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Preparing governments for future shocks

Drought, deluge, and data

Success stories on emergency preparedness and response

In collaboration with





Foreword

From record-breaking wildfires in Eastern Spain and Southern California to deadly flash floods in Japan and across the US, governments and communities worldwide are confronting a new era of relentless, overlapping climate events. These crises are not just increasing in frequency but also in complexity—droughts fuel wildfires, wildfires degrade soil, then sudden storms unleash devastating floods on already fragile landscapes. The compounding nature of these events is overwhelming traditional emergency response systems, stretching financial resources, and exposing critical gaps in infrastructure and governance. Governments must adapt—quickly and systematically—to protect lives, property, economies, and essential services in the face of escalating climate risks.

This report is the latest in a series about future shocks and follows *Resilience in Action*, the first collection of case studies intended to highlight how governments can adopt new approaches to crisis preparedness and response. This next set of case studies addresses how forward-thinking leaders are integrating community-driven flood mapping, adaptive water management, and real-time digital coordination to enhance disaster preparedness and response. These examples reinforce a fundamental truth: resilience does not only mean responding effectively—it also means anticipating, adapting, and enabling the right response before a crisis even begins.

Through the Future Shocks initiative—an effort to help governments identify and develop core capabilities critical to building resilience to escalating shock events—we will continue to explore and share real-world examples of resilience in action, providing decision-makers with strategies to not just survive, but thrive in the face of disruption.

We thank the authors and organizations that contributed to this report. We hope that these insights inspire government leaders to innovate, transform their organizations, and take bold actions to be better prepared for the future—because in today's world, waiting until disaster strikes is not an option.

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Introduction

Governments, public sector leaders, and their constituents increasingly face a relentless barrage of climate-related events—including devastating floods, hurricanes and typhoons, prolonged droughts, and catastrophic wildfires. These events, exacerbated by climate impact, test the resilience of institutions and communities. The lessons of recent years have made one thing clear: the ability to *anticipate and prepare for* shocks before they occur is just as critical as the capacity to *respond and recover* afterward.



This report offers fresh perspectives from the front lines of managing climate-driven crises (see "Case study approach and methodology" on page 31). These case studies highlight innovative, technology-driven, and collaborative approaches that have strengthened resilience across different environments:

- Texas' flood mapping initiative demonstrates how engaging local communities in data collection can improve emergency preparedness in historically underserved areas.
- Colorado's integrated water and land use planning showcases how governments can proactively address long-term environmental threats such as droughts through collaboration across traditional silos and advanced decision-support tools.
- Jakarta's crowdsourced flood response platform illustrates the power of digital technology and civic engagement in real-time disaster response.

The common thread in these case studies: resilience is not a passive trait—it is a deliberate strategy. Governments that integrate forward-looking risk assessments, cross-sector partnerships, and digital innovations into their operational models will be better positioned to navigate the uncertainties of the future.

In addition to these stories as catalysts for innovation, we've included timely insights from emergency response experts who have responded to recent disasters. These actions provide government leaders with tactics to break down silos, foster cross-sector collaboration, and help ensure rapid, effective emergency coordination across disparate networks of people and organizations. We also explore NASA's open-source foundation model for weather and climate, which is poised to revolutionize disaster preparedness by making high-precision climate modeling accessible to communities worldwide.

By capturing these insights and leading practices, this report seeks to provide public sector leaders with the tools and frameworks necessary to build resilience, mitigate disruption, and drive proactive governance in an era of continuous uncertainty. A concluding action guide presents concrete steps that leaders across sectors can take to build a safer, more resilient future.

Case study

Mapping to build flood resilience

Empowering an underserved, flood-prone community with data and communication tools

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The challenge A lack of traditional flood data sources

Fort Hancock, a small farming community on the Texas-Mexico border, sits in the Rio Grande valley between two mountain ranges. In popular culture, Fort Hancock is where two lead characters in the 1994 film, *The Shawshank Redemption*, crossed into Mexico. Because of regional topography, as little as three-tenths of an inch of rainfall is enough to cause damaging flash floods.¹ During these recurring events, water rushes through dry creek beds, called arroyos; washing out roads and bridges; damaging property; and trapping people in their homes.

Fort Hancock is classified as a "colonia," a Spanish term for neighborhood or community. People living in colonias typically have low or very low incomes.² With a population of just over one thousand, Fort Hancock has a median household income of \$30,613, significantly lower than the US national average of \$77,719.³ Many families lack basic services such as potable water, adequate sewage systems, drainage, utilities, and paved roads, making colonias such as Fort Hancock highly vulnerable to environmental risks, especially flooding.

In an effort to protect themselves from chronic flooding, many Fort Hancock residents construct makeshift berms around their homes and yards. But the berms tend to compound flooding issues because diverted floodwater carves out new arroyos and puts neighboring properties at risk for flooding.

Land near arroyos is often inexpensive and many residents build on these flood-prone lots. Unfortunately, the latest flood plain maps are decades old, so residents don't know where the current arroyos are. For most residents, it's a matter of when, not if, flooding will disrupt their lives.

Due to a lack of traditional flood data sources, Fort Hancock government officials have been unable to seek assistance from state, federal, and private flood prevention programs—assistance that could help mitigate or prevent future flood disasters. The urgency to identify, document, and share information about flood risks to protect the health, property, and future of the Fort Hancock community has increased in an age of extreme weather.



The response Social cartography project fills the flood data gaps

Resilience in emergency preparedness and response has become a privilege unavailable to underserved communities such as Fort Hancock. In this context, resilience is not just about bouncing back from adversity, but about surviving and adapting by building new capacities.

After learning about Fort Hancock's flooding challenges, researchers from the University of Texas at Austin (UT Austin) and the Texas A&M Institute for a Disaster Resilient Texas (IDRT) began investigating ways to address the community's failing infrastructure. The research team conducted extensive fieldwork to engage the community and learn what could help residents address flooding concerns.

Recognizing that accurate, up-to-date flood mapping is an essential starting point for building flood resilience, the team co-created a social cartography project. This is part of the Digital Risk Infrastructure Program (DRIP) funded by the Texas State Legislature. DRIP aims to bridge the gap between technical flood-related data and its practical use in rural communities.⁴ Because of Fort Hancock's flooding vulnerability and lack of current flood data, it became a part of the DRIP pilot program.

The mapping process was a collaborative effort between researchers and community members, aligned with the principles of social cartography, participatory mapping, engaged research, and co-creation through communication.⁵ By prioritizing local knowledge, expertise, and cultural inputs, researchers empowered the community. As images were collected, privacy was respected throughout the process. Dialogue and planning served as trust-building mechanisms among community leaders, local data collectors, a healthcare network, and a local church.

The Texas DRIP program funded a community-based field team for one year. Local community members were paid to collect flood image data, and field researchers were compensated for time and travel expenses. The program also funded development of a photo collection application and an interactive online dashboard for displaying photo evidence of flooding on a map.

When the program was finished, Fort Hancock had, for the first time, a comprehensive database of images from flood events—information that is being used to inform decisions about resilience planning and apply for funding with the goal of building future flood management infrastructure.



Outcomes and benefits realized

The project has enhanced the community's capacity for communication and increased geoliteracy—that is, how people view, understand, and interact with the world to facilitate environmental protection. These outcomes contribute to resilience by:

- **Bridging information asymmetry.** Making the map available to the community helped close information gaps that create vulnerabilities.
- Fostering collective learning. To understand flood risks, community members co-constructed a sense of space, and the map reflected multiple viewpoints of shared perceptions and experiences.
- Building trust with constituents. Local government officials participated in meetings, listened to community concerns, and provided information about preparedness and legal pathways to protect property.
- Using dialogue to reduce conflicts. Meeting about the map created opportunities to help reduce conflict created by water diversion practices. Meeting participants expressed interest in organizing future conversations about these practices.
- Searching for grants that facilitate infrastructure investments. Local government officials use the flood map to apply for funds that could help install stormwater management systems and support other infrastructure improvements.

Increased geoliteracy—how people view, understand, and interact with the world facilitates environmental protection.



Lessons learned and critical success factors

Social cartography intervention can increase resilience through communication, mutual learning, and trust-building processes that help sustain good governance. Factors that contribute to success include:

- Viewing data as a communication tool to be co-produced with communities. Computer resources are required to house projects and store data. Texas has a new Disaster Information System initiative to make these outcomes visible and available.
- Engaging locally and supporting community-driven conversations. Avoid imposing external language, time frames, or cultural norms. Create open communication channels, allow problem definitions and solutions to emerge from the community, protect privacy, and respect community wishes.
- Collaborating with local organizations with high relationship capital.
 Community-based organizations, such as Civil Society Organizations (CSOs) and rural congregations, can leverage strong social networks and local knowledge to support data collection and mapping efforts and to mitigate staff and resource shortages.
- Investing in training and education. To replicate efforts, communities need training to assess map reliability, read maps, and understand map limitations. Training should also include instruction about privacy norms, data quality, GIS software use, and emergency management.



What's next

The Fort Hancock DRIP pilot project was completed in 2024. Several follow-up initiatives are underway to build momentum including:

- Seeking grants for public investment. Installing stormwater infrastructure could significantly increase resilience to recurring flooding.
- Replicating community-driven flood map development in other colonias. More than 2,000 colonias exist across California, Arizona, New Mexico, and Texas.⁶ Many of these are vulnerable to flooding and other environmental injustices. Lessons learned in Fort Hancock can help build resilience in these colonias through better communication. Future projects could also include distributing healthcare and legal information to further support these communities.



Case study

Building drought resilience

Collaboration in land use and water supply management

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The challenge Megadrought in the American West

The western region of the US is currently in the middle of a megadrought cycle, with the last quarter-century ranking as the American West's driest period in 1,200 years.⁷ To prepare for and respond to the ongoing challenge and shock of drought-related water shortages, western state, local, and tribal governments have made huge investments in water infrastructure and assets, updated policies, and improved planning practices.

These efforts—in collaboration with various interest groups, researchers, and advocates— have been instrumental in building adaptive water governance. Collaboration has contributed to maintaining physical and social infrastructure, supporting agriculture and water-dependent industries, and achieving noticeable water efficiency gains, which are influential in accommodating population growth.

Policy design and implementation at the state level in the US feature complex and nested components. To illustrate this multiplicity, this case study focuses on the state of Colorado. Warming temperatures and worsening hydrological conditions, such as prolonged dry weather and persistent low precipitation and runoff, may lead to severe water shortages in Colorado by 2050.⁸

As megadrought conditions persist in the American West, how is Colorado integrating land use and water resource management to prepare for and respond to water scarcity?



The response

Building resilience through planning and collaboration

After a series of severe droughts, the Colorado Water Plan was first released in 2015 and updated in 2023.⁹ The Colorado Water Conservation Board (CWCB) drafted the plan after a rigorous civic engagement process with state agencies and divisions, and the general public.

The Colorado Water Plan of 2015 sets a goal for 75% of the state's residents to live in communities that incorporate water-efficient actions into land use planning by 2025. This made Colorado the first state to establish such a goal in its statewide plan and to require water providers to consider how land use planning efforts can reduce water use.



Outcomes and benefits realized

As of February 2025, city and county governments representing 68% of Colorado's population have been trained in land use and water planning integration. With the Colorado Water Plan in place, the state is marshaling many constituent organizations and government entities to follow through with planning and prioritization, and it is providing the necessary resources to support the plan. Steps include:

- Provide an overarching framework. By understanding water challenges and taking supply shocks into account, the plan proposes solutions to address the future needs of competing water users. Updated about every 10 years, the plan also provides guidance to elected officials and stakeholders on aligning with Colorado's water values through balanced policies and actions.
- Prioritize action areas. A rigorous civic engagement process resulted in actionable objectives in four focus areas, including vibrant communities, robust agriculture, thriving watersheds, and resilient planning.
- Establish funding mechanisms. In FY 2022-23, the Colorado Water Plan Grant Program funded \$12.64 million for 63 projects, including \$2.97 million for conservation and land use planning. By the end of FY 2022-23, 386 grants had funded nearly \$70 million in local projects across the state.¹⁰
- Guide decisions through master plans and legislation. In Colorado, local governments are required to have a water supply element in their master plans for addressing water conservation and efficiency. The Colorado legislature has also passed a series of measures that connect water and land use and formalize collaborative relationships to better integrate water demand management and conservation into land use planning.
- **Create collaborative alliances.** The Colorado Water and Land Use Planning Alliance includes representatives from state agencies, local governments, academic institutions, professional associations, and water-focused environmental nonprofits. The organization provides a platform to exchange ideas and integrate land use with water supply planning.

Build a supporting technology infrastructure. With so much data to collect, manage, integrate, and analyze, collaborative efforts in Colorado rely on advanced technology platforms and tools, including Colorado's Decision Support Systems (CDSS), the Snow Data Assimilation System (SNODAS), the Colorado Hazard Mapping Program (CHAMP), and the Community Rating System (CRS). For example, the CDSS features several online tools that connect directly with HydroBase, the state's water data repository, which includes structure and station data and water rights data. Decision-makers and users can access software tools for modeling surface and groundwater, managing time-series data, and estimating consumptive use via the CDSS. Furthermore, it provides links to a range of program-related documents, including project reports, technical memoranda, and meeting materials.



Lessons learned and critical success factors

The following three lessons learned could benefit other governments looking to replicate the actions taken by Colorado for water resilience planning:

- Cross-organizational collaboration between state and local organizations.
 Working together, the Colorado Water Conservation Board, the Colorado Department of Local Affairs, and the Colorado General Assembly are dedicated to integrating land use planning and water resources. These bodies provide leadership, establish statutory requirements and statewide goals, and enhance legal and administrative capacities to address water scarcity. The Colorado Water and Land Use Planning Alliance also connects land use and water management initiatives across jurisdictional boundaries.
- Availability of sufficient and timely investments in water resilience. Two major examples of recurring investments include the Colorado Water Conservation Board's Water Plan Grants and the Colorado Department of Local Affairs Energy and Mineral Impact Assistance Fund Grants.
- Adoption and use of advanced data management and decision support platforms. By using modernized cloud-based platforms and applications, and sharing insights via online dashboards and tools, Colorado's land use and water supply management stakeholders can make informed, timely decisions with transparency.





What's next

For many years, land use and water planning have tended to operate independently. Land use planners typically prioritize community growth and built infrastructure, while water managers prioritize ensuring a clean, sufficient water supply. Bridging this gap and recognizing the interdependence between these vital decision-making processes need to be accelerated as populations grow and water supplies come under increasing pressure.

Integrating land use and water planning remains a relatively untapped opportunity, and the benefits go far beyond managing natural resources. Land management will impact water demand, availability, quality, and affordability. Collaborative management of both land and water resources, as demonstrated in Colorado, will be a key step in achieving a resilient and sustainable society.

Collaborative management of land and water resources is key to a resilient society.

Perspective

What front-line leaders must know (and do) before disaster strikes

When climate events strike, the frontline of response generally is not the federal government, but rather local first responders and a network of volunteers ready to activate at a moment's notice. In the first 24 to 72 hours, these actors can struggle to match limited resources—manpower, emergency supplies, expertise to the most pressing needs on the ground.

Several recent high-profile disasters in the US including Hurricane Helene, the Southern California wildfires, and severe flooding throughout Appalachia underscore the challenge. We witnessed similar difficulties during the flooding in eastern Spain, in the province of Valencia. In discussions with emergency responders to the US events, along with other experts, a stark truth emerged: most municipal leaders are ill-prepared, not because they lack training, but because they fail to leverage networks they do not directly control. Based on these discussions, the following is a compilation of practical, actionable, and specific steps that any member of the emergency management ecosystem could add to their toolkit to improve emergency preparation and response.



Networks are power: Build them now

Crisis response is not a solo act. The most effective leaders understand that resilience depends not only on their immediate authority but on the strength of interconnected networks that span governments, nongovernmental organizations (NGOs), private-sector responders, and local communities. These networks often operate outside traditional top-down hierarchies, yet they are essential for rapid, coordinated action in times of crisis.

Too often, leaders fail to establish relationships with key stakeholders before a disaster strikes, leaving them disconnected from critical resources and expertise. Building and strengthening these connections must be a priority—long before they are urgently needed. Resilient governance depends on proactive collaboration, trust, and integration across sectors to ensure that when crises emerge, response efforts are swift, coordinated, and effective.

Christopher "Jonesy" Jones, Founder and Executive Director of Conversa Corps, Inc., explains: "Most people aren't trained to tap into the value of a network they don't directly control. But in a crisis, that's exactly what they need."

Resilient communities require relationships before a disaster occurs. Leaders should prioritize:

- Establishing relationships with those closest to the crisis response—local officials and first responders—as they will be the first to act.
- Preemptively identifying potential risks, subsequent needs, and available resources at a local level.
- Aligning incentives and interests with other networked partners, to ensure collaboration is in place before a crisis unfolds.
- Keeping communication channels open during noncrisis times, such that if a crisis hits, the channels are already active.
- Ensuring data does not become siloed—to help those in need, information must flow across the network of agencies, organizations, and first responders.

Matching needs with resources: Know your place in the disaster equation

In a sense, disasters function as chaotic marketplaces where supply and demand take the form of resources and needs across communities. Without preparation, these needs and resources remain inefficiently matched, leading to delays and misallocation. Effective leaders must recognize their position early—whether as a supplier of aid or a recipient—and act accordingly. This includes articulating needs clearly, while higher authorities and NGOs must listen and mobilize resources efficiently to deliver the resources.

Coordination beats command: Ditch the hierarchical mindset

Frequently, emergency management follows a rigid top-down structure that struggles to adapt to rapidly changing conditions. Successful leaders, amid turbulent environments, act as enablers rather than strict decision-makers, ensuring disparate response groups connect, collaborate, and communicate freely. The best outcomes emerge from shared goals and clearly defined priorities.

The first 72 hours define the response: Determine what's available ahead of time

The first three days of a crisis shape the overall response effort. This period sees an influx of responders, NGOs, and volunteers, often with little coordination. Leaders must have a "ready reckoner" of available resources—understanding in advance what aid can be mobilized, where it will be needed most, and how to cut through bureaucratic red tape.

Dr. David Bray, Distinguished Chair of the Accelerator & Principal/CEO at Stimson Center & LeadDoAdapt Ventures, Inc., made this blunt assessment: "Disaster professionals know what to do. It's the municipal leaders who are often caught off guard. They need to stop thinking in terms of control and start thinking in terms of trust."

"When you tell disaster response professionals 'No' in an emergency, they don't listen—they just go down the street and do it anyway."

David T. Ackerman, Esq.

Managing Director, Compliance International, LLC

Eliminate the "No": Unleash capacity

In a crisis, an aversion to "Yes" and bureaucratic caution risks hesitation, and hesitation leads to failure. Traditional response mechanisms often become bottlenecks. Volunteers, technologists, and community responders will act regardless—the role of effective leadership in turbulent environments is to harness this energy, not block it.

Compliance International's Managing Director David Ackerman noted: "When you tell disaster response professionals 'No' in an emergency, they don't listen—they just go down the street and do it anyway."

Data must flow: Be ready to share

Every crisis generates a flood of data—requests for aid, resource locations, and evolving situational reports. Too often, this information remains trapped in uncoordinated spreadsheets or siloed systems. The result is what one expert described as "islands of excellence"—each agency or responder doing their best, but without an integrated picture.

The solution? Agreed-upon data-sharing protocols, open platforms, and a commitment to interoperability. Private sector technology firms have a crucial role to play in building infrastructure that ensures real-time coordination.

Right of boom: Remove friction, build trust

Once a disaster occurs, effective response hinges on minimizing barriers between emergency actors. Two core principles should guide effective collaboration:

- 1. Assume that everyone involved is doing their best.
- 2. Trust that all actors are operating with good intent.

For those accustomed to rigid command structures, this can be uncomfortable. However, the reality of modern disaster response is that many critical networks are outside direct government control. Rather than passing down orders or excluding networks from your communications and operations, allow resources to flow where they are needed most by getting incentives in the right places.

The consensus among experts is clear: effective leaders must shift from a reactive to a proactive mindset. An emergency plan is not enough—leaders must cultivate networks, remove bureaucratic roadblocks, and empower those on the ground.

The best time to build bottom-up resilience is before disaster strikes. As history has shown time and again, the only real mistake in crisis response is failing to incorporate lessons from the last one.



Case study

Crowdsourcing resilience

Boosting response to megacity flood events with social media data

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The challenge

Severe flooding due to topography and climate impact

Jakarta, the capital of Indonesia and home to almost 30 million, lies in a low, flat alluvial plain with an average elevation of just eight meters above sea level. The land is swampy with 13 rivers running through it, and it routinely floods. But even more concerning, Jakarta is sinking at an alarming rate: four meters in the last 30 years. Sitting on the shores of the Java Sea, Jakarta faces rising sea levels, while groundwater extraction for reliable drinking water is also a major contributor. ¹¹

During flood events, water levels can rise quickly, endangering people and threatening homes, businesses, and public property. Providing Jakarta's residents with accurate, up-to-the-minute updates about flood events is vital for flood response and recovery.

But integrating information from diverse sources, including social media posts, government data, and sensor information represents enormous challenges. Could a digital platform be built that delivers accurate crowdsourced data, scales rapidly, and builds trust while enhancing collaboration among residents, government agencies, and humanitarian organizations?



The response

A web-based platform with real-time, flood risk information

With the growth of social media in the late 2000s/early 2010s, many Jakarta residents began sharing flood updates on microblogging services such as Twitter and messaging apps such as Telegram. Seeing significant potential in this trend, the Yayasan Peta Bencana (Disaster Map Foundation) was formed in 2013. The foundation dedicated its work to harnessing social media data, enabling real-time situational awareness, and helping the community respond more effectively during and after flood events.

The foundation developed software based on the CogniCity open-source platform to launch the PetaBencana.id website. By aggregating, filtering, and visualizing updates from many sources into a single platform, the website provides a comprehensive overview of disaster events, enabling residents, government agencies, and humanitarian organizations to make informed decisions during emergencies.

Aggregating, filtering, and visualizing updates from many sources into a single platform provides a comprehensive overview of disaster events.

For example, a resident may report rising water levels in their area using specific hashtags. PetaBencana.id then uses crowdsourcing to gather these reports, cross-check them with other user submissions and official data, and display information on a real-time map. Residents can use the map to make safety decisions and plan evacuation routes if necessary. Government agencies and first responders also rely on the website to coordinate and target response efforts.

PetaBencana.id received initial funding support from a Twitter data grant and the University of Wollongong's Global Challenges Program. Since then, the Asia Pacific Network Information Centre (APNIC), the International Development Research Centre (IDRC), and the Swedish International Development Cooperation Agency (SIDA) have provided grants. The Australian National Data Service and Department of Foreign Affairs and Trade also contributed.

Integrating social media reports, government data, and sensor information into a cohesive platform was a complex undertaking, along with verifying crowdsourced data and scaling the platform for high traffic during disaster events. Building trust and collaboration among residents, government agencies, and humanitarian organizations was also critical for success.



Outcomes and benefits realized

PetaBencana.id has revolutionized disaster communication and response in floodprone areas, ushering in a new era of collective resilience. By tapping the power of real-time, crowd-sourced data, this platform dramatically enhances situational awareness and bridges critical information gaps. Achievements include:

- First platform of its kind. The website pioneered the harnessing of social media to aid disaster response and recovery. For its efforts, PetaBencana.id won a United Nations Public Service Award in 2019.
- Used by millions of Jakarta residents. PetaBencana.id plays a pivotal role in raising awareness about disaster preparedness and empowers communities to take proactive measures and assume ownership of their safety. The Indonesian National Emergency Management Agency (Badan Nasional Penanggulangan Bencana [BNPB]) also uses the website to monitor disaster events, accelerate response, and share time-critical emergency information.
- **Community engagement and training.** These efforts gain community trust and empower residents to contribute vital data during disaster events. A community-driven approach fosters resilience and showcases the usefulness of collective intelligence in addressing complex urban challenges.
- Prioritization of technology infrastructure. The platform uses cloud services for data processing, storage, and real-time mapping for seamless scalability and reliability. A multifaceted approach amplifies the platform's technical capabilities and fosters resilient and collaborative community response, promoting the importance of human-centered design in disaster risk management.

A community-driven approach showcases how collective intelligence can address complex urban challenges.



Lessons learned and critical success factors

As PetaBencana.id evolves, valuable insights have emerged to guide other regions in adopting this solution. The following lessons will be crucial for emergency response and disaster management in the densely populated megacities of South and Southeast Asia.

- Community engagement is crucial. It underscores the platform's relevance and effectiveness, while enabling communities to adapt to dynamic environments and stay ahead of emerging challenges.
- Leveraging collective intelligence is instrumental to success. Social media data collection generates accurate and timely information and surpasses traditional data collection methods in terms of speed, volume of data, and cost-effectiveness.
- Data integration is fundamental and essential. Incorporating data from social media, government reports, and sensor data creates a more comprehensive and reliable disaster response system.
- Partnerships optimize impact. Partners include the Massachusetts Institute of Technology Urban Risk Lab, BNPB, USAID, University of Wollongong Global Challenges Program, DM Innovation, AusAid, X (formerly known as Twitter), the Department of Foreign Affairs and Trade of the Government of Australia, World Vision Indonesia, Australian National Data Service, Open Data Institute, Pasang Mata (Citizen Journalism Platform), Smart City Jakarta, Humanitarian OpenStreetMap Team (HOT), the Pacific Disaster Centre (PDC), Pasang Mata, and other academic organizations.



What's next

Yayasan Peta Bencana's commitment to community engagement, technology infrastructure, and human-centered design remains crucial for addressing the complex urban challenges of the 21st century. The effort underscores the vast potential of collective intelligence in shaping a more resilient and adaptive future. The organization is exploring several initiatives to amplify the impact of this project including:

- Introduction of a crowd logistics feature. This functionality will support communitylevel resource and logistic coordination and facilitate mutual aid and resource distribution during disasters.
- **Expansion of technology infrastructure.** More resources will handle an increasing volume of data, integrate new sources of information, and help ensure that the platform remains robust and reliable during disaster events.
- Enhanced user engagement. New user experience tools and options will make disaster information more accessible and actionable for all website users.
- Expansion into other countries. Yayasan Peta Bencana has already expanded into the Philippines with MapaKalamidad.ph. By collaborating with other governments, NGOs, and international organizations, Yayasan Peta Bencana aims to replicate its success and contribute to global disaster resilience efforts.

Yayasan Peta Bencana's commitment to community engagement, technology infrastructure, and human-centered design remains crucial for addressing the complex urban challenges of the 21st century.

Perspective

The promise of AI for enabling climate resilience¹²

Nearly a quarter of the earth's population now lives in a flood zone, where rising seas and more severe storms put ever more people at risk. Deploying AI to accurately map flooding events can save lives and property.

Together, NASA and IBM are creating AI geospatial foundation models to analyze petabytes of satellite images to create customized maps of natural disasters and other environmental changes. The goal: provide an easier way for researchers to analyze and draw insights from large NASA data sets related to natural processes.

Potential applications for this first-of-its-kind AI model extend beyond floodmapping to estimating climate-related risks to crops, buildings, and other infrastructure, evaluating and monitoring forests for carbon-offset programs, and developing predictive models that help enterprises mitigate and adapt to climate impact.

"We hope that this spirit of open collaboration can be a model for developing other tools aimed at unlocking very large data sets."

Dr. Juan Bernabé-Moreno Director of IBM Research Europe (UK and Ireland)

The family of models was expanded in 2024, developing a foundation model for weather and climate data. The model was customized for more specific tasks, such as creating highly localized wind forecasts for renewable energy planning and increasing the resolution for climate simulations to better understand and plan for the local effects of climate impact.

This initiative is just the start of AI's potential to accelerate emergency preparedness and response. "We hope that this spirit of open collaboration can be a model for developing other tools aimed at unlocking very large data sets," says Dr. Juan Bernabé-Moreno, Director of IBM Research Europe (UK and Ireland).



Action guide

Resilience is forged, not found. The time to act is before the next crisis not after. Governments that proactively leverage technology, remove coordination barriers, and operationalize resilience in governance will not only protect their communities but lead the way in creating adaptive, future-ready societies. Based on lessons learned from the preceding case studies, the following concrete actions can help government leaders ensure future readiness by focusing on resilience, collaboration, and adaptability in response to shock events.



Build predictive resilience—Act before disaster strikes. The most effective governments don't just react to crises; they anticipate and mitigate risks before they escalate. AI, data modeling, and real-time analytics must be embedded into decision-making to accelerate responses to crises. Leaders should:

- Leverage open-source foundation models, forecasting, and real-time data to enhance decision-making, using tools such as NASA's Prithvi WxC to predict extreme weather events and prepare accordingly.
- **Integrate community-driven intelligence** by crowdsourcing environmental risks, ensuring local insights complement official data sources.
- **Develop preemptive response plans** that align local, state, and federal agencies with private sector partners to position resources and personnel before an emergency occurs.



Collapse bureaucratic barriers—Build a crisis

response ecosystem. Government agencies, private sector partners, and communities must work as a single, adaptive network before a crisis occurs. Bureaucratic isolation slows response times and increases the cost of recovery. Leaders should:

- **Develop multisector crisis playbooks** that integrate emergency management with cross-industry partners, including private companies, nonprofits, and technology providers.
- Remove barriers to data-sharing by adopting open-source platforms and prenegotiated agreements that enable seamless exchange of critical information during crises.
- **Strengthen community engagement** in preparedness by empowering local organizations to contribute to data collection, risk assessment, and resilience planning.



Be proactive—Design for resilience, not just response.

Governments can't afford to focus only on reacting to disasters they must proactively design resilience into infrastructure, policies, and governance. To do this, leaders should:

- **Bake resilience into infrastructure investments** by requiring flood mapping, water conservation strategies, and digital risk assessments in urban planning.
- Embed crisis simulations into governance by conducting regular scenario planning exercises that bring together first responders, technologists, and policymakers.
- Scale adaptive technologies that make emergency response more agile, such as cloud-based disaster management platforms, social media-driven crisis monitoring, and rapid AI analysis of evolving threats.

Case study authors



Mapping to build flood resilience

Empowering an underserved, flood-prone community with data and communication tools

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Building drought resilience

Collaboration in land use and water supply management

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Crowdsourcing resilience

Boosting response to megacity flood events with social media data

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Case study approach and methodology

The IBM Institute for Business Value, in collaboration with the IBM Center for The Business of Government and the National Academy of Public Administration, issued a call for proposals to learn about real-world examples of how government organizations implemented strategies and capabilities that improved their mission resilience to be "future ready" and prepared them to respond to disruptive events.

Five key domain areas were identified for case study development, including emergency preparedness and response, cybersecurity, supply chain, climate sustainability, and workforce development. The case studies could be from anywhere in the world and apply to any level of government. Examples should have been piloted or implemented between 2022 and 2024. Submissions were evaluated for suitability to the challenge theme and across evaluation criteria including recency, replicability, transferability, and innovation. Case studies included in this report were selected based on the quality and impact of their solution.

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