Disaster Response Efforts Highlight Value of Relationships, Nontraditional Partners

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Photo courtesy of the Naval Postgraduate School

NGA, National Defense University, U.S. Geological Survey, State Department and U.S. Agency for International Development representatives piloted technical interoperability and data flow between lead federal agencies and the Volunteer Technical Community in an international and domestic disaster response, part of the August 2011 Research and Experimentation for Local and International Emergency First Responders — RELIEF — experimentation event at Camp Roberts, Calif.

The nation's response to the January 2010 earthquake in Haiti demonstrated the life-saving power of governmental, private-sector and nongovernmental organizations working hand-in-hand during disaster response. Thanks to an emerging group of organizations loosely called Volunteer Technical Communities (VTCs) — like the International Network of Crisis Mappers, OpenStreetMap, the Global Earth Observation Catastrophe Assessment Network (GEOCAN), Google Map Maker, Ushahidi and CrisisCommons, among others — relief workers and international aid coordinators had access to a wealth of geospatial information to help them manage the response.

The VTCs' response to Haiti expanded efforts by the National Geospatial-Intelligence Agency's crisis action team to provide situational awareness and complemented NGA's holistic approach to disaster response. The VTCs produced geospatial information products immediately useful to relief workers, allowing NGA's team to focus on deeper and more specialized analyses for environmental and critical infrastructure assessments and forecasting population movements.

John Crowley, a researcher with the Harvard Humanitarian Initiative and National Defense University's Transformative Innovation for Development and Emergency Support program, helped marshal resources following the Haiti earthquake and credits the Haiti response with a "complete transformation in how we use geospatial information for crisis response." Contrasting the Haiti effort with the response to the 2004 Indian Ocean tsunami, Crowley conveyed the frustration of relief workers in Aceh, Indonesia, who had difficulty determining where to find internally displaced people (IDP) without imagery depicting their camp fires and temporary structures. In Haiti, however, imagery was widely available under attribution-only licensing from commercial imagery providers GeoEye and DigitalGlobe. The open license on imagery had a secondary effect: OpenStreetMap was able to build a map of Haiti's critical roads, infrastructure and emerging IDP camps within about 2 1/2 weeks, with 640 mappers contributing over 1.4 million edits, reported Crowley.

NGA's Katie Baucom, a geospatial intelligence analyst supporting NGA's Integrated Work Group for Readiness, Response and Recovery (IWG-R3), predicted that the Haiti response will be a long-lasting highlight in public-private cooperation. "The reservoir of geospatial information produced by and for local and international communities changed from unknown to extraordinarily detailed features in the blink of an eye," Baucom said. VTCs captured indigenous knowledge about places and people, including names for roads, landmarks and community gathering spots, Baucom added. This volunteer-led digitization effort made it easier for relief workers to cross-reference geospatial information with text messaging alerts and social media reporting to identify areas and people in need of aid, said Baucom.

The Haiti earthquake response offers a number of positive lessons for government officials seeking to build trust and teaming relationships with non traditional partners. Crowley emphasized four elements in particular: building momentum for a broad-based and strategic public-private partnership independent of a crisis response; solidifying collegial relationships before a crisis response; creating a neutral space in which to test the mechanisms for collaboration; and defining roles to provide consistency and a common frame of reference to guide future endeavors.

Building Momentum

The Defense Advanced Research Projects Agency sponsored one of the early catalysts for connecting global communications technologies, geospatial information and disaster response, a project called Strong Angel. Originally to train Marines for humanitarian operations like they do for combat, Strong Angel experiments in 2000, 2004 and 2006 created a neutral space between academia, government, United Nations' agencies, nongovernmental organizations and the private sector. These events used real-world scenarios and DARPA-like challenges to drive rapid innovation of information-sharing technologies with special focus on the interoperability of geospatial tools. "Strong Angel paved the way for a more concentrated effort to produce, collect and disseminate open geospatial data," said Crowley. The National Science Foundation and the National Defense University were key partners, and private sector team members have included representatives of Google, ESRI, Microsoft and Cisco Systems to name just a few, said Crowley.

Solidifying Relationships

In late 2009 the International Conference of Crisis Mappers convened a public-private dialogue under the auspices of Harvard and Tufts Universities to delve more deeply into geospatial information technologies. Crisis Mappers is a self-organized network of individuals from the humanitarian, development, human rights, policy, technology and academic communities. The overarching purpose, said Crowley, was to understand and harness the potential of crowd sourcing, text messaging, human geography, remote sensing and other tools to provide the best possible geospatial data for disaster planning and crisis response. "The face-to-face relationships, the exchanging of contacts, the collective awareness of capabilities — the Crisis Mappers' network was what made the Haiti response unique," Crowley asserted.

When the earthquake struck Haiti, VTCs like Crisis Mappers knew exactly how they could help. As a World Bank Global Facility for Disaster Reduction and Recovery report summarized, VTCs collaborated across specialties. Volunteer experts in remote sensing exchanged the latest aerial and satellite imagery and committed thousands of hours of labor to process more than 9 terabytes of raw imagery. Cartographers and Web technologists used the imagery to build an OpenStreetMap workflow that generated vector, or line data, sending the results to the MapAction team in the U.N.'s On-Site Operations Coordination Centre. In addition to these new maps, Ushahidi and other text messaging-based platforms placed the locations of more than 30,000 reports from the affected population into a Haitian text messaging shortcode. Volunteers at Stanford University worked with 1,200 members of the Haitian diaspora to translate these reports (usually received via text message or Twitter) into English, generally within five minutes of posting. Other VTCs built on this initial work. With the World Bank's guidance, volunteers with GEOCAN employed remote sensing tools to produce damage assessments that captured the spatial scale and magnitude of the disaster.

Creating a Neutral Space

The power of the crowd created an expectation for future disaster response efforts and prompted NGA analysts to find a way to interact with the VTCs. Christina Higgins, NGA's Office of Geospatial Management team lead, confirmed OGM's role was to bring the right people together, with perspectives ground in operations, policy, law and humanitarian assistance and disaster response, to develop a model for collaboration. The technology solution was easier to evaluate than the legal and policy implications, Higgins said. "OGM led us through a paradigm shift toward open, shareable and accessible geospatial data, so that we could enable but not get in the way of the crowd," added Baucom.

OGM launched this change process at the October 2010 CrisisMappers conference at Harvard. "The OGM team started asking questions — what do we need to know? How do we partner? What roadblocks do we need to get through?" Crowley recalled. Three objectives framed the answer to these questions. First, the process needed to preserve the U.S. Agency for International Development's role as lead federal agency for foreign disaster assistance. Second, the process needed to be designed around "demand-pull" requests for baseline geospatial data from the VTCs. And third, the process needed to be transparent. Given what's at stake during a disaster response, the VTCs, National System for Geospatial Intelligence (the community of GEOINT partners including Department of Defense, intelligence community, civil, industry, academia and service providers), NGA and lead federal agencies needed a high level of confidence in each other and in the rules of the road for exchanging and using open source and commercial imagery and geospatial data. It was a problem ready-made for the type of experiments Strong Angel conducted.

Using the Strong Angel model, Crowley encouraged the VTCs and NGA to collaborate during a series of quarterly field experiments at Camp Roberts, Calif., in 2011 known as RELIEF (Research and Experimentation for Local and International Emergency First Responders). According to OGM's Dave Reed, lead staff officer in OGM responsible for examining the VTC concept, "RELIEF provided the neutral space we needed to look at the broad range of legal, policy and operational issues associated with interaction between the VTCs and that growing group of USG (U.S. government) agencies who are NSG mission partners and involved in disaster response."

Defining Roles for Consistency, Common Reference

The Camp Roberts RELIEF experiments produced a conceptual work flow for geospatial information, with the Department of State's Humanitarian Information Unit (HIU) in the role of facilitator. The HIU — an interagency unit housed in the Bureau of Intelligence and Research's Office of the Geographer and Global Issues — is developing a procedure to manage and prioritize VTC requests for baseline data. Working closely with the department's imagery center and NGA support team, members of the NSG maintain situational awareness on where and how to access open geospatial data

including crowd-sourced geospatial information and participatory mapping products.

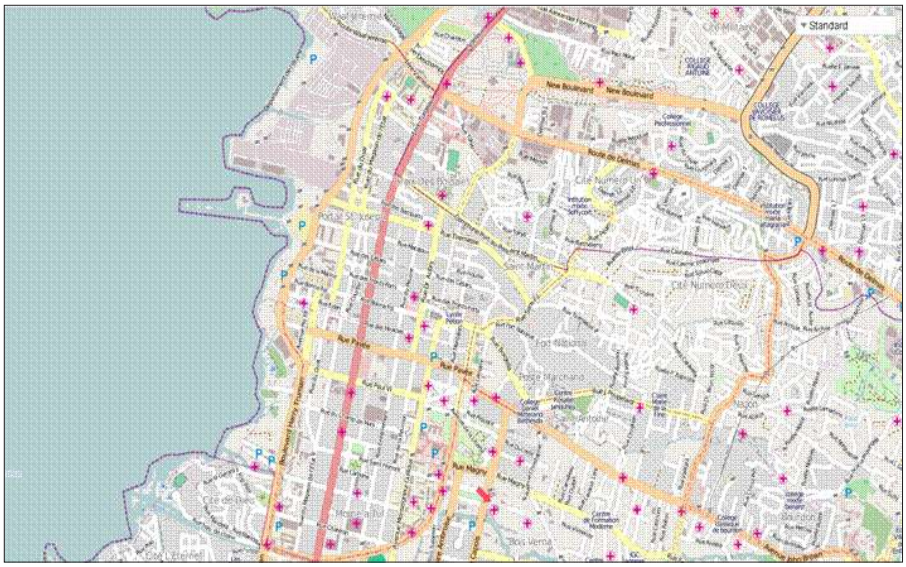
"The beauty of this collaboration," said Crowley, "is that the VTCs no longer have to rely on ad hoc personal networks to obtain imagery. The HIU is a 'go-to' group of geographers and analysts who provide an open interface with the U.S. government, and who are able to assess requests and release fresh imagery and vector data using a new and innovative workflow."

Benson Wilder, a humanitarian affairs analyst with the HIU, credits OGM and the Camp Roberts RELIEF experiments with "helping us develop a structure to fit the logic we've seen all along — the Volunteer Technical Communities have the ability to add detail that is meaningful to the disaster response community, and we should provide the best possible data as a basis for them to start from."

Sustaining Momentum

The long-term value of open geospatial data for disaster planning and response may be incalculable. As articulated by Wilder: "No clear lines exist between disaster response, recovery and long-term sustainable development — that is true for programs as well as the data used and created during their implementation. A development program might mitigate or prevent a disaster, and a well-executed disaster response can and should lead to more resilient communities." Open data remains the driving force for resiliency because "it enables a common baseline for decision making across organizations," explained Joshua Campbell, a geographic information system architect with the HIU. Returning to the VTCs' value added in producing geospatial information products infused with local knowledge of roads and infrastructure, Campbell commented that "this is how we get food to a certain spot, how we deliver vaccines more efficiently — open road and infrastructure data provides the foundation for a coordinated response by synchronizing planning and operations through the same lens."

Partnership building clearly demands a lot of patience. Baucom and her colleagues at the HIU look forward to stewarding the relationship with the VTCs in parallel with the stand-up of NGA's IWG-R3, which provides content, processing and application services to NGA's emergency preparedness, response and recovery mission partners. The constructs and relationships developed with the VTCs give the IWG-R3 a jump start toward mission success, with more rapid, dynamic and effective ways of accessing NGA's unclassified information. In turn, the increasing availability of high-quality open geospatial information means that during a crisis response, NGA analysts can dedicate more time to performing deeper and more predictive analyses for its mission partners.



This screen resolution graphic of Port Au Prince, Haiti, courtesy of OpenStreetMap, illustrates the detailed foundation data provided by Volunteer Technical Communities following the January 2010 earthquake, including Haiti's critical roads, infrastructure and emerging camps for those who were displaced from their homes.