

Field Investigation on the Comparative Performance of Alternative Humanitarian Logistic Structures after the Port au Prince Earthquake: Preliminary Findings and Suggestions

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March 2, 2011 version

1. Chief Findings of Field Research after the Port-au-Prince Earthquake

Days after the January 12th, 2010 earthquake, a combined team of the Center for Infrastructure, Transportation, and the Environment, and the Disaster Research Center at the University of Delaware arrived to Haiti to conduct interviews with the individuals involved in the humanitarian response. In total, more than ten trips were made to Haiti, Dominican Republic, and other centers of the Haitian diaspora such as Miami. A total of about informal 100 interviews were conducted with the staff of international, Haitian, and Dominican agencies. This research has been funded by the National Science Foundation's projects: NSF-HSD/DRU 0624083: "Contending with Materiel Convergence" and NSF-RAPID 1034365: "Field Investigation on the Comparative Performance of Alternative Humanitarian Logistic Structures." The support of the National Science Foundation is acknowledged and appreciated.

The field work conducted clearly revealed the existence of two radically different humanitarian logistic operational models: (1) agency-centric efforts (ACEs); and (2) collaborative aid networks (CANs). The former refers to distribution efforts in which a relief agency attempted to conduct the entire chain of humanitarian logistic functions (ranging from the transportation of critical supplies to the disaster site, to the distribution of aid to the victims); while the latter designates the efforts of large networks of individuals—that already had in place large, operationally active, and well functioning human/logistic networks at the time of the disaster—and decided to extend their mission to humanitarian logistics.

Although in both cases, ACEs and CANs extended their work (the ACEs to local distribution of relief aid, and the CANs to humanitarian logistics) the nature of their extension was radically different. In the case of the CANs, extending their work to humanitarian logistics only entailed assigning an additional task to the existing network. In contrast, the ACEs had to create the human/logistic network to distribute the aid, gather the necessary manpower and equipment, and integrate the operations of the newly assembled network. The evidence shows that this was an insurmountable obstacle for the ACEs to overcome. Not surprisingly, the ACEs had an extremely hard time creating the networks, gathering the necessary resources (e.g., appropriate manpower, and particularly trucks), and delivering the aid. In contrast, the CANs distributed substantial amounts of aid with great efficiency, and without a single incident of theft or aggression on the part of the locals, or any of the problems that plagued the ACEs.

The chief conclusion is that the Haiti earthquake will go down in history as a watershed moment in humanitarian logistics as it highlighted the limitations of ACEs to respond to large urban disasters in which the local leadership has been impacted. The fundamental implication is that the best way to distribute humanitarian aid, in the context of a large urban disaster, is for the ACEs to focus on the transportation of the large flows of aid to the disaster site; and then articulate their efforts with the local CANs to distribute the aid among the victims. It is important to highlight that expanding the concept to other areas such as community development, risk reduction, disaster preparedness, risk management, first aid, and the like could have a transformative effect in increasing community resiliency after disasters. The rationale for this conclusion is presented next.

Agency-Centric Efforts (ACE)

The problems faced by the ACEs were widely reported in the international press (New York Times, 2010a; 2010b). At the height of the crisis, international aid groups reported not being able to find enough trucks to distribute the aid, to the point that “...equipment for distributing supplies...” were designated as the top third priority for airplane landings at the Port au Prince airport almost a week after the event (behind water, and water purification equipment, and before medical supplies) (New York Times, 2010b). Reports that people without food coupons were attempting to gain forced access to distribution sites (BBC News, 2010) which, although presented as a security issue, suggest that distribution was in fact not meeting the needs of the people.

However, understanding the problems faced by agency-centric efforts requires the analysis of the impacts that the earthquake had on the local leadership structure. As it is known, the earthquake killed the leadership of the United Nations Mission for the Stabilization of Haiti (known by his Spanish acronym, MINUSTAH), the leadership of the Catholic Church, and about one sixth of Government workers. The immediate impact of the decapitation of the local leadership was the removal of the natural partners of international aid groups, i.e., the individuals that help these groups distribute the aid locally to the people in need. As a result, when tsunami of international aid started to arrive in Port-au-Prince the capability of these groups to deliver the aid to victims—in a context in which transportation networks have been significantly damage, and a city that grew without any formal planning, with no street signs and very few formal streets—was significantly hampered. In essence, the international aid was disconnected from the local distribution channels and local knowhow that are essential to effective aid distribution in a large and complex metro area. The international aid piled up at entry points with no way to go. In desperation, helicopters were used to drop humanitarian aid to the victims; which prompted complaints from many that deemed this practice not respectful of the dignity of the population in need.

At the heart of these problems, one finds the impossibility of setting up a distribution network of great complexity, and arranging for the manpower that trucks needed, with the short timeframe demanded by the circumstances. The so called “truck crisis” began to subside with the arrival of 200 trucks from the Dominican Republic, which the Dominican Government arranged for after receiving a request for assistance from international groups. Not surprisingly, Haitian truckers complained—and not without reason—that instead of bringing Dominican truckers it was better to hire local Haitian truckers. Two weeks after the disaster, a registry of Haitian truckers (none existed before) was created which enabled international groups to have access to the local truckers. The creation of a trucker registry marked the end of the truck crisis, as it provided ACEs with a mechanism to hire the local truckers needed for the distribution effort.

The chief conclusion is that, indeed, there were enough trucks in Port-au-Prince to satisfy the needs of the humanitarian logistic effort. The truck crisis took place because the international aid groups—deprived of their natural partners—did not know how to reach the local truckers. In essence, the truck crisis that they experience was the result of the lack of connectivity between these groups and the local distribution channels. This was not the only problem encountered by the agency centric efforts. They also faced significant safety problems, which required the use of armed cars and large security details to ensure the integrity of the deliveries and the personal safety of the staff.

The most striking finding of this research is that a number of unheralded relief operations did not experience such problems. These operations were able to transport significant amounts of aid, without any problems as they found both the equipment and staff needed, and without the safety issues that plagued the others. This is the remarkable feat accomplished by the Collaborative Aid Networks (CANs).

Collaborative Aid Networks (CANs)

The term Collaborative Aid Networks (CANs) refer to the collection of individuals and their social connections, logistical systems, and physical spaces that make possible the social mission of an aid group (e.g., Servicio Social de Iglesias, Caritas). In some cases, the CAN has a religious mission though this is not necessarily the case. They are inherently collaborative and tend to focus on aiding the needy, hence

the name. The most salient aspects of the CANs are that they: (1) are typically very large with hundreds to tens of thousands of individuals; (2) tend to cover the entire geography of the country; (3) have a very horizontal structure without pronounced hierarchies and chains of command; (4) are embedded in the local populations (more precisely, they are part of); (5) are trusted by the locals; (6) are comprised of motivated volunteers; and, (7) possess detailed knowledge of local conditions. Although there must be many others, the team was able to identify three notable cases: Servicio Social de Iglesias (the social arm of the Evangelical Churches); Caritas Dominican Republic-Haiti; and the Dominican/Haitian Red Cross.

These remarkable operations were able to transport significant amounts of cargo without none of the problems faced by the ACEs. The field research conducted by the team revealed that:

- Because of their large geographic coverage, and the fact that their members knew each other, the CANs were remarkably well informed about the actual needs in the ground.
- Because of the sheer size of their human/logistic networks, and its super-connected nature, the earthquake could not destroy the CANs, though probably thousands of their members were killed / injured. As a result, the CANs remain functional after the disaster, enabling it to spring back into action with a humanitarian logistic focus. The CANs are, inherently, extremely resilient networks.
- Because the CANs enjoy the trust and respect of the locals, the population was more willing to wait for the arrival of supplies in an orderly fashion. This, in turn, enabled the CANs to operate without any disruptions and transport relief aid when the ACEs were having problems.
- Because the CAN members organized the local population, identifying and building on the local leaders, they had an accurate estimate of the population needs, which enabled them to transport the exact amount of cargo that the population needed. This allowed the CANs to avoid the use of large convoys that tend to become a target of opportunity for vandals and criminals. In doing so, the aid that they transported reached the intended individuals.
- Because they were embedded in the local social fabric, they were much less vulnerable to theft by local criminal gangs as these organizations typically shy away from stealing from well respected institutions like churches as this may antagonize the local population.

It is astonishing—though completely understandable once the social context of their operations is brought into the picture—that none of the CAN groups interviewed reported a single incident of theft, or an unsafe situation. This stands in contrast with the experience of the ACEs.

Implications

It is important to highlight that the contrasting performances of ACEs and CANs is a direct result of the characteristics of their networks. Although it is likely that the unique characteristics of the Haitian society and economy exacerbated some of logistical problems, the conclusion of the team is that the problems faced by the ACEs are a reflection of their structural limitations.

Most ACEs are designed for the efficient transport of large volumes of aid to a disaster site. As a result, their networks are characterized by a relatively number of high capacity links connecting donors/warehouses to disaster sites. At the local level, these networks articulate with a relatively small number of government agencies, local aid groups, and the like, that typically take care of the distribution of the relief aid to the needy. If these links to the local networks are destroyed—as it happened in Haiti when the leadership of the MINUSTAH, Catholic Church, and Haitian Government was killed/hampered—the aid brought by the ACEs have very limited distribution options. In this context, if the ACEs try to take matters into their own hands—to preserve the very essence of the ACE approach—they have no alternative but creating their own local distribution network. Doing so would maintain the ACE character, and ensure that the aid is distributed strictly following the ACE guidelines; or so it seems. Unfortunately, this hope is likely to be crushed by the magnitude of the challenge.

The team's estimates are that delivering the aid to the about 2 million residents of Port au Prince, scattered over a challenging terrain, with few formal streets and highways, may require between 200 to 300 Points of Distribution (PODs). Assuming that each POD requires 80 staff/volunteers, (to organize the aid, organize/control the crowds, ensure the safety of the staff, and other support functions) implies that anywhere between 16,000 to 24,000 staff members are needed. Since the ACEs did not have that kind of

manpower at hand, they could only man a handful of PODs that were flooded by tens of thousands of desperate Haitian citizens. (As an illustration of the amount of time it would take to assemble and deploy such a network, it is important to mention that these numbers are equivalent to one division of average size, e.g., about 20,000 troops, in the U.S. Army; that typically take 3-4 weeks to be deployed.) The inescapable conclusion is that the ACE model cannot be expected to be an effective contributor to the local distribution of aid in a large urban disaster. This is beyond what its inherent structure could offer.

In contrast, the CANs are comprised of tens of thousands of highly motivated individuals, already organized around a common social/religious goal, and widely distributed throughout the country. For instance, the Servicio Social de Iglesias, SSID, (the social arm of the Evangelical Churches in the Dominican Republic) is supported by 16 Evangelical Councils, each having an average of 500 individual churches. In addition, one must add the Haitian churches that collaborate with the SSID in humanitarian work, which could be estimated in another 3,000 churches. This implies that, assuming that each church is a node the SSID's CAN network, the SSID has access to 11,000 nodes in the island, i.e., about half a million people. Their huge size, the distributed nature of the network, and the strength of the connections between the members (after all, some of the CANs have existed for thousands of years, e.g., the Catholic Church), enabled the CANs to remain functional after disasters. Although many of their members died during the earthquake, the ability of the network to function was not in question. Topologically, the CANs are comprised of tens of thousands of nodes, e.g., churches, that are well connected by social links. For that reason, the removal of nodes from the network was dealt with by rerouting the aid through the remaining nodes. In essence, the distributed nature of the CANs lead them to be extremely resilient.

The research conducted has a number of profound implications for humanitarian logistics. The most salient ones are that:

- Agency centric efforts (ACEs) are not likely to be able to put in place timely and efficient distribution systems in large urban areas impacted by disasters, without the assistance of local support networks: This is a consequence of the huge amount of man-power required, the need for local knowledge, and others. These groups typically have large amounts of material resources, and access to large international donors, that could make a difference in the aftermath of a disaster. They do not have, however, the widespread local networks required to distribute the aid.
- The best alternative for local distribution of critical supplies is to use the pre-existing Collaborative Aid Networks (CANs): These groups have the social networks, the geographic coverage, the local knowledge, and the motivation to help the victims. Although they have these invaluable networks, their potential is underutilized because they not have the material resources in amounts comparable to their capacity to distribute.
- The fundamental implication is that the capabilities of ACEs and CANs are best utilized when the ACEs focus on the transportation of the large volumes of critical supplies to the disaster site; leaving the local distribution to the CANs.

The analyses of the humanitarian logistic structures that emerged after the Haiti earthquake strongly suggest that the humanitarian logistic community must rethink its approach to the distribution of aid, that emphasizes the transportation of large flows of relief aid without comparable emphasis on local delivery mechanisms. As the Haiti tragedy demonstrated, the ACEs are bound to find significant obstacles. As a result, there is no practical alternative other than using the CANs for local distribution, engaging them as equal partners in the relief effort. This is particularly important in large urban disasters as they will entail distributing critical supplies to large amounts of individuals. In essence, the CANs are the only human/logistic networks that could tackle this huge challenge.

In this context, it is important to take full advantage of what the CANs could offer. Achieving this goal entails engaging the CANs as part of a holistic strategy of community development, risk management, disaster response (including humanitarian logistics) and recovery. Such strategy is needed to improve the communities' capabilities to minimize risks, address vulnerabilities, develop resiliency, maximize the efficiency of disaster response, and the speed of the recovery. Specific steps suggested include:

- The creation of a super network, comprised of the CANs associated with credible organizations, that would be the local end of the disaster mitigation and response process.
- The creation of a Coordinating Committee of CANs (that could be part of a VOAD-like structure) that will be in charge of ensuring an equitable and just distribution of resources.
- Training the leaders and key members at each of the locations part of the CANs (the local nodes, such as churches) on risk management, first aid, disaster response, humanitarian logistics, and the like. This will ensure that local leaders know how to respond, and how best to use resources.
- Designate each node/location as a Point of Distribution (POD) to be activated in the event of a disaster. In such a situation, the leader of the node would be expected to gather other members of the CAN and get ready to help people, and distribute the aid when it arrives. The designation of these locations as PODs will enable the local population to know where to get first aid, or critical supplies, instead of wandering about the city desperately looking for the aid needed.

As an intermediate step before attempting to implement the plan described above, would be to pilot test the concept. A well designed small pilot could provide significant insight into the advantages, disadvantages, and real life impacts of the proposed concept. As part of it, an international relief agency could partner with a CAN to conduct a preset number of humanitarian logistic activities. Before doing the test, however, extreme care must be given to ensure it is properly designed so that its findings are not bias in any given direction.

The approach suggested here implies a significant departure from prevailing practices and the thinking at many relief organizations, that emphasize control and custody of the aid flows (quite frequently, a donor's requirement to ensure proper use and equitable and just distribution of the donated resources). In the opinion of the authors, such goals could be accomplished with proper training and engagement of reputable CANs.

2. Rensselaer Polytechnic Institute's Center for Infrastructure, Transportation, and the Environment

The research team led by Professor Holguín-Veras is one of the largest ones in the area of engineering-based disaster research. It has received significant funding from the National Science Foundation—the largest and most prestigious research funding agency in the world. The team works closely with the Disaster Research Center at the University of Delaware that is the largest social science based disaster research center. The research conducted takes place on two different aspects: characterization of the humanitarian logistic process based on quick response field work, and development of decision support tools to enhance the efficiency of the operational response.

NSF-HSD/DRU 0624083: Contending with Materiel Convergence (1/1/07-12/31/11, PI: J. Holguín-Veras, Co-PIs: T. Wachtendorf and others): The work characterized HL and developed novel HL models. The characterization provided key insight into the realities of HL. The team: (1) estimated dynamic patterns of immediate resource requirements to develop look-ahead ordering policies (Holguín-Veras et al., 2010); (2) estimated econometric models of MC to gain insight into its determinants (Destro and Holguín-Veras, 2011); (3) developed novel procedures to location problems taking into account MC and proxies of DC (Ukkusuri and Yushimito, 2008; Yushimito et al., 2010); (4) produced inventory control models based on assumptions of demand/perishability; (5) is finishing a dissertation (M. Jaller) that considers resource constraints and a probabilistic payoff function to define optimal control strategies, and planning of points of distribution (Jaller, 2011); (6) is starting work on the incorporation of DC into HL modeling, as part of another dissertation; (7) found that the flow and type of disaster relief is strongly influenced by the subjective framing of need (Wachtendorf, 2010); and (8) conducted quick response field work after the Haiti earthquake (four trips). Funded five Hispanic students (C. Torrers, MSc 2009; L. Destro, MSc 2010; W. Yushimito, MSc 2008; M. Jaller, PhD 2011; N. Pérez, PhD, C. Colindres); and 15 undergraduate researchers (9 minority) jointly with Rensselaer's Undergraduate Research Program.

NSF-RAPID 1034365: Field Investigation on the Comparative Performance of Alternative Humanitarian Logistic Structures (6/1/10-05/31/11, PI: J. Holguín-Veras, Co-PI: T. Wachtendorf)

Conducted field work after the Haiti earthquake, identified the root causes of the logistical problems faced by the large relief groups in delivering critical supplies to the population, conducted numerous interviews with logistical staff. Three papers are being written.

NSF-HSD/SGER 0554949: Characterization of the Supply Chains in the Aftermath of an Extreme Event: The Gulf Coast Experience (01/01/2006-12/31/2006, PI: J. Holguín-Veras, Co-PI: T. Wachtendorf and S. Ukkusuri) Analyzed the logistical debacle post Katrina, described the supply chains that emerged, quantified MC, collected data about dynamic resource requirements, partially supported two PhD students (female, Hispanic). Three papers published.

NSF-CMS-0301391: Impacts of Extreme Events: A Systematic Analysis of Individual Travel Choice Decisions (9/1/2003-02/28/2005, PI: J. Holguín-Veras) Collected additional behavioral data to assess latent impacts, estimated behavioral models based on state of the art mixed logit formulations. Three papers were published.

NSF-SGER/CMS 0205188: Impacts of Extreme Events on Passenger Travel Behavior (04/01/2002-03/31/2003, PI: J. Holguín-Veras): Behavioral data were collected and a set of discrete choice models were estimated that provided evidence of behavioral changes produced by 9/11. Two papers and a book chapter published.

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