Science Academies from G20 Nations Identify Opportunities for Their Governments to Use Advanced Technology to Strengthen Disaster Resilience
WASHINGTON —

Today, the science academies of the G20 countries under the leadership of the U.S. National Academy of Sciences released a joint "S20" statement to inform discussions within the respective governments on how advanced technologies can be used to strengthen preparedness and response to natural hazards and disasters. The statement will be presented to the G20 prior to the summit to be held in Miami, Florida in December. Natural hazards such as heavy rainfall, earthquakes, droughts, wildfires, and heat and cold waves are increasingly growing in intensity and frequency and becoming disasters, causing devastating impacts to populations, ecosystems, and economies. Advances in technology, such as Earth observation, remote sensing, early warning systems, digital twins, drone technologies, and artificial intelligence have the potential to support decision-making and strengthen preparedness and resilience globally. Their application and effectiveness, however, can be constrained by gaps in data availability, infrastructure, technical capacity, and institutional coordination, as well as differences in access to and readiness to deploy these technologies. "Natural disasters can have cascading and far-reaching effects, extending across communities and national borders," said NAS President Neil H. Shubin. "It is important that governments understand how science and technology can strengthen preparedness, inform decision-making, and support response. Science academies can help bring this knowledge and these opportunities to their attention."
The statement identifies opportunities across the following five actions:

Strengthen data collection and availability and the understanding of risk. Accurate data on hazards, exposure, and vulnerability are essential for disaster preparedness, response, and recovery. Countries need stronger observation systems and datasets on infrastructure, housing, transportation and communication systems, supply chains, socio-economic conditions, and vulnerable populations. Forward-looking models need to be regularly updated to reflect evolving conditions and emerging risks.

Enable safe, secure, and equitable access to data and technology. The value of data depends on the ability of users—particularly governments and institutions responsible for protecting the public—to access, share, integrate, and apply them effectively. Expanding access, promoting common standards and interoperability, and developing resilient systems that can function during power, telecommunications, or internet disruptions can strengthen early warning, emergency response, and resilience planning. Decisions on data governance, safety, security, privacy, and access remain the responsibility of national authorities.

Build local skills and capacity and design solutions for local contexts. Technology and data deliver the greatest benefits when adapted to workforce development, training, exercises, and sustained community engagement can build the capacity needed to operate early warning systems, manage data platforms, interpret risk information, and maintain critical technological infrastructure over time.

Strengthen human decision-making and governance in technology-enabled systems. Advanced technologies should enhance rather than replace human expertise.

Effective systems require human oversight, local validation, continuous evaluation, transparency, accountability, cybersecurity, and clear communication of risk and uncertainty. Scientific and technological outputs must be translated into timely and actionable information that supports decisions by authorities, emergency managers, and communities.

Advance international and cross-sector collaboration through co-production. Data, experiences, and insights generated by disasters in one region can provide critical lessons for strengthening preparedness and resilience elsewhere. International collaboration is most effective when framed as the co-production of knowledge and technology rather than the one-way transfer of expertise or solutions. Sustained partnerships among governments, academia, industry, civil society, communities, and international organizations can accelerate innovation, expand access to data and technology, strengthen local capacity, and enable rapid collaboration during and after disasters. “Developing this statement has been a collaborative effort across the S20 academies,” said Cherry A. Murray, NAS International Secretary. “We are grateful to the academy members around the world who engaged throughout the process, as well as to the U.S. experts who contributed their knowledge and perspectives to drafting and reviewing the statement. Their engagement helped bring together a broad range of scientific and technical expertise and perspectives from across the G20 nations.”

The U.S. National Academy of Sciences is a private, nonprofit institution that was established under a congressional charter signed by President Abraham Lincoln in 1863. It recognizes achievement in science by election to membership, and—with the National Academy of Engineering and the National Academy of Medicine—provides science, engineering, and health policy advice to the federal government and other organizations.
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