*human suffering is the incalculable cost of disasters

Disaster costs are reported in terms of lives lost, people displaced, and economic damage. While these measures help quantify orders of magnitude, no number can capture the related human suffering caused by the impacts.

In 2014, we saw Ebola in Africa; million-acre fires in Canada; massive earthquakes in Chile, huge mudslides in the U.S. and Afghanistan; and super-strong, long-lived cyclones in the Pacific, to name a few. In all, cost of disasters was estimated at $110 billion, according to Munich RE.

But for each family or village touched by these calamities, the true toll will always remain incalculable, and the grief, intolerable.

Improved preparedness and earlier warning, better planning, and quicker, more coordinated response can all help reduce the toll of disasters. Year after year, we at Pacific Disaster Center use the latest information, science, and technology to foster resilience, empowering others to save lives and livelihoods.

PACIFIC
DISASTER
CENTER

PDC in action

Supporting disaster managers and the communities they serve to better mitigate, prepare for, respond to, and recover from disasters, PDC uses innovative technologies to provide just-in-time information about disasters and their impacts, combining real-time observations, risk and vulnerability assessments, modeling and visualization, and analytical reports and products supporting events, exercises, and other capacity-enhancement measures.

hazards and disaster events

Across the globe, tropical cyclones, volcanic eruptions, and earthquakes required massive multinational responses. In the face of these events, PDC worked to minimize loss of life and property by collaborating with emergency managers across the globe, collecting data, providing tools for analysis and visualization, and using technology to disseminate actionable information to key decision makers and responders.

* **Tropical Cyclone Ian in the South Pacific** (January)

* **8.2 M Earthquake off the Coast of Chile and Pacific-wide Tsunami Warning** (April)

* **7.5 M Earthquake in Mexico and Pacific-wide Tsunami Warning** (April)

* **Kilauea Volcano on the Big Island of Hawaii** (June-2015)

* **Hurricane Arthur along the U.S. East Coast** (July)

* **Super Typhoon Neoguri in Japan** (July)

* **Typhoon Rammasun in the Philippines and Vietnam** (July)

* **Tropical Cyclone Halong in the Marianas and Southwest Japan** (July)

* **Tropical Cyclone Iselle in Hawaii** (August)

* **Typhoon Kalmaegi in Philippines and Vietnam** (September)

* **Hurricane Odile in Baja California, Mexico** (September)

* **Typhoon Phanfone in the northwest Pacific** (October)

* **Typhoon Vongfong in Rota, Okinawa, and Japan** (October)

* **Hurricane Ana in the Hawaiian Islands** (October)

* **Tropical Cyclone Gonzalo in Bermuda** (October)

* **Tropical Cyclone Hudhud in India** (October)

* **Super Typhoon Hagupit in the Philippines** (December)

exercise support

Training and exercise help responders better prepare for humanitarian assistance missions and disaster relief operations. In 2014, PDC worked with a variety of stakeholders and helped with scenario development, specific modeling, staff planning, and more. We engaged in exercises that ranged from hurricanes to earthquakes... and even included variables as unpredictable as organized crime.

* **Angel Thunder Multi-national Personnel Recovery Exercise** (January–May)

* **NORTHCOM Exercise Ardent Sentry** (March–April)

* **Exercise TRADEWINDS** (Antigua and Barbuda, May–June)

* **Mentawai Megathrust Disaster Relief Exercise** (10 nations in Indonesia, March)

* **PACOM Pacific Theater Engagement Exercise** (March–April)

* **Exercise Nine Innings** (April)

* **USMC University Common Operating Picture Exercise** (April–May)

* **Fuerzas Aliadas Humanitarias** (Multinational in El Salvador, May)

* **Makani Pahili: Hawaii Statewide Hurricane Exercise** (May–June)

* **8th Theater Sustainment Command Humanitarian Assistance Survey Team** (Indonesia, June)

* **PACOM Pacific Endeavor 2014** (Nepal, June)

* **ROGUE JCTD (GeoSHAPE) Operational Demonstration #2 and #3** (Latin America, June & July)

* **PACOM Exercise Ulchi Freedom Guardian** (August)

* **Tribhuvan International Airport Disaster Response Plan Exercise** (Nepal, September)

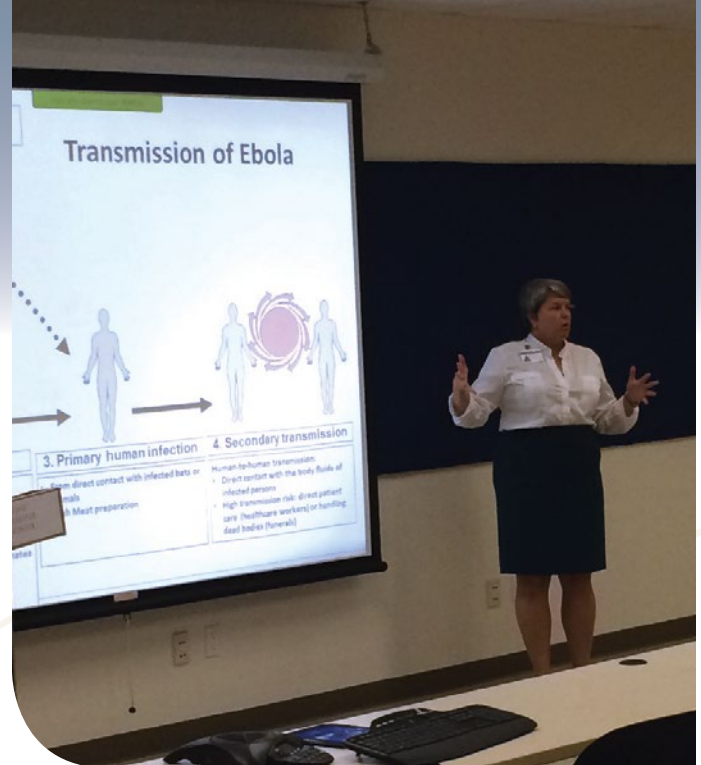* **PACOM Exercise Tempest Winds** (Nepal, September)

global

Information Services

Global Information Services – Supporting Event Monitoring, Exposure, and Impact Estimation: Expanding dynamic information helps deliver the most reliable, recent, and comprehensive information during a crisis. In 2014, PDC improved gathering and processing of data for many existing hazard layers, refined the SOPs for the processing of manually reported hazards and products, and enhanced the security of our publishing services. We also augmented automated reporting for tropical cyclones with a unique approach that significantly enhances reports used for humanitarian relief operations.

Anticipatory Sciences – Socio-Economic Risk and Vulnerability Assessment (RVA): Information is only valuable and useful to decision makers when it is easily understood. Therefore in 2014, PDC refined its national-level Global RVA methods for measuring and comparing national resilience, making results more intuitive. In fact, the new approach encouraged several key constituents to sponsor multi-year projects, enhancing our existing coverage to sub-national analysis that can help guide development projects and planning. Extending capabilities, we also initiated new research exploring "connectivity," or how the effects of large disaster on one nation may be felt by other nations. This approach offers a potential scientific method for understanding regional and transnational impacts of large disasters.

Decision Support Platforms and Applications: Keeping pace with technology is a fundamental requirement for providing the best information where and when it matters most. This year, as our Internet user base was quadrupled, and our Disaster Alert mobile app downloads surpassed 1.45 million globally, the entire DisasterAWARE engine was re-written, employing the new (HTML 5) standards, improving speed and widening compatibility for supported browsers and devices. Security was overhauled, with public and authenticated traffic separated to ensure that emergency management stakeholders are not affected by surges of public traffic.

Mobile Devices, Social Networks, and Related Strategies: During disaster events, a wealth of information is being generated and shared by those on the ground during the moments of impact. PDC has become a pioneer in extracting important information and developing Twitter content "heat maps" by fine-tuning the visualization of filtered content. We also partnered with others to harness this new resource, putting our expertise at visualizing results to work.

✻ impact: Help to keep hazards from becoming disasters by delivering the right information, to the right audience, at the right time.
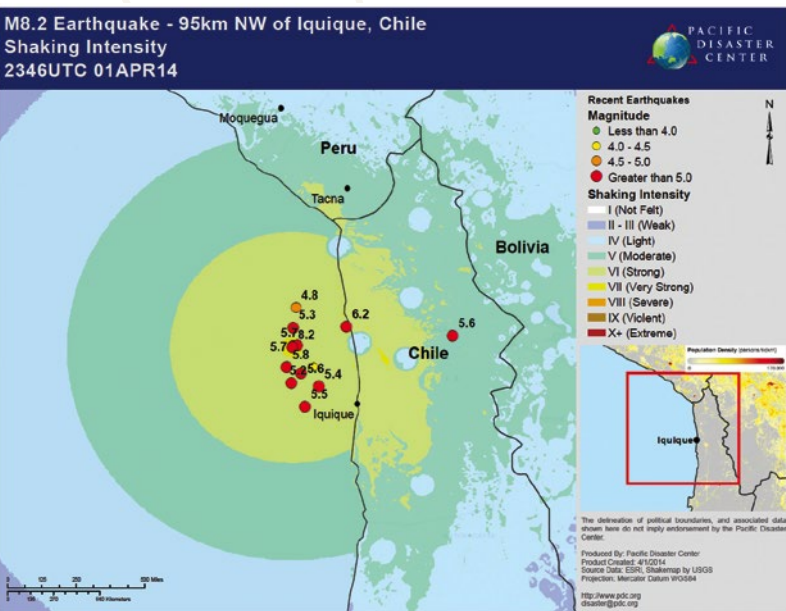

By accessing the DisasterAWARE platform, the Disaster Alert app provides users with real-time access to data on active hazards globally—showing events that are designated potentially hazardous to people, property, or assets.

international

International Cooperation Programs and Partnerships

ASEAN Disaster Monitoring and Response System (DMRS): Having the ability to monitor events, share information, and coordinate actions across borders is immeasurably valuable during a large disaster. With funding from USAID, PDC deployed the DMRS in 2013 at the ASEAN Humanitarian Assistance Coordination Centre (AHA Centre) in Jakarta, Indonesia. DMRS is based on PDC's DisasterAWARE platform and helps support transnational coordination among ASEAN's 10 Member States. This year, PDC was awarded additional projects to help enhance ASEAN's regional disaster risk reduction capabilities.

Various situational awareness products were developed throughout the year to support international hazard response, such as this map depicting shaking intensity and numerous aftershocks following a powerful 8.2 M earthquake.

Vietnam Flood Monitoring and Early Warning – Phase II: Maximizing the utility of an early warning and decision support system requires a thorough understanding of the system's existing capabilities. This year, as part of an ongoing USAID OFDA project, PDC completed data automation tasks and organized a "capstone" exercise at national and provincial levels to maximize the potential use and application of Vietnam's existing DisasterAWARE (VinAWARE) system.
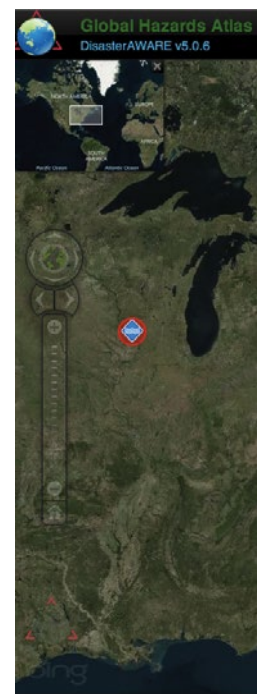
Early Warning, Decision Support, and Capacity Enhancement in Indonesia – InAWARE: In order to support the consolidation of hazard information from various national and international sources, as well as to facilitate information sharing within and between national and

provincial disaster management agencies, PDC collaborated with Indonesia's national disaster management agency (BNPB) in Jakarta to deploy an early warning and decision support system, called InAWARE, and helped draft a Concept of Operations (CONOPS) for the system, as part of a USAID OFDA-funded project.

Partner Nations and Civil-Military Communications

Emergency Operations Application (EMOPS): This PDC system is widely used, not only by a host of domestic agencies, but also internationally by United Nations (UN) agencies, national disaster management organizations (NDMOs), intergovernmental and nongovernmental organizations (I/NGOs), and other disaster management professionals around the world. During 2014, PDC continued to host this global DisasterAWARE application, and supported its operation, integration, and maintenance.

✳ impact: Enhance resilience by fostering international partnership and cooperation among regional, national, and local communities of action.
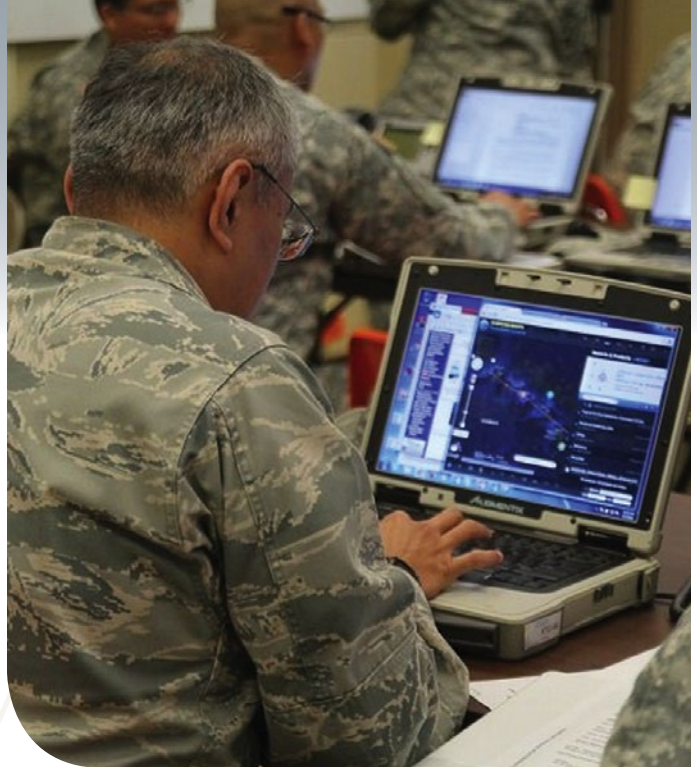
national

Comprehensive Support and Capacity Enhancements

PDC remains focused on scientific and technological advances that can enhance and promote evidence-based decision-making processes at home and abroad. We value the partnerships, collaborations, and information exchanges that provide complementary support to those involved in homeland security and disaster management.
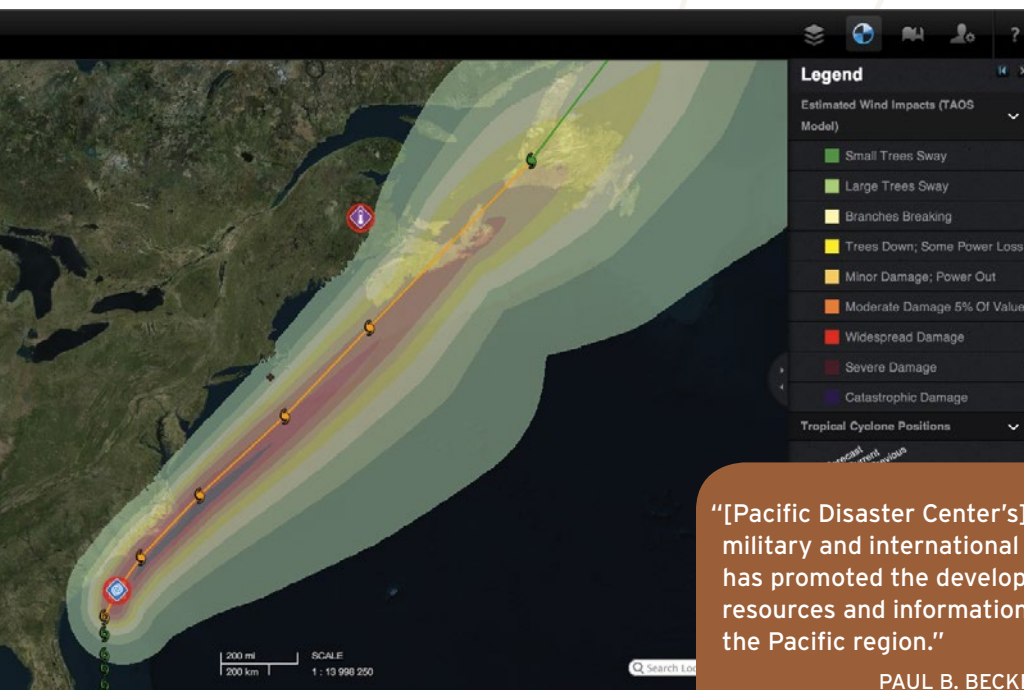
Analytical & Situational Awareness (SA) Products: Stakeholders involved in risk reduction activities, including response and recovery efforts, utilize PDC analytical and SA products in support of major domestic and international disaster events. To support such critical requirements, PDC personnel and partners, collect, generate, and disseminate a variety of products to assist stakeholders in preparedness, planning, response, and recovery. Over the year, these products were used by UN OCHA, PACOM, MARFORPAC, and a host of others.

Capability- and Data-augmentation: Decision makers are often required to assess a variety of options when considering the evaluation, placement, and prioritization of humanitarian assistance and disaster relief (HA/DR) projects. To support this complex process PDC has begun to develop a capability that supports systematic, traceable HA/DR resource-allocation cost/benefit analysis of various projects. Over the year, PDC partnered with the U.S. Army Corps of Engineers to leverage geospatially referenced, multi-scale, subnational data and a multi-criteria decision analysis framework.

Global Situational Awareness: In support of the Office of the Secretary of Defense (OSD) Global Situational Awareness Facility (GSAF), PDC continued providing on-site support through a dedicated, full-time senior geospatial analyst.

Security Cooperation Engagement: This year, PDC support was requested by NORTHCOM for a Disaster Management Knowledge Exchange with the National Emergency Management Agency (NEMA) and several affiliated organizations in The Bahamas. Additionally, PDC expanded engagement with AFRICOM, providing training on the use of DisasterAWARE for HA/DR activities, as well as support for ongoing geospatial data collection and mapping.

✳ impact: Institutional partnership provides an essential component in amplifying collective efforts for risk reduction.

Estimated tropical cyclone wind impacts for Hurricane Arthur as it tracked along the east coast of the U.S.

"[Pacific Disaster Center's] support of military, non-military and international HA/DR organizations has promoted the development of new information resources and information sharing opportunities in the Pacific region."
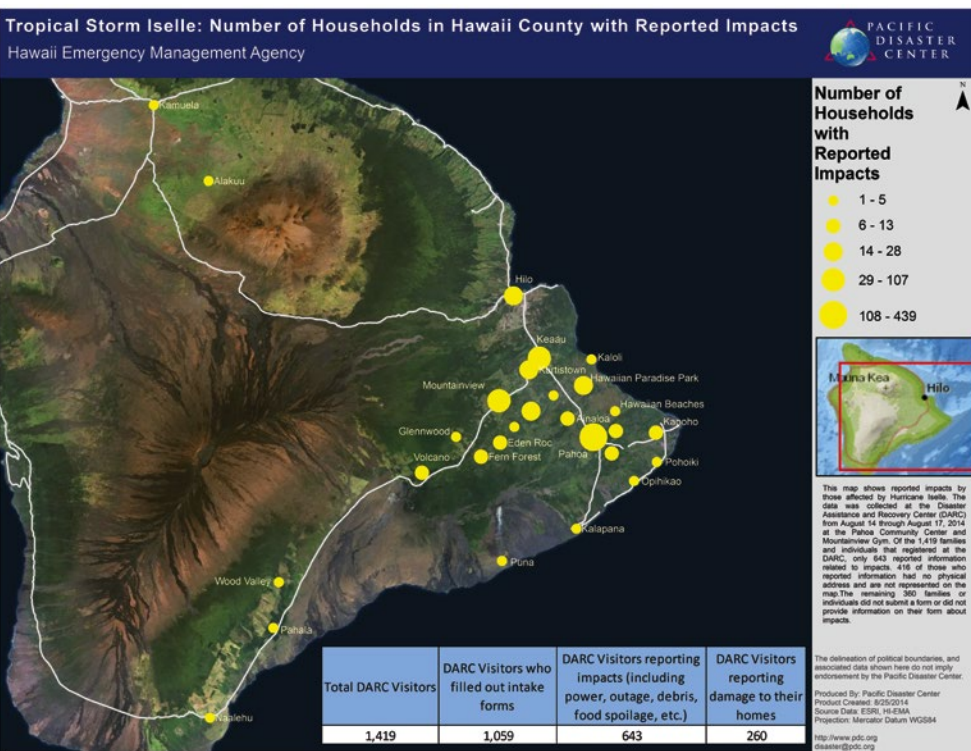
PAUL B. BECKER, REAR ADMIRAL, U.S. NAVY
DIRECTOR FOR INTELLIGENCE, USPACOM

pacific

Disaster Management in the Pacific

PDC's unique location in the Hawaiian Islands, placed in the middle of the hazard-prone Asia Pacific region, means our home state is susceptible to numerous potential disasters. This has prompted a strong commitment and dedication to serve the disaster management communities, both civil and military authorities, at home and throughout the region. In fact, the free but secured-access version of DisasterAWARE, EMOPS, remains a key resource utilized by Emergency Operations Centers (EOCs) throughout the region.

Hawaii Disaster Management Support: PDC provided DisasterAWARE training and support to civil and military authorities, such as Hawaii Emergency Management Agency (HI-EMA) and Hawaii National Guard (HING). PDC also

Reported Impacts from Tropical Cyclone Iselle, which was downgraded to a tropical storm shortly before the eye crossed over the Big Island of Hawaii.

actively participated in various interagency and multiagency homeland security and disaster risk management forums, including Hawaii Emergency Preparedness Executive Committee (HEPEC); Hawaii State Earthquake and Tsunami Advisory Committee (HETAC); and the regional Pacific Risk Management Ohana (PRiMO). Support was also provided to

the disaster management community through access to the early warning platform for disaster events, drills, and exercises.

Cyber-Traffic Monitoring (Cyber-I): As an unprecedented innovative use of DisasterAWARE's monitoring capabilities, PDC partnered with the State of Hawaii to develop a cyber-traffic/physical-asset monitoring platform. The system aims to detect and alert authorities to possible harmful cyber traffic to the state's computing and communication systems, and to present the information in an understandable and actionable form to executives and operators.

Pacific Academic Collaborations: PDC also collaborated with numerous university researchers within the Asia Pacific region involved in Disaster Risk Reduction, including Indonesia's Gadjah Mada (community-based landslide risk reduction), Asia Pacific Region Universities (conferences), Japan's Tohoku University (tsunami risk knowledge exchange), and of course, University of Hawaii (innovative research in hazard detection using extreme low frequencies), to name a few.

✳ impact: Partnerships with academics and practitioners helps reduce risks, at home and throughout the region.

select conferences and workshops

January – March

APDR3 Workshop: Education & Training (HAWAII)

Pacific Risk Management 'Ohana (PRiMO) Annual Meeting (HAWAII)

Philippine National Institutes of Health Workshop on Tropical Cyclone Haiyan Response (PHILIPPINES)

April – June

ASEAN Workshop on Development of Mechanisms for Acquisition/Utilization of Space-based Information (INDONESIA)

National Guard Bureau State Partnership Program Symposium and Workshop (FLORIDA)

NORTHCOM Joint Training and Education Academic Workshop (COLORADO)

Sixth Asian Ministerial Conference on Disaster Risk Reduction (THAILAND)

July – September

Second Annual APRU-IRIDeS Multi-Hazards Program Summer School (JAPAN)

ASEAN Regional Forum (ARF) Cross-Sectoral Security Cooperation Workshop on Bio-preparedness & Disaster Response (PHILIPPINES)

2014 Pacific Operational Science and Technology Conference (HAWAII)

DoD Peacekeeping Operations Technical Workshop: Enabling UN Peacekeeping (WASHINGTON DC)

FEMA (Senior Level) International Lessons Learned Workshop (WASHINGTON DC)

UN International Conference on Space-based Technologies for Disaster Management (CHINA)

University of SF Conference on Emerging Issues in Homeland Security and Disaster Response (SAN FRANCISCO)

October – December

National Emergency Management Association 2014 Emergency Management Policy & Leadership Forum (GEORGIA)

SOUTHCOM J9 Public Private Partnership Forum (FLORIDA)

World Wide Human Geography Data Working Group: "Data and Mapping for the Ebola Response" (REMOTE)

Capacity-building Seminar on Collaborative Approaches and Solutions to DM for Small Island Developing States (SINGAPORE)

2014 International Training Workshop at NCDR (TAIPEI)

Geospatially Enabling Community Collaboration (GECCo) Workshop (HANOI)

Canada-U.S. Enhanced Resiliency Experiment (CAUSE III) (WASHINGTON DC)

partners, clients, and funding organizations

Disaster Management and Humanitarian Assistance

All Partners Access Network (APAN)

American Red Cross (ARC)

Asia-Pacific Economic Cooperation (APEC)

Association of Southeast Asian Nations (ASEAN) Humanitarian Assistance Coordination Centre (AHA Centre)

Badan Nasional Penanggulangan Bencana–Indonesia (BNPB)

Federal Emergency Management Agency (FEMA)

Hawaii Emergency Management Agency (HI-EMA)

Hawaii National Guard (HING)

Joint Program Executive Office-Chemical and Biological Defense (JPEO-CBD) BioSurveillance Program (BSP)

National Emergency Management Agency (NEMA) of The Bahamas

National Science and Technology Center for Disaster Reduction–Taiwan (NCDR)

Pacific Risk Management Ohana (PRiMO)

R3ADY – Asia Pacific

South Pacific Applied Geoscience Commission (SOPAC)

State of Hawaii: Office of the Governor, county civil defense agencies, HEPEC, HSCD, DCCA

United Nations: UNOCHA, UN-SPIDER, and others

U.S. Agency for International Development (USAID): Office of Foreign Disaster Assistance (OFDA), U.S. Business Chamber of Commerce

U.S. Army Corps of Engineers (USACE): Institute for Water Resources (IWR), Pacific Ocean Division (POD)

U.S. Department of Defense: PACOM, NORTHCOM, SOUTHCOM, EUCOM, AFRICOM

U.S. Department of Homeland Security (DHS): U.S. Coast Guard

U.S. Department of State Humanitarian Information Unit (HIU)

U.S. Office of the Secretary of Defense Global Situational Awareness Facility (OSD GSAF)

U.S. Trade and Development Agency (USTDA)

Vietnam Ministry of Agriculture and Rural Development (MARD)

The World Bank (WB)

Research, Education, and Training

Armed Forces Health Surveillance Center (AFHSC)

Asia Pacific Center for Security Studies (APCSS)

Center for Excellence in Disaster Management and Humanitarian Assistance (COE DMHA)

Center for Strategic and International Studies (CSIS)

National Defense University (NDU)

National Telecommunications and Information Administration (NTIA)

Naval Postgraduate School (NPS)

University of Hawaii (UH)

Universitas of Gadjah Mada (UGM)

U.S. Forest Service (USFS)

Water Resource University of Vietnam (WRU)

Major Data Providers

Defense Threat Reduction Agency (DTRA)

National Aeronautics and Space Administration (NASA)

National Center for Medical Intelligence (NCMI)

National Geospatial-Intelligence Agency (NGA)

National Oceanic and Atmospheric Administration (NOAA): NWS, CSC, PSC

Pacific Tsunami Warning Center (PTWC)

U.S. Department of Veterans Affairs (VA)

U.S. Geological Survey (USGS)

Private Sector

Development Alternatives Inc. (DAI)

DHI

Environmental Systems Research Institute (Esri)

Hawaii Hotel and Visitor Industry Security Association (HHVISA)

Kinetic Analysis Corporation

Nathan Associates, Inc.

Oracle

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