toilets especially in areas with minimal infrastructure.</li> </ul> <p><b>Costs associated</b> (Civil and construction costs, materials, labour, IEC): INR 1.5 lakh per toilet seat.</p> <p><b>Co-benefits:</b> Can improve health through better sanitation.</p>	<ul style="list-style-type: none"> <li>Awareness generation programs on the risks of releasing sewage and sullage into open drains.</li> </ul> <p><b>Costs associated</b> (Cost of IEC, meetings, trainings, staff costs): INR 2.5 lakhs per training.</p> <p><b>Co-benefits:</b> Can be used for other systems together.</p>
<b>Power Supply</b>	
<ul style="list-style-type: none"> <li>Setting up a biogas plant which converts the methane generated by organic waste into energy.</li> </ul> <p><b>Costs associated</b> (Can be combined with public or community toilets, civil and construction costs, designing, labour, materials): INR 60 lakhs per unit.</p> <p><b>Co-benefits:</b> Less dependence on grid power.</p>	
<b>Transportation</b>	
<ul style="list-style-type: none"> <li>Converting basement and ground floor as parking area for all office, market and houses complexes.</li> </ul> <p><b>Costs associated</b> (Renovation costs): A separate plan will have to be drawn for each building.</p>	<ul style="list-style-type: none"> <li>Green cess on private vehicles.</li> </ul> <p><b>Costs associated</b> (Policy formulation, meetings, trainings): INR 2.5 lakhs.</p> <p><b>Co-benefits:</b> Reduction of emissions, can generate revenue for the Urban Local Body.</p>