

## OPINION

# Priorities for natural disaster risk reduction in Central America

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Central America is known for its high risk of disasters due to various physical, economic, and sociocultural factors. The region sits on the following tectonic plates: North America, Cocos, Caribbean, Nazca, and Panama, which results in frequent seismic and volcanic activity, intensified by meteorological events like the Intertropical Convergence, cold fronts, tropical cyclones, El Niño-Southern Oscillation (ENSO), and droughts. These events can alter the climate and geomorphology, making the population more vulnerable to disasters such as landslides and floods. Disasters have been increasing in frequency and severity in Central America over the past two decades [1]. According to the Central American Integration System (SICA), these disasters can reduce a country's Gross Domestic Product (GDP) by roughly 2% [2].

The population's exposure and vulnerability are further exacerbated by land use changes, such as urban sprawl, which often leads to low-density development and limited access to open spaces, increasing the risk of loss of life, livelihoods, homes, and infrastructure [3]. Many countries in Central America also have high poverty rates, with Guatemala, Honduras, and Nicaragua among the poorest in Latin America [4]. This exacerbates the population's vulnerability to disasters, as they have limited access to resources and support in times of need. The region's complex tectonic structure and high seismic activity increase the risk of slope failures, especially adjacent to the Pacific coast boundaries where the Mesoamerican Trench subducts with the Cocos and Caribbean plates and the Panama block [5].

The El Niño-Southern Oscillation has a significant effect on precipitation levels, with different responses in catchment areas towards the Pacific Ocean and the Caribbean Sea. During El Niño conditions, Pacific-facing slopes in Central America tend to be drier, while La Niña conditions tend to bring increased rainfall. There has also been an increasing trend in the quantity of intense hurricanes in the Caribbean Sea since the 1970s, which intensifies with La Niña conditions, leading to landslides and floods in Central America [6]. Moreover, droughts can be extreme and devastating for agriculture and water supply in the whole regions during intense El Niño phases [7]. Given the high risk of disasters in Central America, it is crucial to monitor areas affected by earthquakes, particularly during unusual rainfall events like tropical cyclones. Improving the quality of disaster data is necessary to enhance disaster risk assessment, which is currently limited by the lack of baseline information and natural hazard mapping [8]. There is a need for increased research and investigation to reduce disaster risk in the region, using innovative and practical methods as disaster risk assessment tools.

To mitigate the risk of disasters in Central America, disaster risk assessment must be performed at different scales, including the community level, and involve decentralization of decision-making [9]. Utilizing new technologies for infrastructure prevention and rebuilding is also important. Focusing on urban areas and decentralizing disaster risk decision-making can improve disaster governance and bring citizens and their government closer together. Effective

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inter-scale coordination, early warning systems, and resilient fiscal policies can help prevent casualties and minimize economic losses [10]. Land use planning and engineering projects can also perform a key role in reducing disaster risk.

Strategies improving data collection, increase resilience, and prioritize gender equity and sustainable development should be promoted by public, private, and non-government institutions. The Central American Integration System (SICA) should promote the development of a regional program for continuous disaster event recording. Hazard maps should be generated in commonly affected areas through various methodologies, and exposure and vulnerability studies should inform climate change risk policies in the region. Risk mapping is crucial for effective risk management in diminishing disasters, especially in light of intensifying hydrometeorological hazards due to a changing climate [11]. Decentralization of government decision-making is necessary to improve risk management at local, regional, and national levels and mitigate economic effects of risks [12]. Community involvement, considering factors such as gender, income, education is essential for successful risk assessment, planning, and implementation.

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