

COMPARATIVE PERFORMANCE OF ALTERNATIVE HUMANITARIAN LOGISTIC STRUCTURES AFTER THE PORT AU PRINCE EARTHQUAKE: ACES, PIES, AND CANS

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ABSTRACT

The paper defines a typology of the humanitarian logistic structures identified during the field work conducted by the authors immediately after the Port au Prince earthquake of January 12th, 2010; assesses their relative performance in terms of delivering relief aid to the people in need; and identifies the causes that explain the observed differences. Three different structures are used for comparative purposes: Agency Centric Efforts (ACEs), Partially Integrated Efforts (PIEs), and Collaborative Aid Networks (CANs). These structures differ to the extent to which they are integrated with the local social networks and structures during the relief effort. Representative examples were analyzed to illustrate the inherent strengths and weaknesses and reach conclusions of general applicability. Based on the chief findings concerning the strengths and weaknesses of these structures to respond to disasters of various sizes, the paper makes a number of policy recommendations to maximize the effectiveness of relief distribution efforts. In doing so, the paper specifically analyzes the impacts of the fundamental differences between disasters and catastrophes on the nature of the humanitarian logistic effort. The analyses in the paper are based on dozens of interviews, both formal and informal, conducted with the individuals directly involved in the relief effort, which were complemented with critical analyses of news accounts, and technical reports produced by the agencies involved.

Keywords: humanitarian logistics, disaster response, social networks, Haiti disaster.

INTRODUCTION

The tragic January 12th, 2010 Haiti earthquake impacted a highly vulnerable population at a moment at which—after decades of political, social and economic turmoil—its internal capacity to respond to such an event was at its lowest. In its wake, tens of thousands of individuals lost their lives, and legions of others were injured and traumatized by the earthquake and its aftermath. Without any doubt, the Port au Prince (PaP) disaster—that technically met the criteria that define a catastrophe (Barnshaw et al., 2008)—is one of largest human tragedies that have taken place in the Americas in the last several decades.

Following the 2010 earthquake, a massive international response ensued. Thousands of planes and ships transporting aid arrived at the island, and, in a convergence similar to other events (Fritz and Mathewson, 1957; Scanlon, 1991; Wenger and Thomas, 1994; Kendra and Wachtendorf, 2003), tens of thousands of volunteers from all over the world converged on Haiti to participate in the response. However, the relief operations did not run smoothly as a number of prominent and experienced relief agencies had major problems in delivering the aid to the people in need. The most visible manifestation of the problems—though not the only one—was the reported inability of some of these agencies to find the trucks needed to distribute the aid. This “truck crisis” prompted the designation of planes loaded with trucks as the top three landing priority at the airport (New York Times, 2010g), and urgent appeals to the Government of the Dominican Republic and international donors to help them get the trucks needed. There were also major delays in setting up the network of Points of Distribution (PODs), and numerous security problems that required the use of large security details to protect convoys. As a result, the massive volume of aid piled up at the Port au Prince airport. In contrast, the field work conducted by the authors indicated that a number of unheralded relief operations were able to deliver relief aid to the survivors, find the resources required for the operation, and do the job in a very efficient manner without the security problems that plagued other efforts. A key objective of the paper is to identify the factors that explain these contrasting performances, and translate the lessons from the Haiti experience into policy recommendations. In doing so, the paper aims at contributing to the humanitarian logistics (HL) and disaster response literature by conducting a critical analysis of the HL structures that emerged during the Port au Prince response.

The research reported here is based on the interviews conducted by the authors with individuals directly involved in the relief effort. In accordance with Institutional Review Board procedures, their wishes regarding the release of their identities and the information provided have been respected. The several dozen formal and informal interviews conducted, both formal and informal, took place in a sequence of trips to Haiti (the first one 10 days after the event), Dominican Republic, and other centers of the Haitian diasporas such as Miami. This information is complemented with media accounts and official reports. In order to conduct the analyses, the authors defined a basic typology of HL operations comprised of three types: Agency Centric Efforts (ACEs), Partially Integrated Efforts (PIEs), and Collaborative Aid Networks (CANS); that differ to the extent to which they are integrated with the local social networks and structures during the relief effort. Representative examples were analyzed to illustrate the inherent strengths and weaknesses and reach conclusions of general applicability. It is important to highlight that, since the paper focuses on a catastrophic event, care must be exercised when attempting to extend its conclusions to other smaller disasters.

One key reason is that in catastrophic disasters the bulk of the relief aid has to come from the outside of the impacted area (Wachtendorf et al., 2011; Holguín-Veras et al., 2012). The tremendous increase in demand for critical supplies, the partial and sometimes complete destruction of local inventories of goods, the severely disrupted private sector supply chains, and the impact to neighboring jurisdictions that might otherwise provide aid are contributing factors to the increased reliance on outside support. This stands in contrast with small or localized disasters, e.g., a tornado, where the businesses and individuals located in the surrounding areas are key sources of relief and may have mutual aid agreements in place. The disaster vs. catastrophe distinction is important because it is not only a matter of scale, the operations are qualitatively different.

The paper is comprised of six sections in addition to the introduction. Section 2 discusses a typology of HL structures identified in Haiti, and characterizes their main features. Section 3 discusses the immediate impacts of the Port au Prince earthquake. Sections 4, 5, and 6 discuss the role of Agency Centric Efforts (ACEs), Partially Integrated Efforts (PIEs), and Collaborative Aid Networks (CANS) in the response. Section 7 presents the chief findings of the research conducted and discusses policy implications.

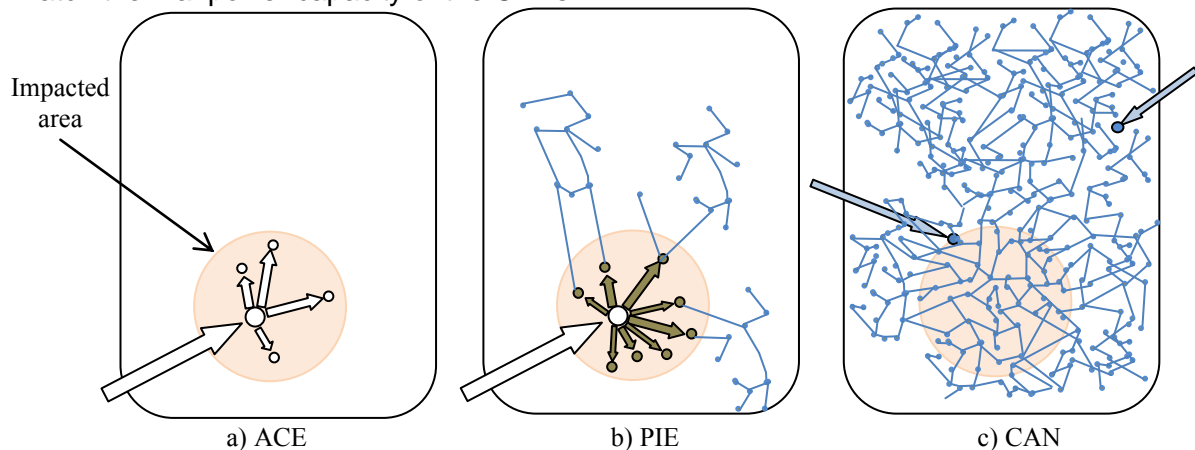
TYPOLOGY OF HUMANITARIAN LOGISTIC STRUCTURES

The analyses made by the authors suggest the need to classify humanitarian logistic (HL) structures on the basis of their level of integration with the social fabric of the impacted area. Central to these definitions is the concept of a “foreign” group, i.e., a group that is not part of the local social fabric of the impacted area (that could well be from the same country). Although there is a continuum of possibilities, the relevant operations could be exemplified with three types. At one end of the spectrum, one finds the operations performed by an agency foreign (outsider) to the area, with little or no integration with the locals. This case is labeled Agency Centric Effort (ACE) as the operation is based on the internal capacities of the group. At the other end, there is the case of networks of individuals/groups that are part of both the community impacted by the disaster and of a larger network that extends to other communities, e.g., a religious group. This type is referred to as a Collaborative Aid Network (CAN). In between these cases there are endless possibilities depending upon to what extent and on what form, they integrate with the locals. To refer to these cases, the paper uses the term Partially Integrated Effort (PIE). Although it is tempting to think that a highly integrated PIE could become a CAN, this is not the case. The CAN is a completely local effort that exist for another purpose and cannot be replicated by a PIE that, by definition, has a foreign component. In essence, at one end of the spectrum one finds the operations not integrated with the locals; while at the other end there are operations that are part of the local community. Implicit in these definitions is that a foreign relief group could do its work as an ACE or as a PIE. In most cases, this is a matter of choice that could well be constrained by the circumstances in the ground. In essence, the classification applies to the operations performed by the relief groups, not to the groups themselves. Figure 1 depicts the ideal types of the different HL types. As Weber notes, ideal types are not meant to be considered perfect or preferred models, but rather constructs against which one can measure the fit of actual cases (Weber, 1949). Here, too, the models presented reflect the constructed forms of the

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networks as a way to understand the very different approaches to humanitarian logistics in disaster events. To facilitate interpretation, colors and patterns are used to represent the ownership/nature of the various links in the networks. As shown, in the case of the ACE the entire process is under the control of a foreign relief group (represented in the figure by clear arrows and circles). In the PIE case, there is an articulation between the foreign and local(s) group(s) in which the latter help with the local distribution of supplies. In most cases, these are international/domestic non-profit/non-governmental organizations that focus on humanitarian assistance. The CAN is a completely different case as it extends far beyond the impacted area, and exists for a different purpose. The fact that large components of the CAN are outside the impacted area enables its nodes to generate critical supplies, e.g., through donation drives, in addition to the supplies that they could get from outside donations. As implied in Figure 1, there are substantial differences in terms of network size. ACEs may be able to accrue an impressive amount of supplies but since ACEs are constrained by their internal capacity to deploy man-power and assets, the number of points of distribution (PODs) that they could put in place is generally small. PIEs, by virtue of exploiting existing local networks are able to deploy more PODs than the ACEs. However, none of them is able to match the manpower capacity of the CANS.



Notes:

- 1) ACE's relief flows are represented by clear arrows and circles
- 2) The local relief flows part of the PIE are represented by shaded arrows and circles
- 3) The components of the CAN are depicted as small circles and links
- 4) In all cases, the circles represent Points of Distribution (PODs) and the links connecting them represent logistical/ social/physical connections

Figure 1 – Schematic of ACES, PIES, and CANS

Table I shows a basic comparison of the key HL features of these types. As shown, the features under analyses have been organized in two groups: logistical and social. The former considers the nature and capability of performing the key components of the HL process; while the latter characterizes the nature and extent of the linkages between the structure and the impacted area and population. The logistical features considered focus on the ones that define the ability of the network to transport the supplies from the origins—typically outside the impacted area—to the population in need. In terms of the capacity to transport supplies to the site, or to staging areas, foreign relief groups have the upper hand as they are typically able to use high capacity transportation modes that originate outside the impacted site. In contrast most CANS—originally created for another purpose—do not have the logistical structures and access to assets that foreign relief groups have. For that reason, ACEs and

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PIEs are expected to outperform the CANS in terms of sheer ability to transport cargo to the site.

Table I – Key features of ACES, PIES, and CANS

Feature:	Foreign Relief Groups		Social/religious groups
	Agency Centric Effort (ACE)	Partially Integrated Effort (PIE)	Collaborative Aid Network (CAN)
Logistic:			
Transport to disaster site, staging areas	Old (familiar) task, of typically high capacity	New/old task, of typically high/medium capacity	New task, of typically low capacity
Transport to Points of Distribution (PODs)	Old (familiar) task, medium/high capacity	Medium/large capacity	Medium capacity
Number of Points of Distribution (PODs)	Old (familiar) task, PODs limited by manpower	Medium/Large	Very large
Geographic coverage of pre-existing network	None/minimal	Size depends on local partners	Very large
Decision making structure	Typically hierarchical	Typically hierarchical	Typically collaborative
Social:			
Organization of the local population	Typically no, or minimal	Typically yes	Typically yes
Relationship to local people	Foreign to the area	Some group members could be locals	Typically strong, they are part of the community
Knowledge of local conditions	Typically limited	Could be extensive, depends on local partnerships	Typically extensive
Legitimacy with local people, trust	Not established, or lack thereof	Could be established, depends on local partnerships	Typically established
Strength of network ties	Internally strong, weak local connections	Internally strong, could be well connected to locals	Typically very strong
Extent of local contacts	None/minimal	Some	Extensive

In regards to the ability to transport supplies to the PODs, there are some counterbalancing effects that make it difficult to judge a priori how they would perform relative to ACEs and PIEs. Foreign relief groups may be constrained by low levels of integration with the local networks, as Haiti demonstrated. The CANS on the other hand, may be limited by their ability to secure large amounts of relief aid which are required for major relief efforts. However, the CANS advantage lies in the size and strength of the local delivery networks they can create. As established in this paper, CANS bring to the table extensive networks with very strong social ties that can quickly refocus to their efforts on HL. This is the fundamental strength of the CANS. The social features listed in the Table I describe the nature and degree of integration with the social environment in which the relief work takes place. Here again, the CANS are expected to outperform the others as they are likely to be better integrated, have a better command of the local conditions, have more legitimacy, and better access to a large network of contacts than foreign relief groups. Of great import is that the CANS are very large with strong social links among the members. These features make CANS an ideal mechanism for disaster relief distribution.

IMMEDIATE IMPACTS OF THE HAITI EARTHQUAKE

The Port au Prince earthquake had a huge impact on both the demand and supply of critical supplies. The first and most obvious impact was on the demand side as, all of the sudden, more than 3 million in Port au Prince and other locations (United States Agency for International Development (USAID), 2011) people found themselves either injured, homeless—1.6 million (United States Agency for International Development (USAID), 2011)—or without access to food, water, and other life sustaining items (Office for the Coordination of Humanitarian Affairs, 2011). However, it is not yet clear how many people died as there have been a great deal of confusion (Fox News, 2010). The Haitian government's estimates—initially of 100,000 deaths and then 316,000 fatalities a year after (Reuters, 2011)—have been challenged by an unpublished report by the United States Agency for International Development that suggests no more than 85,000 deaths (National Public Radio, 2011; Schwartz, 2011). Ironically, this report has also been the subject of criticism (Associated Press, 2011). In any case, regardless of the actual number of fatalities that probably will never be accurately known, this is a major human tragedy. Adding to the problem, a large portion of the supplies that households had in store at home were lost to the earthquake, as 30 to 60 percent of buildings in Port au Prince collapsed or were severely damaged (Anglandes et al., 2010). Lack of potable water—a perennial problem in Port au Prince—became a life or death problem as the earthquake disrupted the operations of the local suppliers (i.e., handful of mid-size companies, and the numerous unregulated vendors that sell the untreated water they get from the subsoil using small electric pumps). At the same time, the private (both formal and informal) sector that routinely bring supplies to Port au Prince experienced major disruptions due to impassable roads, death or injury of business partners, and lack of communication as the local phone network collapsed. It is very telling that it took six days for a trickle of local products to start to appear in the Port au Prince market (New York Times, 2010d; New York Times, 2010c); and more than two weeks for the “...surviving supermarkets...” to reopen (New York Times, 2010f). Moreover, significant portions of the inventories of both local businesses and relief organizations were destroyed when warehouses and commercial centers collapsed. The loss of the supplies at three out of the four massive warehouses kept by the UN was of great significance as they had in store the kind of critical supplies that were needed in the initial response (New York Times, 2010f).

The earthquake damaged major components of the transportation infrastructure: the seaport, the Port au Prince airport, and the road connecting Port au Prince to the Dominican Republic. The road, though passable, was promptly repaired by the Dominican Government which opened a lifeline to the city. The seaport suffered major damage as piers and cranes were destroyed, which required the use of less efficient ships equipped with cranes, and/or construction cranes to unload the cargo. The port opened to traffic only after a floating pier was anchored there ten days after the event (United States Southern Command, 2010). The airport was also damaged, particularly its passenger building and communication tower, though portable air traffic control equipment operated by the U.S. Air Force arrived the day after the earthquake. However since the runway was usable, planes were able to land almost immediately after the earthquake; and they did in such numbers that created a logjam in the tarmac that forced a 24 hour landing freeze in day two of the response (United States

Southern Command, 2010). In day three (Friday January 15th) the airport reopened with a priority landing system (New York Times, 2010h; Wall Street Journal, 2010b); which led to complaints from prominent relief groups. For instance, the World Food Program and Doctors Without Borders felt their planes should have been allowed to land in Port au Prince instead of being diverted to Santo Domingo: "Their priorities are to secure the country. Ours are to feed. We have got to get those priorities in sync." (New York Times, 2010g; New York Times, 2010f).

In addition, there was another important factor that would end up having a significant impact: the earthquake decapitated the leadership of key institutions that would have been expected to play a key role in the response. 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, destroyed 14 out the 16 building that housed government ministries, and killed numerous government workers (New York Times, 2010b). 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 would have significant consequences.

In essence, the humanitarian crisis was aggravated by a combination of factors: a huge surge in population needs, as well as the needs associated with the response itself (Holguín-Veras and Jaller, 2012), destruction of the local inventories of critical supplies, disruption of the private sector supply chains, major damage to critical components of the infrastructure, severely weakened internal capacity to respond, and decapitation of the local leadership that led to the isolation of foreign relief groups. Some of these factors have been observed in other disasters, as the research conducted on Japan make clear (Comfort et al., 2010). The following sections discuss the HL structures identified during the research.

AGENCY-CENTRIC EFFORTS (ACE)

The different agencies in the UN system have had a significant and important presence in Haiti for both humanitarian and public safety reasons since the 1990s. In 2008, the UN conducted a fairly successful humanitarian operation following the massive flooding produced by a series of storms (i.e., Tropical Storm Fay, Hurricane Gustav, Hurricane Hanna and Hurricane Ike) that hit the country in rapid succession, which lead to the death of nearly 800 Haitian citizens (CNN, 2008). For the most part, in conducting these efforts the UN followed the PIE model relying on "implementing partners" that delivered the assistance to the people in need. The catastrophic event of January 12th, 2011 will provide this highly experienced and professional network with its most difficult challenge.

Understanding the problems faced by the foreign relief groups that operated agency-centric efforts (ACEs) requires the analysis of the impacts that the earthquake had on the local leadership structure. Of great import are the cases of MINUSTAH, the Catholic Church (which is probably the largest and most important institution in the country), and the Haitian Government. The MINUSTAH was created in 2004 with the mission to support and ensure a secure and stable environment, restructure and reform the national police, help with Disarmament, Demobilization, and Reintegration programs, restore and maintain rule of law, public safety and order, protect civilians under imminent threat, among others. Between 2004 and 2010, the mission had to adjust its operation concept and strength to adapt to changing

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political, security and socio-economic conditions in the country (United Nations, 2011). In a different scenario, the MINUSTAH could have spearheaded the response as it had a strong command and control structure, the assets (e.g., trucks, heavy equipment), and both the security personnel to ensure public safety and the mandate to do so. Instead, with their leadership killed, witnesses reported "...total chaos..."; "...everybody was crying..."; "...no coordination capacity..." (Holguín-Veras, 2010a); "The collapse of the headquarters of the United Nations mission here robbed the relief effort of a central command." (New York Times, 2010a). Not only the MINUSTAH failed to respond, many of their duties, e.g., patrolling the streets, had to be taken over by others (New York Times, 2010j). The impacts on the Catholic Church—a major moral and spiritual force in Haiti—were equally significant as the earthquake killed its bishop, depriving the Catholic Church of the opportunity to mount a coordinated response. The earthquake also impacted the Haitian Government as it destroyed 14 out of the 16 buildings that housed the various ministries, making coordination a lot more difficult. The lack of leadership from the country's President during the first days of the crisis did not help rally the country to help the survivors. Showing a profound disconnect with the people, one of the first statements made to the press by President Preval reflected his concerns about "...not knowing where he would sleep..." as the Presidential Palace had been damaged (New York Times, 2010b). In essence, the political leaders failed the Haitians at a moment of crisis. As a result, the government was completely absent during the first weeks of the response (New York Times, 2010e).

The picture that emerges is one in which the institutions of local governance that could have played a lead role were in complete disarray and unable to respond. This presented a major and unprecedented challenge to foreign relief groups because—since that they are accustomed to partner with local institutions and there were none to be found—they were forced to attempt the local distribution themselves. In essence, foreign groups—though inclined by tradition and pragmatism to operate as PIEs—were forced to operate as ACEs. As a result, when the tsunami of international aid started to arrive in Port-au-Prince the capability of these groups to deliver the aid to survivors—in a context in which streets were clogged by debris, a city that grew without any formal planning, with no street signs, and very few formal streets—was significantly hampered. At that crucial point, they needed experienced local truckers with small trucks that could navigate the obstructed streets. Unfortunately, the foreign relief groups could not get them. In essence, they were disconnected from the local distribution channels and local knowhow that are essential to effective aid distribution in a large and complex urban area. Deprived of their natural partners, and without mechanisms to identify and locate reliable truck owners that could help with the local distribution, they could not deliver the supplies (Holguín-Veras and Jaller, 2010c). At this particular juncture, the crisis could have probably been averted if the local business class would have offered to help with the relief effort by helping connect foreign groups to the numerous trucking associations in Port au Prince. However, the interviews conducted indicated that the ACEs received little or no help from the local business class. Thus, the humanitarian crisis was not arrested.

The situation created by the lack of trucks became so desperate 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, 2010i). The international aid

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piled up at entry points with no way to go. In desperation, the decision was made to use helicopters and planes to drop relief supplies to the survivors (CNN, 2010; Daily Mail, 2010). This practice prompted criticisms from many that deemed it not respectful of the dignity of the population in need as the drops generated chaos in the camps that mostly benefited the strongest (LiveLeak, 2010a; LiveLeak, 2010b). Quite tellingly, the State Department had rejected the use of air drops before because of the turmoil they would create (CNN, 2010; Daily Mail, 2010). The “truck crisis” persisted. In the words of the UN Chief in Haiti: “We have the food to be distributed,” he said. “We just don’t have the vehicles.” (New York Times, 2010f). Complicating the matter, there were also fuel shortages (Guardian, 2010). The UN reported needing to bring in 10,000 gallons of diesel per day from the Dominican Republic just to keep water trucks circulating (New York Times, 2010f). The irony is that the UN had plenty of trucks, though of the wrong kind (Office for the Coordination of Humanitarian Affairs, 2011). The net effect of all of this was a humanitarian crisis of unprecedented proportions. As a clear indication of the lack of resources to do the local distribution, 20 days after the disaster, the UN finalized plans to create 16 points of distribution (PODs), which is far below what is needed for a city with more than two million. Not surprisingly, tens of thousands of desperate individuals flocked to these PODs (New York Times, 2010a). As a reference, it suffices to say that the highest capacity POD (Type I) designed by USACE to deliver to 20,000 individuals per day requires an average of 80 staff members to do all the tasks needed (including both the distribution of supplies and crowd control) (U.S. Army Corps of Engineers, 2010). Reflecting the difficulties in securing the required resources, it took the UN 19 days to set up the first nine PODs, 20 days to setup 12 PODs, and 21 days to setup 14 PODs (New York Times, 2010a). This provides a clear indication of the challenge—in terms of manpower, equipment, and logistics—associated with setting up the POD network. The authors’ conclusions are that the difficulties experienced by the ACEs were not the result of incompetence, lack of motivation or complacency on the part of their staff, as implied by elements of the popular press. In fact, the individuals involved in the effort are experienced and motivated professionals and probably among the best in the field. Instead, the problems faced by the ACEs were of a structural nature as they were related to their lack of connectivity with the local logistic networks. In essence the relief groups were forced to take on an unfamiliar role, without the assistance of their natural counterparts and the local knowhow, material, and human resources these partners bring to the table. The root problems were the lack of connectivity to the local networks and assets, and the practical impossibility of setting up a distribution network of great complexity and arranging for the manpower and trucks needed, within the short timeframe demanded by the circumstances. The ACEs also faced security problems, which required the use of armed cars and large security details to ensure the integrity of the deliveries and the safety of the staff. It is very telling that other ACEs, in this case a small foreign relief group, experienced similar problems as the “Convoy to Nowhere” demonstrated (Wall Street Journal, 2010a). The most striking finding of the research conducted is that a number of unheralded relief efforts 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 ACEs. This is the remarkable feat accomplished by the Partially Integrated Efforts (PIEs) and Collaborative Aid Networks (CANs) discussed in subsequent sections.

PARTIALLY INTEGRATED EFFORT (PIE)

The term Partially Integrated Effort (PIE) refers to cases in which a foreign relief group joins forces with a local partner to do humanitarian logistics. In most cases, this is a tactical decision based on mutual convenience or interest; though in others, there is a long term relation that binds the partners together. The PIE format is probably the most widely used in humanitarian assistance as it enables a foreign group to leverage its resources by collaborating with the locals. The team identified and studied a number of instances that belong to this group. Among them it is important to highlight the Dominican Red Cross/Haitian Red Cross, and Operación Mano Amiga (Operation Friendly Hand)/Ministry of Women Affairs of Haiti.

Dominican Red Cross

The Dominican Red Cross (DRC) has a long history of collaboration with the Haitian Red Cross (HRC) (Holguín-Veras, 2010a). As an indication, in the four years previous to the earthquake the DRC had trained more than 1000 staff members of its counterpart in Haiti. On January 12th, 2011 there were about 500 Haitians studying at Dominican Universities that have been or were being trained by the DRC. In addition, the DRC have numerous staff members fluent in Creole, Haiti's indigenous language. Upon hearing the news of the earthquake, the leadership of the DRC attempted to establish communication with its contacts in Haiti. After an hour they were able to talk to their colleagues at the HRC in Port au Prince. At 7PM of January 12th, 2010 the DRC organized a meeting with the Haitian students that were receiving training in Santo Domingo at the time, 75 students participated. They decided to include one Haitian citizen in each of the DRC response teams to be sent to Haiti. By 7:00 AM, the morning after the quake, a number of search and rescue teams equipped with supplies left for Haiti, thus becoming the first international teams to come to aid the survivors (Holguín-Veras, 2010a). An interesting aspect is that, instead of sending the teams to locations determined at random, the DRC sent them to the community of the Haitian member. The expectation was that by visiting locations where the DRC teams have contacts, would improve the efficiency of the response as they could have an easier time organizing the local population and engaging local support. The information received by the authors indicates that this seems to have worked very well. A key priority was to establish a logistical corridor to deliver supplies to Haiti. This was a major challenge as the earthquake had severely impacted the neural center of the country, and the internal capacity to respond was at its lowest. The DRC secured priority processing at the Santo Domingo Airport, which helped ensure that the cargo stayed there for a minimal amount of time. Warehouses were setup at the headquarters of the DRC, Alma Caribe (an industrial park), San Cristóbal, and a location offered by the Ministry of Education at Haina to classify the goods received by the DRC. In addition, the DRC had a number of warehouses at the Haitian border in Jimaní, Pedernales, Dajabón, and Elias Piña which assisted nearby communities. As in previous disasters, due to the news reports that water was scarce in Port au Prince, the DRC received massive donations of water that came from countries like United States, Venezuela, and even Spain. Reflecting on the cost-effectiveness of spending considerable amounts of

money to transport ordinary bottled water from far away countries, DRC officials indicated that "...every bottle of water transported from a foreign country deprives three to four individuals of the water that could be provided if the money is used to buy the water locally..." (Holguín-Veras, 2010a).

The donations received by the DRC (in Santo Domingo) were handled in different ways depending on whether or not they were classified. If they were classified, the donations were sent directly to Port au Prince, to one of three warehouses managed by the DRC, the International Committee of the Red Cross, and others. The DRC also used its warehouse at SONAPI (an industrial park located near the airport and seaport in Port au Prince) to process, classify and distribute supplies. If they were not classified, they were sent to one of four warehouses in Santo Domingo for sorting and processing. To avoid the problem of overwhelming the local responders with supplies that were not high priority at the moment, the DRC only sent the supplies requested by the local teams. In spite of this precaution, the amount of cargo flowing to Port au Prince was so large that on one occasion five trucks had to be stopped at Jimaní, a border town in the Dominican Republic, for five days because the warehouses at Port au Prince were full and could not take the cargo. Ultimately, the DRC delivered relief supplies to about 50 PODs. The operations relied on large trucks to transport the supplies from Santo Domingo to Port au Prince; and small trucks following a scout pick-up truck to deliver the supplies to the PODs (Holguín-Veras, 2010a). In all cases, the DRC teams organized the local population in collaboration with local leaders, assessed the conditions on the ground, determined the type and amounts of supplies needed, and then requested them from Santo Domingo. This enabled the DRC to send relatively small shipments in small trucks that met the needs of the survivors without the use of security details. The tight collaboration with the locals engendered significant support, guaranteed an orderly process of aid distribution, provided the locals with assurances that they would be properly and respectfully treated, and ensured that the aid reached the intended target. In contrast to the lack of substantial business support in Haiti, the DRC reported to have received substantial assistance from Dominican businesses. At the height of the crisis, the DRC had 500 trucks at its disposal, which had been made available by different companies in different terms (Holguín-Veras and Jaller, 2010a). These companies lent their trucks to the DRC for different lengths of time, ranging from a weekend to three weeks. Some companies paid for the full costs, while others only provided the truck leaving to the DRC the responsibility of paying for driver wages and fuel.

A finding of great relevance—given the media portrayal of the relief effort as chaotic and unsafe—is that the DRC did not experience any security problems, in spite of the fact that did not use security details. During the entire operation, not a single truck was robbed or a single staff was threatened. The DRC credits the tight integration with the locals and use of small trucks with small shipments for specific communities for this record.

Operación Mano Amiga (Operation Friendly Hand)/Ministry of Women Affairs

At the time of the earthquake, the Centro de Operaciones de Emergencia (COE) was in the midst of a table top exercise which was abruptly interrupted by the news of the Haiti earthquake. They received news directly from the Dominican Embassy about the severity of the situation in Port au Prince. Then, the Dominican Embassy made arrangements for the

COE to take over SONAPI (an industrial park). Soon after, the leadership of the operation concluded that they were not capable of doing local deliveries in Port au Prince. For that reason, they set up to find suitable partners in the Haitian Government. After frantic calls, the only person they could contact was Mrs. Marjorie Mitchell, the Minister of the Ministry of Women Affairs. They struck a deal: the Dominican Government would transfer the cargo to her staff at SONAPI, and she would arrange the local distribution. According to Dominican officials interviewed, this arrangement worked well as it enabled the locals to take care of the local distribution of the aid (Holguín-Veras, 2010c; Holguín-Veras, 2010b).

The common feature among the cases discussed in this section is that the groups involved conducted fairly successful operations with the cooperation of local counterparts in the PIE format. The knowhow, manpower, and resources provided by the locals played a key role in ensuring effective relief operations. It is worthy of mention that for the Dominican Red Cross, its access to local contacts gave them a quick start; while in the third case (Operación Mano Amiga) the operation was made possible thanks to the “frantic phone calls” that enabled them to find a suitable local partner. In this latter case, it is very likely that should have them been unable to find such a partners, Operación Mano Amiga would have followed the ACE model. Central to the success of these PIEs is their decision to favor effectiveness, i.e., ensuring that supplies reach the survivors, instead of efficiency, i.e., ensuring no loses or inappropriate use of the supplies. In selecting effectiveness over efficiency, the PIEs implicitly accepted that some supplies could be diverted away from the intended use. In their opinion, as long as the bulk of the supplies reach the needy, this was much better than other strategies that would ensure proper use of all the supplies though requiring a longer time for the aid to reach the beneficiaries. This decision was made possible—to a great extent—due to the lack of constraints on the use and distribution of the aid. Had these groups been constrained by donor requirements that mandate control and custody of the supplies, and use of authorized implementing partners, it is doubtful that these PIEs could have implemented the successful operations that they did.

COLLABORATIVE AID NETWORK (CAN)

The term Collaborative Aid Networks (CAN) refers 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., churches. In some cases, the CAN has a religious mission though this is not always 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 two notable cases: Servicio Social de Iglesias (the social arm of the Evangelical Churches) (Servicio Social de Iglesias Dominicanas SSID, 2011a) and the Plataforma de Ayuda a Haití (Plataforma de Ayuda a Haití, 2010).

Servicio Social de Iglesias (SSID)

The Servicio Social de Iglesias (Evangelical Churches' Social Service), or SSID, is the social arm of the evangelical churches in the Dominican Republic. It is a non-profit organization that was created in the early 1960s to help low income families being hurt by the international embargo that followed the fall of the dictatorship of Rafael L. Trujillo. The SSID is part of an international network of religious aid groups, which includes Action by Churches Together (ACT), Church World Services, and Christian Aid. The SSID is routinely involved in relief efforts and humanitarian activities in response to hurricanes, floods and other emergencies (Holguín-Veras and Jaller, 2010b; Servicio Social de Iglesias Dominicanas SSID, 2011a). In order to ensure prompt access to critical supplies, the SSID prepositions a basic set of supplies at five locations in the Dominican Republic (i.e., Barahona, San Juan de la Maguana, Dajabón, Sabana Grande de Boyá, and San Pedro de Macorís). The SSID relies on permanent staff and part-time volunteers to conduct their operations. The SSID is supported by sixteen Evangelical Councils, each having an average of 500 individual churches for a total of about 8,000 churches.

Of great relevance to the effectiveness of its response is that the SSID and the Evangelical churches in both Dominican Republic and Haiti had been collaborating as part of the "Dominican-Haitian Dialogue of Churches." The "Dialogue" was created in 2002 with funding from the Norwegian Government as a way to promote economic development, peace, and understanding between the two countries, which have had a troubled history (Diálogo Dominico Haitiano de las Iglesias Evangélicas, 2005). As part of this effort, church leaders from both countries meet on a regular basis to work on joint projects to aid the needy. This has enabled them to get to know each other, and develop strong social bonds. The last meeting of the Dialogue had been in December 2009, and the next meeting was scheduled for January 13th, 2010 (the day after the earthquake). Upon hearing that a massive earthquake devastated Port au Prince shortly after 5PM, the leadership of the Dialogue in the Dominican Republic met at 7:30PM to decide how to help. They immediately contacted their counterparts in Port au Prince to identify the needs in the ground. The information gathered indicated that water, medicines, and tents were the most urgent needs (interestingly, trauma medication was not identified as a priority). The SSID also requested aid from their international partners (e.g., World Church Service, and the Norwegian Church Services). On January 13th, 2010 it was decided to funnel the aid through the SSID (Holguín-Veras and Jaller, 2010b). They implemented three different mechanisms to distribute aid: (1) through the Dialogue to five IDP camps with a total of 23,000 people (which was done regularly for about two months); (2) through two IDP camps at Gantier and Boen (with 667 families and about 3000 people), that were adopted after the first month of the disaster and were still being supported as of July 2011 (with assistance of ACT Alliance, Church World Service, and Christian Aid); and, (3) sporadically through three hospitals and two IDP camps in Léogâne (10,000 to 12,000 people). In addition, they provided logistical support to the ACT Alliance partners and World Vision as they scheduled regular trips to Port au Prince (Mondays, Wednesdays, and Fridays) and back to Santo Domingo (Tuesdays, Thursdays, and Saturdays). Dominican World Vision also used SSID to distribute its aid to PaP.

During the first phase of the response (until the end of January), SSID's relief effort conformed to a two echelon distribution system that included two distribution centers in

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Santo Domingo and Port au Prince, a staging area in Jimaní, and a set of supply and demand nodes. As part of the operations, the different Evangelical churches in the Dominican Republic gathered the supplies identified as needed in Haiti and sent it to SSID's warehouse in Santo Domingo. From there, the trucks transported the goods to a staging area in Jimaní, a small community located at the border between the Dominican Republic and Haiti. Then, the supplies were transported to the Seminario Nazarene (Church of the Nazarene, 2010) in Port au Prince—which acted as a distribution center—in convoys of 3-4 medium size trucks of 6 metric tons of capacity. The local churches, acting as PODs, sent small pick-up trucks to get the supplies needed and distribute them to their members. This system was replaced in the first week of February with point to point distribution from the staging area at Jimaní to the IDP camps under the responsibility of the SSID. This new strategy was possible as the rubble from the main streets was cleared, and overall conditions at the IDP camps had improved. Thus larger trucks could be used to transport supplies to the larger camps. During the second phase, however, predominantly small trucks and pick-ups were used to transport the supplies from Jimaní to the IDP camps. This operation translated into a safer, more secure, and more effective relief effort. First, the use of small vehicles and small shipments reduced their value as a target of robberies on the way to the camps. Second, since the shipment is meant for a specific camp, the residents there have an incentive to protect it, as do the criminal element that could not risk alienating the local population of which they are part of (in fact, the information provided to the authors indicate that the local criminal protected the shipments). These decisions may help explain why none of the SSID's trucks were robbed during the relief effort. In total, the SSID was involved in distributing supplies to 23,000 individuals on a regular basis for about two months, 3,000 individuals at two IDP camps from the second month on, and an additional 12,000 individuals sporadically. They also supported two health centers. This is undoubtedly an outstanding performance for a group of predominantly volunteers that generated the bulk of the relief aid they distributed (Servicio Social de Iglesias Dominicanas SSID, 2011b).

Plataforma de Ayuda a Haití

The day after the Haiti earthquake a diverse group of Dominican civil and social organizations (i.e., Centro Bonó, Centro Cultural Poveda, Centro Montalvo-Bonó, Colectiva Mujer y Salud) decided to work together to participate in the relief effort, and created the Plataforma de Ayuda a Haití (Platform to Help Haiti, or the "Platform"). The Platform created a number of work groups including: coordination (with local organizations in Haiti), bi-national advocacy, donations management, volunteer management, health, information and communications, fund raising, and infrastructure (Plataforma de Ayuda a Haití, 2010). In terms of donations management, the Centro Bonó in Santo Domingo was used as the main distribution center. Here, donations were handled and supplies were gathered from other distribution centers set-up by the organizations part of the Platform. After the aid was received, supplies were organized, classified and then sent to a warehouse lent by a Dominican company (Fructuosas S.A.). At this location, the supplies were further classified by commodity type and arranged in pallets to be sent, either directly to Port au Prince or to a warehouse at Zona Franca in Barahona. This was performed in collaboration with teams at the Jimaní and at Port au Prince. The distribution strategy made use of teams at the border

to coordinate with authorities. This was crucial as it allowed the pass of trucks and the proper paperwork during changing conditions (Plataforma de Ayuda a Haití, 2010).

When the supplies arrived at the Noviciado de los Jesuitas in Port au Prince—that played the role of distribution center—the work was performed in two stages. In the immediate response, representatives from different IDP camps approached the center with a list of requirements, which was verified by visits to the camps. Later on, the distribution arrangements were made by the beneficiaries or their representatives, who were also in charge of allocating the supplies at the camps. In the second stage, eight distribution points/centers were placed at different locations of the affected area: Noviciado de Jesuitas, at Tabarre; Centro de Cité aux Cayes (coordinated by the Petites Soerus de L'Évangéle of the Focoult Sisterhood collaborating and the St.Lois/marie de Mont Fort parish); Center Saint Louis, located behind the Saint Louis parish; Pacot, at the Mont Font parish; Orphanage Foyer Marie, Reine des Apôtres de Leogane; Hospital Cardenal Léger, Leogane; Canape Vert; and Ville Manrese. The use of these locations allowed distributing supplies to camps that were not being aided by other organizations. The activities decreased in April when inspections at the border tightened leading to a slowdown in the flow of relief aid.

ANALYSES AND POLICY IMPLICATIONS

Implicit in the discussions in the preceding sections is that the performance of the HL structures that emerged after the Port au Prince earthquake was determined by their ability to quickly establish an efficient local distribution. Operations that attempted to create such a network from scratch, i.e., ACEs, faced huge obstacles that took them weeks to overcome. In contrast, PIEs and CANS were able to put in place very efficient local distribution efforts much faster than the ACEs. In essence, the ability to do the local distribution was the constraining factor. This insight is consistent with the experience in commercial logistics in that the most challenging part of the distribution process is the so called “...last mile delivery...” problem. Understanding the technical reasons that explain this phenomenon, requires estimating the amount of supplies that need to be transported to the impacted area, the number of PODs and of manpower required to do the job. The amount of cargo to be transported after a disaster should satisfy the needs of both the population in need (agent-generated), and the response itself (response-generated) (Dynes et al., 1972; Taylor and Quarantelli, 1976). In terms of agent-generated demands, there are different guidelines that define minimal amounts to be handed out to survivors. For instance, the U.S. Army Corps of Engineers (U.S. Army Corps of Engineers, 2010) suggests a minimum of 10 kg of water, food and ice; the SPHERE Project suggests 7 to 14 kg of water per day plus half a kg of food (The Sphere Project, 2011); while in Japan about 20kg/day of supplies were handed out at the beginning of the response (Holguín-Veras et al., 2011); in addition, to an estimate of response-generated of about three times the agent-generated demands (Holguín-Veras and Jaller, 2012). This implies that anywhere between 20 to 80kg/day of supplies could be needed to satisfy the needs of both population and the response. In an urban area of more than two million inhabitants like Port-au-Prince, this translates into 60,000 to 240,000 tonnes of supplies per day.

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A second aspect is the manpower needed at each stage of the process. To illustrate the magnitude of the challenge, consider the case of a truck driver (with a helper) that makes the six hours trip from Santo Domingo to Port au Prince in a semi-trailer with 30 metric tons of supplies (12 staff-hours of work) that requires 10 staff-hours (with forklifts) to be loaded. Unloading the cargo from the semi-trailer and loading it on six 5 ton trucks would take 40 men about six hours, for a total of 240 staff-hours. Transporting the cargo to six different PODs took, on average conditions in Port au Prince, about 3 hours per round trip leading to 36 staff-hours of drivers and helpers. Unloading the cargo at the PODs would take about the same effort as loading the small trucks, i.e., 240 staff-hours. However, splitting the rations and distributing to the population would require 1,080 staff-hours each (i.e., 6 PODs, 60 persons, three hours each). These results imply that the long-haul portion requires about 22 staff-hours (10 staff-hours loading plus 12 staff-hours driving); the local distribution consumes about 276 staff-hours (240 staff-hours unloading and loading the small trucks plus 36 staff-hours driving to PODs; and that preparing and handing out the supplies requires a staggering 1,320 staff-hours (240 staff-hours unloading plus 1,080 staff-hours preparing rations and handing them out to survivors). In essence, transporting the supplies to the PODs requires about 12 times the effort than the long-haul trip; while preparing and distributing the rations require 60 times the staff-hours required for the 290 km trip.

The third important aspect is the number of PODs required for distribution in the impacted areas. Although there are not many established methodologies to estimate the ideal number of PODs for a given disaster, recent research (Jaller and Holguín-Veras, 2011) established that the optimal number of PODs depends on walking and waiting costs of survivors, and setup and operational costs per POD. Furthermore, in urban disasters where streets are clogged with debris and driving is not an option, walking is the only option and thus a limiting factor of the area served by a POD. The authors estimate that delivering the aid to the more than 2 million residents of Port au Prince, scattered over more than 90 km², with few formal streets and highways, may require between 100 to 200 PODs. Assuming that each POD requires 80 staff/volunteers, (to organize/control the crowds, ensure the safety of the staff, and other support functions) implies that anywhere between 8,000 to 16,000 staff members are needed to distribute the aid; plus another 4,000 to 5,000 to load and transport the cargo to the PODs. Gathering, training, and putting in place such workforce are a huge logistical undertaking. To make the point, it suffices to mention that these numbers are equivalent to one division of average size in the U.S. Army, e.g., about 20,000 troops; that typically take 3-4 weeks to be fully deployed. These estimates are consistent with the experience of the US military in Haiti: by January 22, they had a total of 13,657 personnel in Haiti (3,258 ashore, 10,399 afloat); and by the end of January they had over 22,200 people both on the ground and off shore (United States Southern Command, 2010). The key implication is that it is not practical for foreign relief groups to attempt to create a local distribution network after a large urban disaster as it simply takes too long to be of any help. Even if POD staffers are selected from the local population, recruiting and training them is a major challenge as it would have to take place throughout the impacted area. For these reasons, the local distribution after a catastrophic urban event is bound to become the bottleneck of the entire relief effort. This conclusion has sobering implications. A successful local delivery operation requires a logistical structure, and both assets and manpower suitably distributed throughout the impacted area in a timely manner. However, creating such structure is a major challenge.

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The fundamental insight is that HL is a socio-technical process in which both the social and the technical sides have to work well for the relief effort to be successful. The problem is that creating the vast network of individuals and systems required to successfully do humanitarian logistics from scratch takes a significant amount of time and resources, which are in short supply in post-disaster response operations.

The analyses conducted by the authors clearly indicate that, in an ideal setting, the CANS should play the key role in the local distribution of relief goods after catastrophic events. This is because the CANS: (1) are very large, thus able to provide the manpower needed to do relief distribution in a post-disaster environment; (2) have a distributed structure with many nodes, e.g., churches, scattered all over the entire area which make them extremely resilient; (3) have very strong social/religious connections that contribute to internal cohesion and collaborations among members; and (4) are comprised of individuals naturally inclined to help the needy. For instance, the SSID estimates that is supported by a network of about 11,000 churches (8,000 in the Dominican Republic, and another 3,000 in Haiti), 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, have enabled the CANS to remain functional after disasters (after all, some of them, e.g., Catholic Church, have existed for thousands of years). Taken together, the results highlighted in this section imply that responding to a large catastrophe is best done in combination with large, resilient, and highly connected (internally and externally) pre-existing social networks. Using such networks to do the local deliveries of the aid is, in the opinion of the authors, the most effective alternative. In this context, the CANS have ideal characteristics to become the backbone of the local distribution effort because: (1) they are already in the ground, which eliminates the need to transplant or create an alternative distribution structure and helps the effort tremendously; (2) their massive size allows the network to absorb the large inflows of supplies needed as part of the response to a large or catastrophic disaster; and, (3) they are geographically distributed, which minimizes the need for relocating volunteers, equipment, and supplies. In the opinion of the authors, there are no alternative structures (pre-existing, or to be created) that could match what the CANS could provide. In terms of their role in the entire distribution effort, the capabilities of foreign relief groups and CANS are best utilized when the former focus on the transportation of the large volumes of supplies to the disaster site; leaving the local distribution to the CANS. 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 recommendations include: (1) taking steps to put in place an integrated logistical structure based on exploiting the strengths of foreign groups to transport large volumes of supplies to disaster sites, and the unique ability of the CANS to locally distribute the aid through their massive local networks. (2) 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. (3) The creation of a Coordinating Committee of CANS that will be in charge of ensuring an equitable and just distribution of resources. (4) Training the leaders and key members at each of the locations part of the CANS (which are the nodes in the network, e.g., churches) on risk management, first aid, disaster response, humanitarian logistics, and the like. (5) Designate each

node/location as a POD to be activated in the event of a disaster. 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 it frequently happens after large disasters.

The approach suggested here implies a significant departure from prevailing practices at many relief organizations, that emphasize control and custody of the aid flows. In the opinion of the authors, such goals could be accomplished with proper training and engagement of reputable CANS. The research reported in this paper has provided evidence of the importance of integrating relief efforts to the local social networks in the impacted area, and of the major challenge posed by the local distribution of supplies after a catastrophic event. The authors' hope is that these findings help improve humanitarian efforts after future disasters and catastrophic events.

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