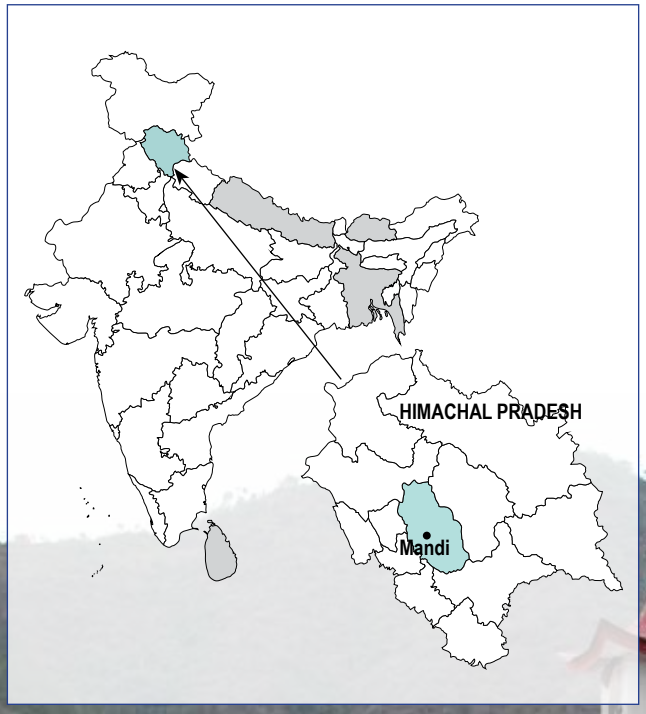
City Resilience Strategy: Mandi

Mandi is one of the oldest and fastest growing cities of Himachal Pradesh, surrounded by the high hill ranges of Gandharv Hills, Motipur Dhar, RehraDhar and Tarna Hill and bisected by the River Beas. The city is located between 30°40'N and 76°24'E at an altitude of about 760 m above Mean Sea Level. As per Census of India 2011, the population of Mandi city is 26,422. Municipal Council (MC), Mandi is the nodal agency for administration of the city. It regulates most of the civic function and services in the city.

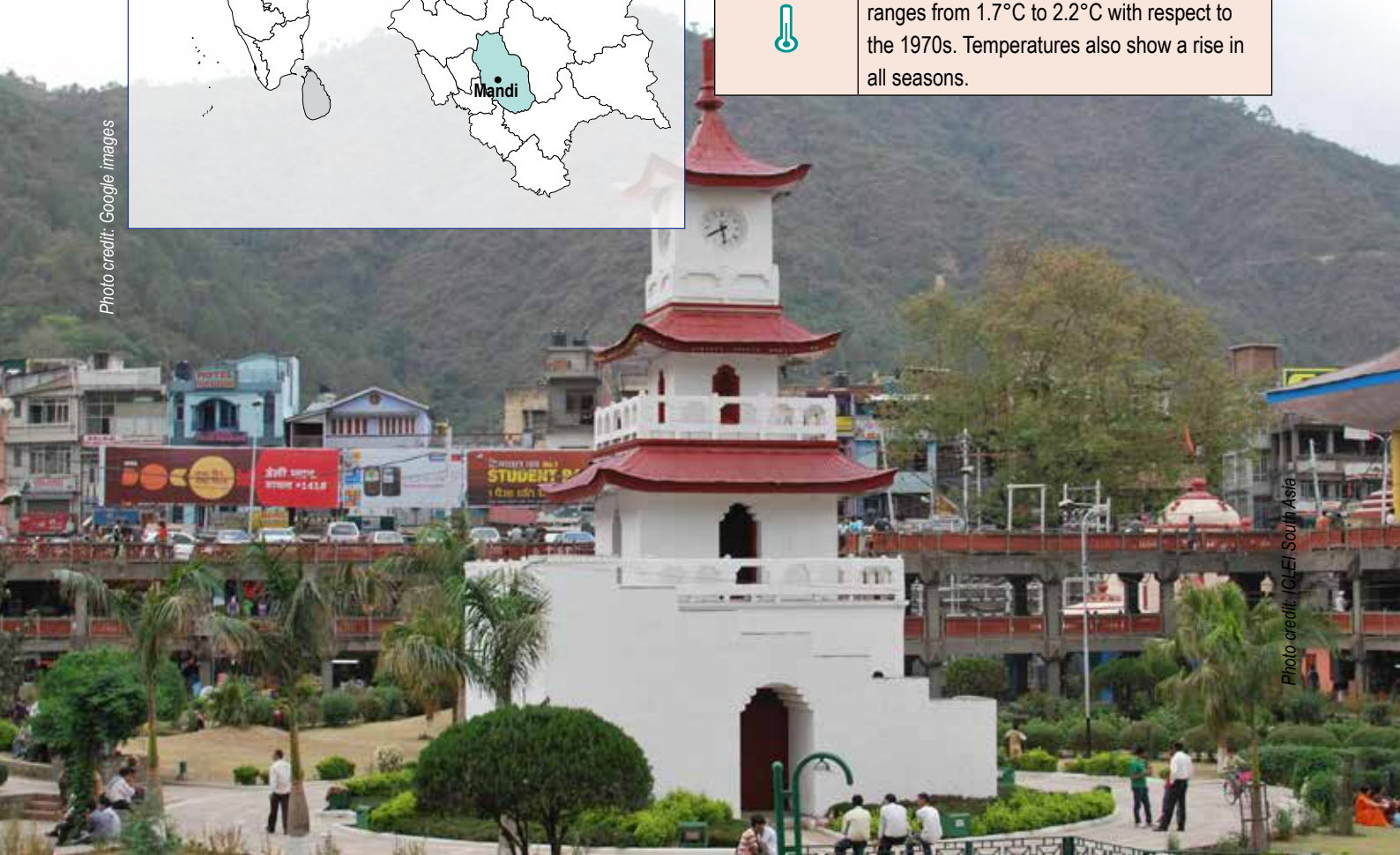
The average total annual precipitation in the city is about 832 mm. The temperature in the city varies between 18.9°C and 39.6°C during summer and between 6.7°C and 26.2°C in winter. Mandi is highly vulnerable to a suite of natural hazards (hydro-meteorological and geological). The city is highly vulnerable to landslides, floods, forest fires and cloud bursts. Geologically, it is located in seismic Zone IV near a fault line and is prone to earthquakes.



Climate Risks

The two major future climate risks identified through the ICLEI ACCCRN Process (IAP) for Mandi are:

Changing Climate Conditions	Climate Scenario Summary Statements
Decreased rainfall	The annual rainfall in the Himalayan region is likely to vary between 1268±225.2 mm and 1604±175.2 mm in 2030s. The projected precipitation is likely to increase by 5% to 13% in 2030s with respect to 1970s.
Increased temperature	The mean annual temperature is projected to increase from 0.9±0.6°C to 2.6±0.7°C in the 2030s. The net increase in temperature ranges from 1.7°C to 2.2°C with respect to the 1970s. Temperatures also show a rise in all seasons.



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Vulnerability Assessment

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

Fragile Urban Systems	Climate Fragility Statements
	• May lead to an increase in vector-borne diseases and landfill fires in the city of Mandi.
	• May result in accelerated corrosion, damage of sewerage network, and greater production of foul gases, posing health risks to citizens.
	• May lead to an increased growth of harmful micro-organisms and production of foul gases, posing a health risk to human health.
	• Further deteriorate sanitation and hygiene conditions, due to higher concentration of contaminants in soil, and surface and groundwater.
	• May lead to greater use of private air conditioned vehicles for comfortable commuting, which may lead to further traffic congestion and increased Green House Gas emissions.

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.

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Actor Analysis for Mandi City

Vulnerable Actors	Supporting Actors
• MC Mandi • Himachal Road Transport Corporation • Regional Transport Office • Town and Country Planning Department • Urban Residents • Slum Residents • Tourists • Student • District Public Relations Office • Irrigation and Public Health Department • Deputy Commissioner's Office	• Public Works Department • Health Department

MC Mandi, which is the administrative body of the city scored low in the analysis, indicating that it is not in a position to take much action with the available resources.

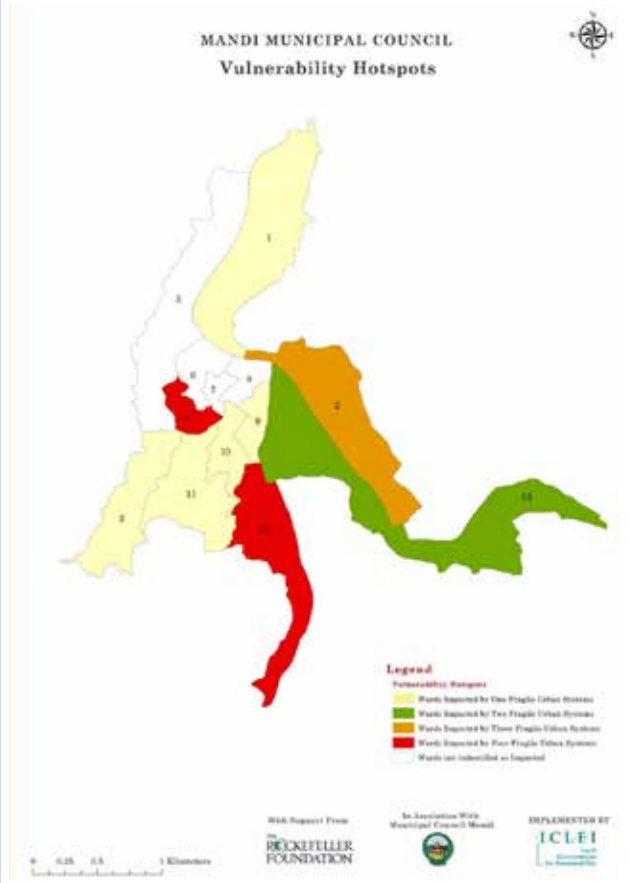
Photo credit: ICLEI South Asia

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 Mandi City

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

The vulnerable area assessment shows wards 4 and 12 as vulnerable to all four fragile urban systems, while ward 2 is vulnerable to three fragile urban systems (refer map).



Among the softer and policy interventions identified through the IAP, awareness generation activities to promote source segregation, better sanitation and hygiene and non-motorised transport options can be taken up. Improvement of interdepartmental coordination is also important. Enforcement of existing by-laws, traffic laws and building regulations should also be prioritised. Side by side infrastructural implementation complementing the soft measures like development of public transportation systems and infrastructure, collection of separated waste facilities to recycle and reuse waste water in commercial buildings, early warning systems and developing composting facilities should be taken up.

Photo credit: Google images

Key Interventions Identified for Mandi City

Infrastructural Measures	Non-Infrastructural/ Policy Measures
Solid Waste Management	
• Door to door collection and transportation of segregated waste in compartmentalized vehicles. Collection of biodegradables and non biodegradables on alternate days from inaccessible area. **Costs associated** (A 1200 ltr container costs approximately INR 40,000. At least 15 such containers are proposed, one for each ward.): INR 6 lakhs. **Co-benefits:** Community participation can lead to increased community cohesion.	• Design of IEC materials and campaigns for awareness and training of key stakeholder to effect behavioural and systemic changes. **Costs associated:** INR 1.5 lakhs. **Co-benefits:** Community participation can lead to increased community cohesion.
Sewerage and drainage	
• Laying of new sewage and water distribution lines. **Costs associated:** INR 10 lakhs per km of pipelines.	• Create single window facility for clearance of applications for water and sewerage connections through better inter departmental coordination. **Costs associated:** INR 50,000. **Co-benefits:** Improved efficiency and departmental coordination.
Health and hygiene	
• Installation of Bio-Digester Toilet System based on anaerobic biodegradation of organic waste by unique microbial consortium at household and community level. **Costs associated:** INR 1 lakh per toilet unit. **Co-benefits:** Reduced cost of pipeline construction and maintenance.	• Increased awareness campaigns to promote hygienic behaviour and counter communicable diseases. **Costs associated:** INR 1.5 lakhs. **Co-benefits**: Improved citizen participation.
Transportation	
• Promotion of Non-Motorised Transport for entire city such as cycling and walking by putting up cycle tracks and footpaths. **Costs associated**: INR 50 lakhs for pilot interventions. **Co-benefits**: Improved air quality and health of citizens.	• More stringent enforcement of traffic laws, including pollution control rules. **Costs associated:** INR 1.5 lakhs. **Co-benefits**: Public safety enhanced.

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