THE GEOLOGICAL SOCIETY OF AMERICA®

GSA Position Statement

# IMPROVING NATURAL HAZARDS POLICIES AND RESPONSE THROUGH GEOSCIENCE

*Source: USGS/Public Domain (https://www.usgs.gov/media/images/hurricane-harvey-flooding-texas)*

***Position Summary.*** **This position statement (1) encourages increased public and private investments to reduce natural hazards vulnerability through better understanding of geologic processes; (2) emphasizes the crucial role of geoscience education and outreach in broadening the public's understanding of their risk from natural hazards and the options to reduce risk; and (3) promotes the active participation of geoscientists in implementing public policy that will improve society's resilience to natural hazards.**

## CONCLUSIONS AND RECOMMENDATIONS

Natural hazards result from earth processes and can be exacerbated by human activity. Mitigating the impact of natural hazards on society is thus a social responsibility and policy priority. It is an achievable policy imperative. Policymakers should address humanity's vulnerability to the impacts of geologic hazards through the promotion and adoption of effective strategies for risk reduction, response, and resilience. Public policies are needed to prioritize research into risk analysis and communication, forecasting and prediction, risk mitigation measures, particularly in vulnerable regions, and the implications of expanding populations, climate change, and political and socioeconomic conditions on the impacts of natural disasters locally and globally. GSA strongly endorses the greater integration of geoscience into prevention and mitigation programs, policies, and practices through:

- Increased public investment to improve understanding and monitoring of natural hazards and to characterizing them and their potential impacts over space and time. To this end, GSA supports funding
    - To modernize and enhance monitoring networks to improve the forecasting, prediction, early warning, and emergency response to natural disasters by improved characterization of the location, magnitude, and frequency of natural hazards.
    - For programs related to the mechanisms and timing of natural hazard events, including the National Science Foundation's EarthScope initiative, the U.S. Geological Survey Natural Hazards Mission Area and National Cooperative Geologic Mapping Program, and NASA, NOAA, and FEMA's earth-science mission.
    - For proactive outreach programs to both the public and private sectors, the latter of which owns or operates approximately 80% of the nation's critical infrastructure and can apply considerable resources toward greater resilience.

- The integration of geoscience information regarding natural disasters into land-use planning and sustainable development policies and practices at the international, national, state, and local level, along with the development of critical infrastructure for disaster response and mitigation. There should be a strong effort to coordinate hazard identification and risk-reduction activities across the general public, private sector, agencies, levels of government, and nations.

- Translating geoscience knowledge on natural hazards to the public to promote individual and collective behaviors that minimize adverse impacts. Robustly funding and supporting interdisciplinary social scientists in the larger geoscience community is critical to the successful translation of geoscience knowledge into policy and practice that directly benefits society.

- Promoting interdisciplinary collaborations between a variety of professionals and stakeholders to enhance society's resilience and reduce the devastating effects of natural hazards. These collaborations would include geoscientists, engineers, architects, building code and standards developers, business leaders, public utilities, emergency managers, policymakers, design professionals, investors, insurers, news media, educators, relief organizations, the public, and scientists of other disciplines.

## RATIONALE

Growing populations in hazard-prone locations, the interconnection of modern economies, and climate change are increasing the risks associated with natural hazards, including, but not limited to, earthquakes, floods, hurricanes, landslides, tsunamis, volcanic eruptions, and wildfires. The impacts of these hazards include the direct costs of repairing damaged infrastructure and housing, economic disruptions, displacement and migration, negative health effects, and weakening national security. Vulnerabilities to hazards and disaster impacts are disproportionately felt by those most marginalized in communities. With population growth and continued development in risky areas, these trends in impact will accelerate as disasters escalate.

- Today's large-scale, interdependent networks of critical infrastructure are both fragile and costly to repair. Cascading impacts could be felt for weeks, months, or even years, with exponentially greater effects in terms of life safety, public and economic health, and overall community viability, as seen during the 2021 Texas power crisis.
- In the aftermath of many disasters, businesses close and either never reopen or fail. Emergency responders and critical care facilities are overwhelmed by sudden, immense, and sometimes long-term demand for their services. The costs of repairing buildings and infrastructure are often exceeded by the indirect socioeconomic costs associated with loss of jobs and business interruption. The impact of disaster experiences on mental health can also adversely affect the long-term functional recovery of communities in post-disaster environments. These overall economic impacts have been seen during countless flooding events on the Mississippi River basin, including the 2022 Jackson, Mississippi, floods.
- Hazardous industrial materials and wastes are transported and stored in structures whose integrity can be compromised by extreme events, as seen in 2017 chemical plant explosions during Hurricane Harvey.
- Globalization of the world economy makes all of us vulnerable to disasters wherever they occur. Modern business practices, such as just-in-time inventory management, have created new vulnerabilities. Supply-chain interruption in one area may result in worldwide economic impact, as seen during the COVID-19 pandemic.

Thus, it is important for scientists who study the causes and/or impacts of natural hazards to collaborate with policymakers, stakeholders, and professionals from a variety of disciplines to develop and implement policies that mitigate adverse outcomes and foster resilience from natural hazards.

*Adopted October 2005; Revised November 2008, April 2012, October 2017, and October 2022*

## Opportunities for GSA and its Members to Help Implement Recommendations

To facilitate implementation of the goals of this position statement and to increase the involvement of geoscientists in developing hazard policy, GSA recommends the following actions:

- Direct engagement allows geoscientists to provide a scientific basis for accurate and effective risk communication, understanding natural systems' effects on the built environment and the potential cascading impacts of natural hazards, and to clearly delineate the multiple factors that contribute to uncertainty of modeling and forecasting natural events. This engagement, in turn, can guide the decisions of disaster responders by helping them understand how a natural disaster may progress, which areas are most vulnerable to those hazards, and what measures should be taken to facilitate post-disaster recovery and redevelopment.
- Advocate for the value of including geoscience as fundamental to the development of natural hazards policy with (1) international, national, state, and local legislative bodies, government agencies, and non-governmental organizations; (2) private-sector leadership, especially in the finance, insurance, energy, utilities, equity, communications, manufacturing, and investment industries; and (3) private developers, economic development corporations, professional land-use planners, chambers of commerce, and other local decision makers.
- Seek opportunities to communicate the vital nature of geoscientific information for sound hazard policy to the public. Geoscientists are encouraged to (1) provide updates on hazard-related information; (2) explain the role of geoscience in understanding and forecasting the impacts of natural disasters; and (3) promote the value of science-based approaches for addressing natural hazards. This engagement can take place in a variety of formats, including social media forums, letters to the editor, op-ed pieces on hazard policy, field trips, public lectures, short courses, and regional forums on hazard policies. Ideally, all of these could be done in concert with end-users of geoscience information (e.g., local planners or emergency managers), amplifying the value of public engagement.
- Encourage institutions to recognize such engagement and publication as a valid form of scholarship in promotion and tenure decisions.
- Increase participation in professional forums and community interactions as experts in natural disasters to provide recommendations for effective hazard mitigation and policy development. Geoscientists are encouraged to use this position statement as a resource in their participation in public discussions related to the study and mitigation of natural hazards.
- Provide resources for other geoscientists to be informed advocates of funding geoscience research and initiatives that support hazard mitigation.