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SPECIAL REPORT

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ABOUT THE REPORT

This report was commissioned by the United States Institute of Peace's Center of Innovation for Science, Technology, and Peacebuilding and Haiti Working Group. It examines the role of Ushahidi, a crisis-mapping platform, in the disaster relief effort following the 2010 earthquake in Haiti. Ushahidi provided the international community with access to actionable intelligence collected directly from the Haitian population via text messages and through social media sources, allowing responders to quickly and effectively target resources in the rapidly changing disaster environment. Jessica Heinzelman and Carol Waters are MA candidates at the Fletcher School of Law and Diplomacy at Tufts University. They are grateful to Patrick Meier, Jaroslav Valuch, and Nona Lambert for their comments.

Jessica Heinzelman and Carol Waters

Crowdsourcing Crisis Information in Disaster-Affected Haiti

Summary

- On January 12, 2010, a 7.0 magnitude earthquake struck Haiti. More than 230,000 people died, and some of Haiti's most populous areas suffered mass destruction. The international community responded immediately to launch extensive search and rescue missions and provide emergency assistance.
- The traditional disaster-response system employed by relief actors in Haiti concentrated on enabling information-sharing among teams of responders from the international community. This system lacked the ability to aggregate and prioritize data that came from outside sources, making it difficult to benefit from valuable information coming from the Haitian community.
- Ushahidi, an open-source crisis-mapping software first developed and used in Kenya, provided a way to capture, organize, and share critical information coming directly from Haitians. Information was gathered through social media (e.g., blogs, Twitter, and Facebook) and text messages sent via mobile phones.
- Reports about trapped persons, medical emergencies, and specific needs, such as food, water, and shelter, were received and plotted on maps that were updated in real time by an international group of volunteers.
- These reports, and associated geographic information, were available to anyone with an Internet connection. Responders on the ground soon began to use them in determining how, when, and where to direct resources.
- The most significant challenges arose in verifying and triaging the large volume of reports received. Ad hoc but sufficient solutions were found that involved the manual monitoring and sorting of information.

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- The Ushahidi–Haiti Project demonstrated the potential of crowdsourced maps for targeted disaster response, providing a useful foundational model for the international community to leverage and improve upon in advance of future emergencies.

On January 12, 2010, a 7.0 magnitude earthquake struck Haiti. The epicenter was just outside the town of Léogâne, approximately 16 miles west of the Haitian capital, Port-au-Prince. The resulting disaster was of incredible scale with mass destruction in Haiti's most populous areas. Eighty to ninety percent of buildings collapsed in Léogâne, along with thousands more in Port-au-Prince and its surrounding areas.¹ Crucial buildings and infrastructure were heavily damaged or destroyed, including Haiti's UN headquarters, the presidential palace, parliament building, and 28 of 29 government ministries. According to the Haitian government, more than 222,000 people died and 300,000 were injured.² Among those killed were the head of the UN peacekeeping mission in Haiti and 96 UN staff, 80 members of the Haitian police, and 31 local journalists.³

Almost immediately after the earthquake, the international community, including aid organizations, governments, and emergency response teams, arrived in Haiti to launch extensive search and rescue missions, set up hospitals, provide temporary housing, and restore vital infrastructure.

As international organizations worked to gain information about damage, needs, locations, and road and security conditions, Ushahidi—an open-source crisis-mapping platform that had been developed following Kenya's 2007–08 postelection violence and that draws on mobile phone communications and social media to map crowdsourced information about situations on the ground—came online in Haiti.⁴ This new source of intelligence pulled information from Twitter, Facebook, and blogs and received it via text message to create reports that were placed on a Web-based, interactive map available to anyone with an Internet connection. Within four days of the earthquake, some first-responder teams began to use the Ushahidi map and information stream.⁵ Secretary of State Hillary Clinton summarized the impact of crisis mapping in her "Internet Freedom" speech on January 21, 2010, saying, "The technology community has set up interactive maps to help us identify needs and target resources. . . . [O]n Monday, a seven-year-old girl and two women were pulled from the rubble of a collapsed supermarket by an American search-and-rescue team after they sent a text message calling for help."⁶ The response community echoed Clinton's praise of the power of this new technology. Craig Clarke, an open-source intelligence analyst in the U.S. Marine Corps, noted, "In this postmodern age, open-source intelligence outperforms traditional intel. . . . The notion of crisis mapping demonstrates the intense power of open-source intelligence. . . . [W]hen compared side by side, Ushahidi reporting and other open sources vastly outperformed 'traditional intel' [after the Haiti earthquake]."⁷

This report focuses primarily on the four-week period following the earthquake. First, it outlines the challenges of obtaining information from local sources and how this affected aid delivery. Second, it provides background on Ushahidi and an overview of its role during the emergency phase and in gathering information for decision making. Lastly, the report offers lessons for crisis mapping in disaster response and conflict management and recommendations for the future.

Traditional Information Gathering in Postearthquake Haiti

Effective decision making after a disaster rests on the ability to gather accurate information about the crisis environment and the needs of the affected population. In fact, "disaster is first of all seen as a crisis in communicating within a community—that is, as a difficulty for someone to get informed and to inform other people."⁸ This section discusses how the traditional emergency response system in Haiti struggled to utilize local knowledge and

engage the Haitian population in the decision-making process. It then explores one impact of this communication disconnect—a missed opportunity to gather hyper-local information to help verify conflicting security reports that directly affected aid delivery.

Challenges in Engaging Local Intelligence

On January 26, the United Nations canceled a relief drop in Léogâne “until it had established security.”⁹ One Léogâne community leader, Roland St. Fort, questioned this action: “I don't know what security they need to establish. There have been no riots here. The people have been very disciplined. They set up their own security around their outdoor camps.”¹⁰ The UN emergency response system in Haiti was not organized to integrate intelligence from community leaders such as St. Fort but rather was designed for collaboration and information sharing between international teams of responders. The population bombarded UN groups with phone calls, e-mails, and letters. Community leaders traveled to the UN Logistics Base in hopes of gaining access to decision makers. Yet the international response system was simply not structured in a way to utilize these inputs, creating a communication disconnect between Haitians and emergency response organizations.

Individual communications from Haitians were lost in the system. The traditional information-gathering approach used by the United Nations and relief organizations is focused on collecting intelligence through internal channels. In Haiti, the typical rapid-needs assessments were time demanding, especially for teams unfamiliar with the environment. The system lacked the ability to aggregate or prioritize information that came from outside sources, making it difficult to pull local intelligence into the process. Additionally, the mass of extraorganizational information was unwieldy. Organizations did not have the capacity to verify reports or develop networks of trusted sources and often faced challenges with language and translation.

Attempts by civil society leaders to provide information in person were also thwarted. Standard protocols prevented community leaders, who could have been valuable key informants, from entering the UN Logbase where local conditions were discussed and decisions made. To enter, individuals needed to be affiliated with international organizations and/or response “clusters,” or groupings of international organizations around a specific sector or service area, and carry an identification badge from organizations approved by the UN Office for the Coordination of Humanitarian Affairs (UNOCHA). Some local nongovernmental organizations (NGOs) were able to gain affiliation during a brief window immediately following the earthquake. This, however, was not well publicized, and few Haitians understood the cluster system and why gaining access would be important.¹¹ The official policy on accessing the UN Logbase for non-UN staff read, “Security at the entrance will grant you access to the Logbase if the name of your organization is on the list they have from OCHA.” The challenge for local Haitians was to get on the list. Without a preexisting affiliation, they could not enter the Logbase. This created a situation in which they could not enter without registering but could not register without entering. Jaroslav Valuch, Ushahidi's field representative in Haiti, noted, “You could see [civil society leaders] trying to access Logbase, but being unreasonably treated by the security forces. Those who were lucky and participated in NGO coordination meetings clearly expressed that they felt ‘like foreigners in their own country.’” Ruth Derilus, a Haitian organizer with the Haiti Response Coalition, confirmed Valuch's observations, commenting, “International aid groups compare notes and discuss strategies for distributing aid at ‘cluster meetings,’ from which ordinary Haitians are in effect banned. . . . Discrimination against Haitians in their own country seems more prevalent than ever since the earthquake.”¹²

The UN emergency response system in Haiti was not organized to integrate intelligence from community leaders . . . but rather was designed for collaboration and information sharing between international teams of responders.

Security: A Missed Opportunity for Local Information

As demonstrated by the example of Roland St. Fort and the canceled Léogâne food drop, local intelligence could have been especially helpful if harnessed to monitor security concerns that were delaying aid delivery. Sasha Kramer, an NGO worker who was based in the Cap-Haitien community before the earthquake, echoed the concern that security measures, compounded by a lack of community engagement were negatively affecting response efforts:

There's a lot of regions in Port-au-Prince that are considered red zones that [large aid organizations] are not able to go into without very high security restrictions. So when the large aid groups circulate around Port-au-Prince, they're often in sealed vehicles with their windows up, and what this means is that they're not able to develop good relationships with community leaders ... at this point, the Haitians on the ground who are ready to do something have no way to connect with the people down at the UN base who have all the materials to make a difference.¹³

Much of the confusion around security stemmed from journalists with the international media who were getting out into the communities faster than relief organizations, causing responders to play catch-up and scramble to determine the validity of often-exaggerated news.¹⁴

Edmond Mulet, head of the UN mission in Haiti, criticized the media during a press conference on January 19: "There have been some incidents [of violence], very isolated, and we cannot really generalize the situation here as it has been depicted by some media—and I would say, in a very irresponsible way—because it does not reflect the situation on the ground."¹⁵ The media's exaggerations were directly impacting the relief effort. Partners in Health, one of the largest medical providers in Haiti, commented on how the sensationalism affected their operations: "Our team on the ground reaffirms that the reports of violence on the streets of Port-au-Prince have been grossly exaggerated and have become a major obstacle to mounting the response needed to save tens of thousands of lives each day."¹⁶ Misrepresentations by the media caused delay in aid delivery as every conflicting report had to be verified before aid operations could commence, costing valuable time and creating frustration when aid was not delivered.

As frustration grew, delayed aid delivery became a source of violence itself. While the level of overall violence was low in the weeks following the quake, the conflict that did arise was often directly tied to a lack of or competition over aid. As Biosurveillance researchers working on the ground observed a month after the earthquake, "There has been lower overall violence compared to before the earthquake, [with] isolated incidents of social tension around food distribution points."¹⁷ Ironically, the lags caused by security verifications themselves created security issues.

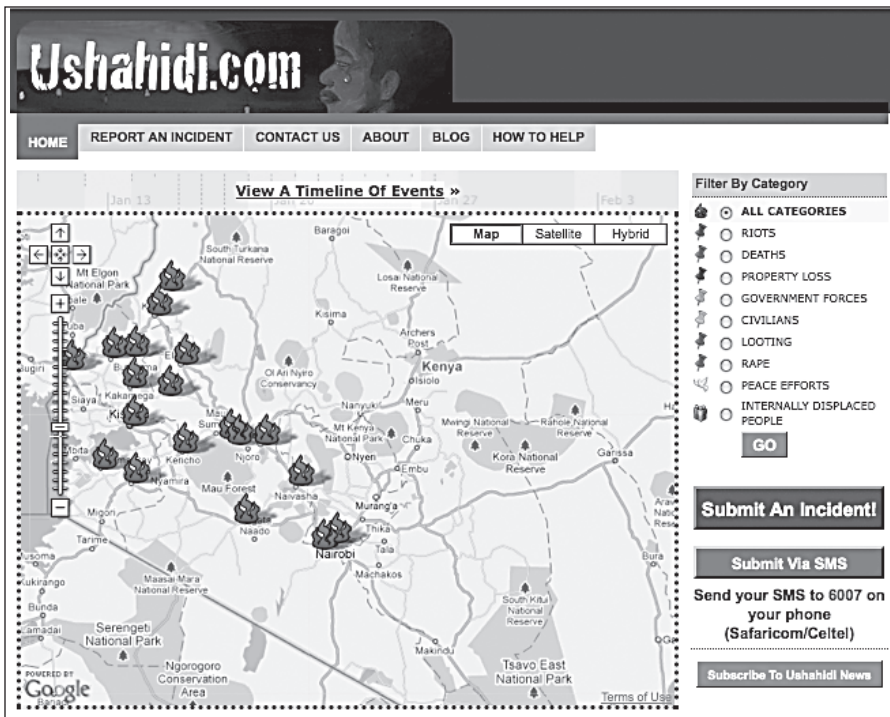
The inability of disaster response organizations to effectively utilize information coming from Haitian communities compromised the relief effort. Responders struggled to create an accurate picture of needs on the ground, and a lack of accurate local security information slowed emergency response costing lives and creating violence. The experience in Haiti illustrates a need for new methods of gathering information that can be employed when chaos and a failing infrastructure render traditional methods insufficient.

Ushahidi: From Kenya to Haiti

The History of Ushahidi

Ushahidi, meaning "testimony" in Swahili, was crafted in the wake of the 2007–08 Kenyan postelection violence by a network of volunteers and powered by a community of citizen reporters and bloggers. It was designed to (1) give everyday Kenyans a way to report incidents of violence that they saw using the tools they had (mobile phones), (2) archive news

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The original Ushahidi Web site launched during the 2007–08 violence.

Source: Ushahidi, Inc. "Ushahidi Legacy," <http://legacy.ushahidi.com>, July 27, 2010

and reports to create a historical record of the conflict, and (3) provide the Kenyan community with up-to-date information about the violence.¹⁸ The Ushahidi platform enabled Kenyan citizen journalists to upload information with detailed eyewitness reports, including geocoordinates and time stamps. This resulted in a detailed crowdsourced map of events on the ground as they unfolded and gave citizens a way to challenge the dominant media narrative, which was limited in key respects:

- Reports of violence were submitted to Ushahidi before the mainstream media reported them, providing early warning to Kenyans;
- Ushahidi's citizen reports covered a larger and more diverse geographic area than the mainstream media;
- Ushahidi reports were greater in number and included violent events not reported in the mainstream media or blogosphere.

Beyond Postelection Violence

After Ushahidi's initial deployment in Kenya, United for Africa approached Ushahidi's creators wanting to use the platform to monitor a wave of xenophobic attacks in South Africa. With this request, Ushahidi's founders recognized that the tool was needed in more than just the Kenyan context and formed Ushahidi, Inc., a registered nonprofit organization committed to develop more advanced versions of the open-source platform, which is now downloadable for free.²¹ As of June 2010, Ushahidi has been downloaded 3,746 times, and there have been 280 active deployments.

Today, Ushahidi is used by groups for various purposes, including tracking the depletion of medical supplies, reporting human rights violations, tracking wildlife, building networks of peace actors, empowering disenfranchised communities through citizen journalism, and more. Organizations are constantly innovating, using the platform in new ways.

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One of the more popular uses of the Ushahidi platform has been in monitoring elections. Deployment groups have ranged from volunteers who set up citizen-driven models that allow anyone to report—such as the Alive in Afghanistan deployment, Sudan Vote Monitor, and VoteReportPH in the Philippines—to organizations that strictly follow international standards for election observation, such as the International Foundation for Electoral System’s (IFES) collaborative project Amatoro mu Mahoro in Burundi. Amatoro mu Mahoro accepts reports only from 450 trusted and trained monitors but makes information available to the public almost instantly. These models are opening up democratic systems for participation and increasing transparency in the electoral process. The increased flow of information is a step forward in many countries, allowing citizens access to information that they can interpret for themselves rather than forcing them to rely only on information filtered through media and organizations. As Matthieu Valot, IFES deputy country director in Burundi, commented, “Our reports are much more interesting [with Ushahidi] because people can now compare the [reports on the] situation with the individual incidents.”²²

Increasingly, groups are investing greater time and resources into customizing the Ushahidi platform and utilizing many of its higher-level functionalities, such as multimedia integration and alert systems. The Niger Delta Watch deployment has added two layers to the platform—one that displays known locations of illegal gas flares and a second that overlays photographs of daily life to convey the negative impact that oil production is having on the Delta residents. Map Kibera in Nairobi, Kenya, has been working with residents of one of Africa’s largest slums to first map their community using basic GPS devices and to then use that map in combination with Ushahidi to create Voice of Kibera, a platform that promotes citizen journalism and community engagement and offers free subscriptions to weekly digests of reports through Ushahidi’s outgoing alert function. Unite Arizona applies Ushahidi in a developed-world context, providing a forum for Arizonans to anonymously report harassment, intimidation, and law-enforcement raids that followed the passage of Arizona Senate Bill 1070. Through a crowdsourced model, the Web site tracks and documents the expected negative impacts of the law and associated harassment through reports, photographs, and video. The SMS (short message service) and Internet-based nature of the system provides a confidential and discreet way for immigrants, who otherwise often fear detention, deportation, or retribution, to report offenses by law enforcement, hate groups, and individuals.

Ushahidi, Inc., continues to improve the platform and build new features to meet the needs of users. It tracks each download of the software to follow how organizations are using the tool in varied fields and sociopolitical contexts.

Ushahidi-Haiti: The Power of Open-Source Intelligence

The Ushahidi-Haiti Deployment

Ushahidi was deployed in the first two hours following the January 12 earthquake by Ushahidi, Inc.’s director of crisis mapping and strategic partnerships, Patrick Meier: “I just couldn’t sit there and do nothing, so I reached out to Ushahidi’s lead developer, David Kobia, and we went live with the Ushahidi-Haiti map.” With technical support from Ushahidi staff, Meier quickly realized that his small team at Ushahidi did not have the capacity to continue mapping the vast amount of information being reported about Haiti. He put out a call for volunteers at the Fletcher School of Law and Diplomacy at Tufts University to continue mapping the crisis live.

Initially working from Meier’s living room, the all-volunteer crisis-mapping team combed through both social media sources, including Twitter, Facebook, and blogs, and traditional



The Fletcher Crisis Mappers at work in Boston. Photo courtesy of Carol Waters.

media sources to identify actionable pieces of information that could be of use for responders on the ground. If a piece of information was deemed useful and had a location attached to it, volunteers would find the GPS coordinates through Google Earth and OpenStreetMap and map it on haiti.usahidi.com for anyone to view and utilize. Through the aggregation of individual reports, the crisis mappers were able to identify clusters of incidents and urgent needs, helping responders target their response efforts.

The Ushahidi deployment was also publicized throughout social networks, including the Crisis Mappers Group; people were encouraged to submit reports via e-mail or through a form on the Ushahidi Web site. Many people posted information that they had received by phone from relatives in Haiti. By January 16, through a collaborative effort between the volunteer team at Fletcher, FrontlineSMS, the U.S. State Department, and Digicel, a system was set up that allowed people in Haiti to submit alerts directly through text message (SMS) using their mobile phones. Reports could be sent for free to the number 4636.

Approximately 85 percent of Haitian households had access to mobile phones at the time of the earthquake, and although 70 percent of the cell phone towers in Port-au-Prince had been destroyed in the disaster, they were quickly repaired and mostly back online before the 4636 number was operational.²³ Mobile phones were the most direct means of communication for Haitians during the crisis and emerged as “a lifeline for many survivors.”²⁴ Without electricity, people in Haiti managed to keep lines of communication open by recharging their phone batteries on gasoline generators.²⁵

The 4636 project opened indirect communication lines between Haitians and disaster responders by enabling the volunteer team from Fletcher to gather information from the disaster-affected population, which was then used to publicly visualize the situation on the ground as well as direct relief. The 4636 number was first announced on Twitter by Josh Nesbit of FrontlineSMS and then publicized via nontechnical means, such as through posters, word of mouth, and local radio broadcasts.²⁶ Haitians began to send in their messages about their location and needs in Creole, the most widely spoken language in Haiti.

To prepare for what became a flood of text messages coming in at a rate of 1,000 to 2,000 per day, Rob Munro at Stanford University worked with Ushahidi’s Brian Herbert to set up Mission4636. They built an Internet-based system that enabled over 1,000 Haitian volunteers in the United States and Canada to remotely translate and assign preliminary geolocation coordinates to incoming messages.²⁷ “The average turnaround for us receiving a message and having a geo-coordinated and translated report to teams on the ground is about 10 minutes,” Rob Munro told *Wired* magazine.²⁸ In addition to handling incoming messages, “The Diaspora were in constant contact with their own friends and relatives in

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Haiti, and were using this to update the maps and share information,” said Munro. “Collaborating with each other, they were collating the maps of food & aid stations and adding them to the Ushahidi/OpenSource maps. They were undertaking services like directing people within Haiti to the nearest aid points, and passing on instructions about, for example, obtaining food vouchers, fuel, places to recharge phones, etc.”²⁹

As messages were translated and tagged with preliminary coordinates by the diaspora, they were sent through the Internet to the Ushahidi-Haiti platform. There they were reviewed, clarified, and approved by more than 100 student volunteers who had participated in impromptu trainings. Urgent reports were often flagged by 4636 volunteers and triaged to a small team of volunteers at the Fletcher School who had a direct line of communication to the U.S. Coast Guard. When emergency-level messages were unclear or lacked detailed geographic information, the team at Fletcher followed up with the person submitting the report via the “send reply” function in Ushahidi. For example, in one instance volunteers used the feature to determine if “Universite Wyal” was the same as “Royal University” so the report could be accurately mapped.

Unfortunately, volunteer teams did not have the capacity to clarify or verify all reports, but the feature allowed for two-way communication with some of the most gravely affected individuals.

Accurately mapping reports in near-real time was one of the greatest challenges of the 4636 project, not least because of the scarcity of detailed maps of preearthquake Haiti. Even so, a precise picture of postearthquake Haiti was critical for the response community. Anticipating the need, a worldwide team of volunteers coalesced around Open Street Map (OSM), the “Wikipedia” of maps, which allows anyone to edit a world map. Immediately after the quake, veteran OSM volunteers began building the most complete map possible for the affected areas using any sources of information they could find. Volunteers first traced older Yahoo! maps and then traced satellite imagery declassified by the government and donated by DigitalGlobe, a for-profit satellite imagery provider. As additional information became available, they integrated postquake satellite imagery donated by GeoEye, another for-profit imagery provider, and the World Bank.³⁰ Within a week, many emergency response organizations were using OSM, including the team at Fletcher who switched the Ushahidi-Haiti map from Google Maps to OSM.

It is notable that the majority of the mapping, translating, and processing work for the Ushahidi platform was done purely by volunteers. In the spirit of the Ushahidi platform itself, the very large and daunting task of aggregating thousands of reports was manageable only because the body of work was crowdsourced to a dedicated international network of volunteers. During the emergency phase, Ushahidi-Haiti operations required almost no financial resources. Ushahidi, Inc. provided server space to host the Web site and the “situation room,” after operating for a few days in Patrick Meier’s apartment, moved to donated space in the Fletcher School’s basement.

When funds came in to support Ushahidi-Haiti effort, including a grant from the United States Institute of Peace, money was directed toward improving the platform. Starting February 2, the Ushahidi-Haiti deployment team at Fletcher sent representatives to Haiti to gather feedback on the crisis-mapping process as it transitioned from the emergency phase to thinking about its potential roles in reconstruction. The representatives talked to international and local organizations about how they would ideally use the platform, built partnerships on the ground, assessed the opportunities for use moving forward, and worked to identify a local sustainable partner that the deployment team could transfer the project to. Overall, approximately \$97,000 was donated to the Fletcher team by various sources, most of which was spent on the ground in Haiti working toward understanding how to improve and effectively implement crisis-mapping platforms in a postdisaster setting.

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Expenses included a formal independent evaluation of the project, the report for which is expected to be completed in fall 2010.

The Ushahidi-Haiti Reports

4636 project volunteers translated 25,186 SMS messages and numerous e-mail, Web, and social media communications, resulting in 3,596 reports that were actionable and included enough relevant information to be mapped on Ushahidi.³¹

The majority of reports received included requests for what were being categorized as “vital lines”—food, water, and shelter. During the first week, the next most common reports were of services available, such as locations of field hospitals and distribution points, and of emergencies, such as reports of trapped persons and urgent medical needs. These tailed off as the growth of new services slowed and the situation on the ground stabilized.

The greatest number of reports were received on January 23, and dropped off almost immediately after. Further research is needed to fully understand what caused the sharp decline in reports, but there were a number of events at this time that likely contributed. First, on January 22 the United Nations announced the end of the emergency period, and the Haitian government officially called off search and rescue missions on January 23. Second, with the end of the emergency period, the 4636 short code stopped being publicized. This decision was made because, as many of the responders who were most actively using Ushahidi’s information stream prepared to leave Haiti, the capacity to act upon reports had declined. Lastly, 4636 started being used by some partners to send out general information about blood drives, health concerns, and other public service announcements. This combination of events may have caused confusion among the population about the purpose of the 4636 system and its continued ability to provide assistance. Nonetheless, reports continued to trickle in until April when Digicel began using the 4636 short code for purposes unrelated to disaster response.

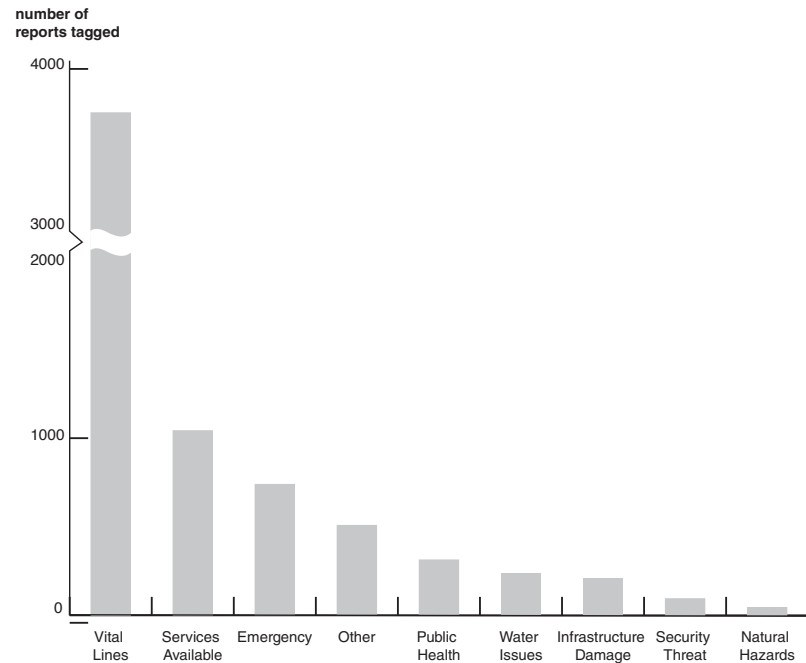
From Reports to Response

As Ushahidi collected reports, the resulting information feed was being used by organizations such as the U.S. Federal Emergency Management Agency (FEMA), UNOCHA, the U.S. Agency for International Development, Marine Corps, and the U.S. military and Coast Guard to direct assistance. Craig Fugate of the FEMA Task Force expressed his gratitude for the information in a “tweet”: “The crisis map of Haiti represents the most comprehensive and up-to-date map available to the humanitarian community.” Unlike the phone calls, letters, e-mails, and visits from Haitians directed to the United Nations that individually failed to affect the response community’s decision-making process, Ushahidi managed to organize communication in a way that allowed its integration into the process by providing organizations with the technical ability to automatically pull the stream of reports into their response systems. “The beauty of what Ushahidi . . . does,” noted the coordinator for Communicating with Disaster Affected Communities in Haiti (CDAC-Haiti), Jacobo Quintanilla, “is that it opens the gates of information to anyone interested, allows citizens in crisis to seek help and helps to foster dialogue between affected communities and services providers.”³²

Security Reports: A New Source of Information?

Only 54 of 3,596 reports (or 1.5 percent) were tagged with categories related to violence or security. This relatively small number of reports is in line with claims by the emergency response community that the international media was sensationalizing isolated occurrences of violence. Unfortunately, reports mapped on the Ushahidi platform could not provide proof

Ushahidi-Haiti Reports by Category



Source: Ushahidi, Inc., number of times reports were tagged, <http://haiti.ushahidi.com/reports>

of conditions on the ground without a method of verification and a way of assessing what was not being reported. Therefore, the absence of reports on violence could not necessarily be interpreted as a lack of actual violence.

Despite the lack of internal verification, some organizations used Ushahidi to cross-check reports from other sources.³⁴ More than 25 percent of security reports included a reference to food or aid supplies, confirming what aid workers were observing—hunger, thirst, and lack of aid were at the heart of much of the violence that was taking place. For example, on January 17, the U.S. Marine Corps responded to an Ushahidi report that read, “Residents angry that they have not received aid have been reported to be building roadblocks between Carrefour and Port-au-Prince.”³⁵

Five days later, on February 2, they responded again to a similar yet more urgent message reading: “Angry mobs are moving up route national no. 2 from the district of Merger. They have set up road blockades and are threatening to move up the road towards Port-au-Prince. They are angry because they have not received any food aid. They are also threatening to escalate violence.”³⁶ In both cases the crowds were dispersed before violence broke.

Ushahidi security reports provided not only information on individual incidents but also insight on the contextual factors that were triggering violence. Had the 4636 system continued to collect information at meaningful levels past the first few weeks, analysis of incoming data may have been able to better predict outbreaks of aid-related violence as well as track and identify early warning signs of conflict.

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Crisis Mapping in Haiti’s Reconstruction

There remain many unanswered questions about the potential of Ushahidi in disaster response. However, one certainty is that the deployment of Ushahidi after Haiti’s earthquake has fundamentally changed the field of disaster response by introducing new mapping and aggregating tools to traditional methods of communication and information gathering. The deployment of the Ushahidi platform has also stimulated an environment of technological innovation among international organizations in Haiti. International organizations, local

NGOs, and civil society have seen the potential power of SMS and crisis mapping, which has led to a greater willingness by organizations to participate in projects that incorporate new tools less familiar to development and humanitarian actors.³⁷ Now that Haiti is in the reconstruction period, crisis mapping is being used in two projects—Noula.ht and Ayiti SMS SOS. The first project is spearheaded by Solutions, a Haitian software company, that has built its own crisis mapping platform and is in the process of building the capacity to respond to requests through partnerships with UNOCHA, IOM, the United Nations Stabilization Mission in Haiti (MINUSTAH), the Haitian government, and local responders. The second project uses Ushahidi as a human-rights observatory tool and focuses on child protection issues, gender-based violence, and human trafficking. Both will continue to provide insight into the potential and limitations of crisis mapping.

Lessons Learned

The launch of the Ushahidi platform in Haiti demonstrated the potential for using mobile technology for information gathering and communication in disasters, but its application there is just the beginning. As Ushahidi co-founder Ory Okolloh says, “Ushahidi is only 10 percent of [the] solution.”³⁸ This section outlines how NGOs, international organizations, governments, and civil society groups can strategically integrate these new technologies into standard emergency preparedness and disaster response practices, building upon lessons learned in Haiti.

Crowdsourced maps enable targeted disaster response in a rapidly changing environment. Disasters have the ability to significantly affect the local geography, making existing maps outdated in an instant. Roads are blocked, IDP (internally displaced person) camps emerge, and landmarks are destroyed. The collaborative model used by OSM enabled individual volunteers, mapping experts, and international actors to update the map of Haiti rapidly and accurately to assist responders on the ground. The key was pulling as many sources and partners into the mapping process as possible. Organizations such as the World Bank, GeoEye, and the U.S. government were critical in providing base geographic information far superior to the Yahoo! maps that OSM originally imported. Volunteers provided the staffing power, rapidly integrating information at a rate that got a highly accurate map out to the response community as quickly as possible.

Integration with Ushahidi took the utility of the OSM map one step further by also identifying specific actionable needs by location, a map layer that was new to the emergency responders. Locating reports on the map was much easier because of the new map’s high level of detail. Reports on IDP camps or hospitals that had been set up after the earthquake were mappable with OSM. There is still room for improvement, however, in helping populations convey location information within an SMS message. Often location information that came through lacked the specificity to be mapped with the required precision.

Verifying crowdsourced information is challenging. As evidenced in Haiti, verifying the accuracy of information is critical for decision making in disaster response. Of the more than 3,500 messages published on the Ushahidi-Haiti crisis map, only 202 messages were tagged as “verified,” mostly from early Web submissions that had been based on media reports. Without the time or ability to check the accuracy of incoming reports, the 4636 team hoped that time lost responding to inaccurate reports would be outweighed by the overall net benefit of the system. However, in order for crowdsourced reports to be permanently integrated as legitimate and actionable sources of information, a system must be created to rapidly identify inaccurate information, whether intentional, exaggerated, or accidental.

There are currently two types of solutions to address this issue. First, many Ushahidi deployments, particularly those monitoring elections, are creating networks of trusted

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reporters. In some cases, reports are accepted only from approved participants (an approach called “bounded crowdsourcing”), while in other cases, hybrid models that also allow the general population to report are used. Reports are automatically verified if received from a trusted source, while crowdsourced reports are verified if they match those of others from within the network. By setting up systems that train civil society groups to report accurate information, a hybrid model could be used in both disaster preparedness and violence prevention campaigns. Using diverse networks can also help triangulate data and reduce the likelihood that groups exaggerate their local needs. A complementary system, Swift River, is being developed by Ushahidi to help filter and validate crowdsourced information. Swift River is a tool that organizes incoming reports on a platform where users rate the accuracy of information. Specific report sources are tracked through unique IDs (phone numbers or e-mail addresses) and thus can be ranked according to their record of veracity. The ranking system can be opened to the public or limited to a select group who maintain control over how veracity is judged. When paired with trusted networks of reporters, Swift River may be particularly effective for verification efforts.

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Triaging crowdsourced reports can help prioritize and direct information. If crisis mapping is to be used as an effective tool in large-scale emergencies, it is critical that systems be developed to triage reports by urgency and category and that those reports are forwarded to the appropriate actors. Possible models for triaging include the use of a combination of keywords, natural-language processing and algorithms, and the participation of volunteers to manually monitor and sort inbound messages. The latter happened to a degree during the Haiti deployment, as translators and Fletcher volunteers often flagged urgent medical needs that were sent directly to a student volunteer in Boston who was in direct communication with the U.S. Marines. For less urgent reports, categories served as a means of organizing messages. But as the Haiti deployment demonstrates, the creation of a universal triage policy built on organizational needs would be a more effective system than subjective flagging.

Ushahidi also has a “get alerts” function that was not active in the Haiti deployment. This function allows individuals or organizations to automatically receive reports via e-mail or SMS within a certain geographic area. The Ushahidi-Haiti development team started to customize the alerts feature to generate alerts based on category as well as geography. This feature is now being built into the Noula.ht system in Haiti to provide hurricane responders with reports based on location, category of need, and demographic information. It is hoped that this type of targeted information flow could be useful in future disasters to deliver information directly to responders in the field as well as to increase the flow of communication within the affected community.

Accurate security information is vital for emergency response. Conflicting reports of violence and the absence of a definitive source on the security situation slowed disaster response. In order to prevent this from recurring in the future, emergency responders must think about how crowdsourcing might be leveraged to gather reliable data. The Ushahidi platform deployed by the Fletcher team had the potential to provide hyperlocal information on the security situation through the population but did not capture enough reports with specific information to draw reliable conclusions to impact decision making. Part of the reason for this was that the 4636 system was set up to be a collection of information rather than a two-way information collection model. The SMS messages that were sent out to the Haitian population provided information about good hygiene practices or advertised blood drives. It was not used to pose specific questions to the crowd. There may have been a missed opportunity here to harness the eyes and ears of the Haitian population to get answers about specific security questions. Had thousands of messages come back with reports echoing Léogâne’s community leader Roland St. Fort’s comments to the local media

that the environment was calm and Haitians were self-policing, organizations may have felt confident enough to act even without expert intelligence.

Privacy and trust may play a role in what people are willing to report. It is impossible to tell if the number of security-related reports on Ushahidi accurately reflected what was happening on the ground or if it was under- or overreported as a category, but it is known, as other sources have confirmed, that violence was relatively low during the period for which 4636 received the most data. As the violence has increased in Haiti, however, and reports have been received through Noula.ht and Ayiti SMS SOS, it has become clear that the ability of users to communicate confidentially and that a general sense of trust in the system may be important for accurate reporting and participation in the system. For example, Noula.ht received only 77 “Protection & Sécurité” reports out of more than 12,286 reports received between February and August 2010.³⁹ Ayiti SMS SOS, which collects only security-related information, received only 100 reports between March and July from a project population of 147,000 people.⁴⁰ Ayiti SMS SOS co-founder Aashika Domadar has said that she believes that instilling trust in a confidential SMS reporting system is key to getting people to report violence. She noted that many of the Haitians who have attended the project’s training programs initially expressed concern about the system: “If we report, they will retaliate.”⁴¹ Ayiti’s approach has been to walk participants through an introduction to the SMS reporting system in which they see the computer where the reports come in and are introduced to the staff that receive, respond to, and follow up on messages. The trust is then passed on through a publicity scheme that relies on social networks and word of mouth. This has slowed Ayiti’s ability to expand quickly, but Amodar believes it is a critical component to overcoming fears related to reporting violence via SMS.

Analysis of reports can help identify early warning signs of conflict. Analysis of crowdsourced data may help identify and track early warning signs of conflict during disasters by collecting information on issues correlated with violence, such as food and water shortages. This analysis should be done as messages come in to better anticipate changes in the security situation and direct resources to minimize the risk of violence. Additionally, “sentiment analysis,” a method using written language collected from a population to gauge the overarching emotional state, might serve to help assess conflict potential. For example, all of the SMS data collected through 4636 was sent in March to the European Council’s Joint Research Center (JRC) for analysis. The center identified approximately 100 words and frequently used word combinations that were categorized as either positive or negative and cross-referenced them with the data to conduct a sentiment analysis.⁴²

The results uncovered some interesting correlations between events experienced by the entire population and the general sentiment of the population. First, the lowest point on the graph, January 21, correlates with a major aftershock felt in Haiti. As Meier reveals in his analysis, “there are subsequent reports of trauma, food/water shortages, casualties, need for medication, etc., which drive the sentiment analysis scores down.”⁴³ The corollary observation is that the positive peak, January 30, coincided with two positive events: (1) news coverage accessible to the Haitian population reported that Haitian leaders “pointed to progress” and (2) the World Food Program launched an aid initiative that was expected to feed two million people.⁴⁴ Interestingly, the Ushahidi platform did not receive any reports of violence from January 29 to January 31. Through sentiment analysis, large numbers of SMS messages not only can provide specific reports that serve as indicators of the potential onset of conflict but also have the potential to track changes in emotion at a societal level. This assessment can serve as an additional early warning sign of conflict to help assess the security situation.

Crowdsourced information needs to be presented appropriately to maximize use by responders. Responders have different information needs depending on their area of work, and

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thus different strategies are required in different circumstances to maximize the usefulness of information. For example, emergency responders need to receive reports of discrete incidents in real time by phone or text message, while responders providing services such as food or shelter need more aggregated information provided less frequently. After the emergency response phase ended, field representatives from Ushahidi went to Haiti to begin consulting with international and community-based responders to find out how to best present crowdsourced information to fill knowledge gaps outside formal assessments. This initial phase of feedback collection was, in part, funded by the United States Institute of Peace grant that also enabled representatives of the Fletcher deployment team to participate in domestic debriefing sessions about the emergency response in Haiti. The findings of these consultations have led, in an immediate sense, to a much more sophisticated system of categories and reports that is being built into the Noula.ht system. By using a call center instead of SMS messages, Noula.ht is able to collect much more specific information through a script that includes follow-up questions to monitor specific indicators that humanitarian actors are interested in following. The format of reports is being determined based on input from the responders themselves so that the reports can be easily integrated into their workflow. Because these modifications have been made in cooperation with international organizations that will be responding to future crises, it is hoped that this type of collaborative design will lead to the institutionalization of crowdsourced information in emergency response.

Recommendations

- The Ushahidi–Haiti Project demonstrated the potential of crowdsourced maps for targeted disaster response, providing a useful foundational model for the international community to leverage and improve upon in advance of future emergencies. The following recommendations highlight several targets of opportunity. Disaster response professionals must work with the crisis-mapping community to develop standardized practices for data collection, categorization, and dissemination that meet the needs of field operators.
- Crisis-mapping deployments should leverage local knowledge and response capacity by working with in-country community-based organizations as both providers and consumers of crowdsourced data.
- Disaster preparedness programs and emergency disaster response organizations should integrate mobile-phone enabled crowdsourcing into information-gathering and communication systems and proactively build trusted networks of verified reporters in the case of emergency.
- Collaboration on the creation of accurate maps does not need to wait until disaster strikes. Governments, international organizations, NGOs, and mapping enthusiasts should combine efforts to consolidate information within OSM, to keep geographic information current, and to lay the foundation for key disaster-related services that will be useful in case of emergency.
- Analytic tools should be developed and integrated into crisis-mapping platforms to automatically identify and detect early warning signs of conflict.
- Additional research needs to be conducted to understand how best to communicate mobile-reporting instructions to populations. Effective messaging will include information on how to submit information that is actionable and locatable as well as instill confidence in individuals that reports of sensitive issues will be kept confidential.

Notes

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