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**RISK, RESILIENCE,
AND RECOVERY:
THE HAITI EARTHQUAKE,
JANUARY 12, 2010**

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Abstract: The transition from response operations to the more difficult and complex challenges of recovery following a destructive event marks a critical shift that, supported by sound analysis, planning, and organizational learning, can lead to a more resilient community. The recent January 12, 2010 Earthquake in Haiti offers an unusual case in which to examine this transition process in both theory and practice. We investigate whether the large number of disparate organizations and jurisdictions that participated in response operations in Haiti has actually coalesced into a coherent system that can bridge international assistance with local capacity to provide an integrated basis for recovery. More critical is whether this nascent international/national system can sustain the complex operations needed for recovery over time.

The increasing impact of natural hazards on human settlements across the world, with consequent losses in lives and property, has underscored the urgency of improving risk management in vulnerable regions. Since 1985, at least fourteen major earthquakes over Magnitude 7.0 on the Richter scale have struck in populated areas around the world, resulting in losses of over 700,000 lives and an estimated \$300 billion in property losses. Table 1 (next page) cites the loss data by seismic event. These data regarding earthquakes document only partial losses from natural hazards. Tropical cyclones in Bangladesh, 1991 and India, 1999; floods in Venezuela, 1999 and China, 2009; hurricanes on the U.S. Gulf Coast in 2004, 2005, and 2008 and a severe heat emergency in France, 2003 have added to this toll. The need for informed analysis and collective action to manage risk from natural hazards is clear. The policy question is what methods and models of risk can most appropriately inform policy makers and residents of regions exposed to hazards and enable them to take timely, appropriate action to reduce risk before a hazardous event occurs, respond effectively when it does, and recover quickly into a stronger, more sustainable community after a damaging event.

Much attention has been given in the administrative and policy literature to the challenges of preparedness and response to disasters (Waugh, 2000, 2006; Waugh and Tierney, 2007; Quarantelli, 1998), but relatively little attention has been given to the more critical set of functions that mark the transition from the immediate response following a destructive event to more difficult and complex challenges of recovery from the actual damage. This transition marks a critical shift that, supported by sound analysis, planning, and organizational learning, can lead to a more resilient community able to anticipate risk from natural hazards

more effectively and manage scarce resources more appropriately to reduce risk from future threats. Characterizing this transition process requires three basic steps: 1) identifying the primary actors, policies, and procedures and status of risk management in the disaster-affected region prior to the event; 2) identifying the influx of new actors and implementation of specific policies and procedures that structure operations in the immediate response to the event; and 3) identifying the changing patterns of interaction among actors as operations shift into recovery and long-term sustainable development. This is a dynamic process that generates a complex set of actors which engage in different activities at each stage, often changing their functions in adaptation to the changing environment. Mapping the patterns of interaction among this changing and diverse set of actors allows the identification of a disaster recovery system that evolves over time.

Three primary characteristics affect the patterns of interaction among actors participating in the disaster recovery system. These include the: 1) severity of the triggering event, capacity in place before the event, and consequent degree of damage; 2) scalability of recovery operations initiated at different jurisdictional levels of authority; and 3) heterogeneity of participating actors and affected clientele groups. Understanding this transition process can best be done by examining an actual case in practice. The recent January 12, 2010 Earthquake in Haiti offers an unusual case for analysis, as it represents a hazard event that has generated extraordinarily severe consequences for the capital city of Port au Prince and the entire country. Recovery in this instance takes on new meaning in terms of rebuilding not just damaged infrastructure, but a set of economic, legal, and social institutions that can anticipate and manage risk more consistently and effectively before hazardous events occur, as they surely will again in this small Caribbean nation exposed to multiple hazards.. Importantly, the redesigned infrastructure and revitalized organizational policies and processes that are currently in the planning stages will transform the basic needs of Haiti, turning recovery from a single catastrophic event into long-term program of sustainable development for the nation.

TABLE 1: MAJOR EARTHQUAKES WITH CONSEQUENT LOSSES IN LIVES, PROPERTY, AND NUMBER AFFECTED, 1985-2010

YEAR	COUNTRY	AFFECTED AREAS	DEPTH (KM)	MAG. (MS)	DEATHS	INJURED	NUMBER AFFECTED	DAMAGE (MILLIONS \$US)	HOUSES DESTROYED	TSUNAMI GENERATED
1985	Mexico	Michoacan: Mexico City	28	8.1	9,500	30,000	2,130,204	4,104	–	Yes
1988	Armenia	Leninakan, Spitak, Kirovakan	5	6.8	25,000	–	1,642,000	14,000	–	No
1990	Philippines	Baguio, Cabanatuan, Dagupan	25	7.8	2,412	–	1,597,553	370	–	No
1995	Japan	Sw Honshu: Kobe, Awaji-Shima, Nishinomiya	22	6.8	5,297	36,896	541,636	100,000	200,000	Yes
1997	Iran	Birjand, Ghaen	10	7.3	1,568	2,300	74,600	100	10,533	No
1999	Turkey	Istanbul, Kocaeli, Sakarya	17	7.8	17,127	50,000	1,358,953	20,000	–	Yes
1999	Taiwan	Nantou, Taichung, Taizhong	33	7.7	2,264	8,700	108,664	14,100	8,200	No
2001	India	Gujarat: Bhuj, Ahmadabad, Rajkot; Pakistan	16	8	20,005	166,836	6,321,812	2,623	339,000	No
2003	Iran	Southeastern: Bam, Baravat	10	6.8	26,796	30,000	267,628	500	–	No
2004	Indonesia	Sumatra: Off West Coast	30	8.8	165,708	–	532,898	4,452	–	Yes
2005	Pakistan	Muzaffarabad, Uri, Anantnag, Baramula	26	7.7	73,338	69,000	5,128,000	5,200	–	No
2008	China	Sichuan Province	19	8.1	87,476	374,171	45,976,596	85,000	–	Yes
2009	Indonesia	Sumatra: Padang	81	–	1,117	1,214	2,501,250	2,200	–	Yes
2010	Haiti	Port-Au-Prince	13	7.3	222,570	–	3,700,000	–	97,294	Yes
2010	Chile	Maule, Concepcion, Talcahuano	35	8.8	530	–	2,671,556	22,500	200,000	Yes
2010	China	Qinghai Province: Yushu	10	7.1	2,183	12,135	10,515	4	15,000	No

■ THE JANUARY 12, 2010 HAITI EARTHQUAKE: INITIAL CONDITIONS, CONSEQUENCES, AND ACTIONS

A severe earthquake measuring 7.0 on the Richter scale occurred on the Enriquillo Fault in Haiti on Tuesday, January 12, 2010 at 4:53 p.m. The epicenter of the earthquake was located at 18.457°N, 72.533°W, approximately 25 km. west of Port au Prince, the capital city of Haiti, at a depth of 13 km, or 8.1 miles

(USGS, 2010). The earthquake severely damaged Port au Prince, the capital city of Haiti and the political, economic, and cultural center of this small Caribbean island nation. Recent reports (EERI, 2010; MCEER, 2010; Government of Haiti; 2010) cited losses of at least 250,000 lives, with 1.5 million people homeless, as the earthquake had destroyed approximately 80% of the buildings in Port au Prince. Eleven out of twelve governmental ministries collapsed, as well as the presidential palace, leaving an already fragile government in Haiti with limited capacity to respond to the enormous need generated for its affected population. In addition, approximately 80% of the schools' infrastructure was destroyed or damaged; three of the four universities were severely damaged, and the General Hospital, the primary medical institution in the city collapsed.

The catastrophic damage to this port city devolved directly from the initial conditions in which the earthquake occurred. There was virtually no awareness of seismic risk or preparedness for earthquakes in this small island nation, located on the edge of the Caribbean plate. Further, the level of poverty, illiteracy, and limited infrastructure existing prior to the earthquake was exacerbated by a series of unstable governments for the previous fifty years, a set of conditions that ranked Haiti 149th out of 189 nations on the United Nations' index of human development (UNDP, 2009)¹. When the earthquake occurred, Haiti had no national disaster plan; no building codes were in effect, and government's limited capacity to respond was further constrained by the direct loss of personnel, buildings, and equipment. Haiti was in urgent need of assistance from the international community.

■ THE ROLE OF INTERNATIONAL ORGANIZATIONS

The international community responded quickly and generously to provide assistance to Haiti in this devastating event, but the task of mobilizing the international response and coordinating it with Haitian organizations to meet the overwhelming need proved to be a major challenge. Not only were the local Haitian governmental agencies shattered and limited in their capacity to function, but also the United Nations (UN) mission in Haiti was severely affected. The United Nations had both a UN Development Program in Haiti and a UN peacekeeping force, United Nations Mission to Stabilize Haiti (MINUSTAH). Both missions suffered severe losses in personnel and building structure. Especially crippling were the deaths of the UN Head of Mission and his deputy, who were in the UNDP building when it collapsed. MINUSTAH also lost personnel when its building structures were damaged. The UN lost 144 experienced personnel who were familiar with Haiti and its programs, a critical loss in establishing the cross-jurisdictional capacity needed to respond to the extraordinary demands generated by the earthquake.

Over 1,000 governmental and nonprofit organizations rushed from around the world to assist the people of Haiti, overwhelming the limited transportation and communication facilities that were further disrupted by the earthquake. This urgent situation required the rapid design and implementation of an information management system for response and recovery operations, delayed in part as the United Nations, responsible for managing international response to disaster-stricken communities, was coping with its own losses.

The formal process for securing international assistance for Haiti was initiated by President René Préval when he requested international assistance from the United Nations. This request activated the Office of Coordination of Humanitarian Assistance (OCHA) which implemented its Cluster format for organizing the many nonprofit, governmental, and private organizations that sought to give assistance to the Haitian people following the disaster. The UN Cluster format emerged informally in practice in the spring of 2005 in the aftermath of the Sumatran Earthquake and Tsunami, was formally organized and adopted by OCHA in July 2005, and was first officially implemented in the Kashmir, Pakistan Earthquake in October, 2005². Essentially, the Cluster format is designed to align the response activities and services that are offered by international organizations to the needs of the disaster-affected population and the capacities of the local host

¹ UN Human Development Index, <http://hdr.undp.org/en/statistics/> Accessed May 15, 2010.

² Personal interview, UN OCHA staff member, UN Logistics Base, Haiti, March 10, 2010.

country organizations to receive and implement them. For example, all nonprofit organizations and governmental jurisdictions providing materials, personnel, and skills in constructing shelter meet together and share information and strategies under the aegis of the shelter cluster; all nonprofit organizations and government agencies providing personnel, supplies, and skills in health care coordinate their activities under the health cluster. It is a functional scheme to organize thirteen different types of service, such as food, shelter, health, education, logistics, agriculture, water and sanitation, that presumably has both international and national counterparts. The organizational design is intended to provide a collaborative means of matching resources to demands in an efficient, constructive process. In theory, the UN Cluster format represents a reasonable way to manage the intersection between offers of international assistance and needs of a disaster-stricken community.

In practice in Haiti, the UN Cluster format was hampered by several local constraints. Severe damage to both Haitian national agencies and the responsible United Nations agencies slowed the implementation of the cluster process and led to significant variance from the official Cluster format, not always positive. Confronting urgent, massive need with limited local capacity in a city overwhelmed by disaster, international organizations acted to provide immediate relief, doing what they thought needed to be done under the critical press of time and the obvious suffering of the Haitian people, so visible in the streets. As a result, the primary disaster needs assessment was conducted largely by international organizations, with relatively little participation from Haitian ministries or agencies. The immediate coordination of logistics for incoming international assistance was provided by the U.S. military at the request of President René Préval, given the damage to the airport and the strain of managing up to 80 flights a day at an airport with only one runway and limited landing facilities. (The airport was returned to Haitian control by mid-March, 2010). The official registration process for all NGOs and governmental agencies seeking to provide assistance, formally a function of UN OCHA, was turned over to the individual clusters in late March, largely abandoning the intent of obtaining an accurate, comprehensive list of all organizations, governmental and nongovernmental, who were offering assistance, materials, and services in Haiti. Although an official web site was established to provide information on all cluster activities, <http://haiti.oneresponse.info>, the timeliness and accuracy of the information available depends upon the voluntary entry of information by the participating cluster lead organizations. The thirteen clusters have different levels of skill in data management, use different types of software, and allocate different amounts of time and attention to this task. The result is a less than systematic record of disaster assistance activities that is largely presented in English in a nation where the official language is French.

A second constraint on the development of an integrated approach to the design and delivery of disaster assistance to the Haitian people was the physical separation of the international agencies from the local Haitian ministries and agencies. Given the severe destruction of the built infrastructure in Port au Prince, the international organizations established their base of operations in temporary container boxes at the United Nations Logistics Base (Log Base) near the Toussaint L'Overture Airport. This practical solution solved the space problem, but adversely affected communication and coordination efforts with Haitian organizations. Cluster meetings were largely held at Log Base, but the condition of the roads and heavy traffic meant that travel time between Log Base near the airport and the Haitian agencies down town was at least an hour and a half on a good day. Consequently, the cluster meetings, most often conducted in English, had little participation from their Haitian counterparts, and the goal of an integrated disaster assistance effort, although often stated in theory, was largely not achieved in practice. The urgent need for advanced information management and decision support tools to support coordinated action among international, national, and local organizations, given the physical limitations of the operational environment, is now recognized by key actors, but is not yet in place.

The potential for increased, effective use of information technologies to overcome serious constraints of distance and time hindering the development of coordinated action is clearly apparent in the spontaneous use of Twitter messaging, text messaging, and importantly, the use of texting via cell phones to raise funds for

Haiti relief. Approximately \$554 million was raised via text messaging alone³, a record for philanthropic organizations seeking to mobilize support for a single humanitarian mission. Crisis camps sprang up across the world, starting in Los Angeles, California, spreading to New York, Washington, DC, London and Mumbai. These camps were one-day gatherings of individuals skilled in computer programming, software development, and spatial analysis, who volunteered their time and technical skills to interpret satellite imagery of the damaged area, program the data into GIS maps, and make the maps available without charge to search and rescue teams working on the ground in Port au Prince. The rapid and spontaneous emergence of both technical developments in software programming and fund-raising campaigns for Haiti created a conscious engagement by citizens in the global community in support of Haiti. Nonetheless, these efforts need to be nurtured and guided into a global information infrastructure that can provide consistent and informed support for the continuing tasks of reconstruction and development in Haiti.

A third area of emerging cooperation among the international and national communities lies in the area of security. Haiti represents an interesting case of nation-building in a non-conflict zone. MINUSTAH, first authorized by the United Nations Security Council in 2004 (Resolution 1542, April 30), is a UN peace-keeping force organized under the Brazilian military and composed largely of Latin American troops. Initially authorized for 6,700 military personnel and 1,622 UN police, the mission is intended to work collaboratively with the Haitian national police, provide training, and set a professional example for maintaining security in the nation. Re-authorized in October, 2009 (UN Security Council Resolution 1892), the international forces were increased to 6,940 military personnel and 2,211 UN police. After the earthquake, the authorization for the number of troops was again increased on January 19, 2010 (UN Security Council Resolution 1908), and the current strength now stands at 7,032 military troops and 2,055 UN police.⁴ Further, the allocation of 10,000 U.S. military troops by President Obama on a humanitarian mission to Haiti marked a significant contribution to the early response efforts in the first two months following the earthquake. These troops carried out critically important tasks of clearing debris, establishing shelters, setting up camps for Internally Displaced Persons (IDP), and reactivating the port that had been badly damaged. Their engineering skills were essential in restoring a basic measure of functionality to the devastated city. The four branches of security forces -- UN military, UN Police, US military, and Haitian National Police (PNH) – developed a professional mode of defining, executing, and managing projects that was mission-oriented and largely apolitical. While there are certainly areas that could be improved, this area of security showed substantive collaboration and advancement of the overall mission to stabilize Haiti.

A major question is whether the large number of disparate organizations and jurisdictions that participated in response operations in Haiti has actually coalesced into a coherent system that can bridge international assistance with local capacity to provide an integrated basis for recovery. More critical is whether this nascent international/national system can sustain the complex operations needed for recovery over time.

■ COMPLEX, ADAPTIVE SYSTEMS IN DISASTER ENVIRONMENTS

A disaster response system constitutes an interconnected set of components that includes individuals, groups, organizations, jurisdictions, and computers operating as intelligent agents in the changing conditions of a region struck by disaster. These agents have the capacity to search for, and exchange, information to support action. They interact in an interdependent web of operations that provides life-saving rescue services and support in food, shelter, and medical care to communities damaged by extreme events. Response systems emerge following an extreme event when the interacting agents are committed to a shared goal: protection of life, property, and continuity of operations for the damaged community. Such a disaster response system clearly emerged following the January 12, 2010 earthquake in Haiti, and the dynamics among the participating organizations create the basis for the next phase of action, the transition to reconstruction and recovery in Haiti.

³ Kathleen Buechel, Executive Director, Philanthropy Forum, University of Pittsburgh, April 6, 2010.

⁴ www.un.org/en/peacekeeping/missions/minustah/facts.shtml

Disaster response systems reflect the basic characteristics of complex adaptive systems (CAS) that are observed in other dynamic environments (Holland, 1995; Axelrod and Cohen, 1999; Newman, Barabási, and Watts, 2006). These characteristics include the emergence of new agents as well as the capacity of the system to adapt its performance under changing conditions to achieve a better fit to its operating environment. The system's capacity for adaptation is driven by an internal dynamic; that is, the changes are not imposed by external authority, but rather result from reciprocal interactions among agents. In disaster response organizations, the driving dynamic is the shared goal of protecting life, property, and continuity of operations.

In characterizing and analyzing such complex systems in disaster environments, the research tasks are more complex, measurement issues are more difficult, and integration of data from different sources is not trivial, but the goal of identifying the threshold points at which interdependent agents cohere into a functioning system or fail to do so remains the same. The use of multiple methods of data collection and analysis enhance the validity of findings through triangulation. Insights and information drawn from analyses of disaster response operations are invaluable in informing the next stage of disaster risk reduction, the transition to sustainable recovery in a damaged region.

Each complex system consists of multiple agents who are interacting to some degree with one another and their environment. The degree of interdependence or dependence among the organizational agents engaged in disaster response operations is a major factor that contributes to the performance of the system and its vulnerability in environments exposed to varying degrees of destruction and risk (Perrow, 2005). The extent to which one system made up of multiple agents depends upon another, either for a physical resource, spatial proximity, or updated status of the changing situation increases the vulnerability of the second system to the failure of the first. If this dual dependency then triggers failure in a third system, a cascade of failure may ripple across all related systems in catastrophic failure. Consequently, the vulnerability of organizational systems that conduct basic response operations in a disaster-affected region cannot be calculated separately from technical systems, but rather must be based upon careful estimates of the degree of interdependence or dependence across the entire socio-technical system that provides urgently needed services to a disaster-stricken region.

Perrow (2005) distinguishes two types of interdependence from dependence in interacting systems. The first type, in his terms, is *reciprocal*, in which one system affects the operation of another, but in turn is influenced by the ensuing change in performance of the affected system. The two systems, through their interactions, mutually alter the performance of one another. The second type of interdependence is *logical*, in which one system shares the same structure for operations as the second, enabling the two systems to function in productive exchange and extending the capacity of both. This type, close to the concept of interoperability sought by emergency managers in communications and other functions, is critical to managing technical infrastructure. Perrow (2005) classifies other types of connections among systems as simple dependencies, where there is no interactive influence exchanged among two systems. Rather, he designates two types of dependence, physical and spatial, in which the operation of one system is affected by the performance or lack of same by another system. Physical dependency is obvious. If a hospital collapses, its medical personnel cannot provide services in that building, and their capacity to provide timely medical care is compromised. Spatial dependency captures the interaction among technical systems that are located in the same area. Overlapping distribution systems such as water, power, and sanitation, create spatial dependencies that may spread disruption from one system to others operating in the same affected region.

In addition to physical and spatial dependencies, we add temporal dependency, in which the sequence of time is critical to the performance of related systems. Temporal dependency is illustrated most vividly by the limited time for survival of persons trapped in the rubble of collapsed buildings. If rescued within one hour, almost all trapped persons survive, but the rate of survival decreases significantly with time (Ricci et al, 1991). After four days without access to water, chances of survival by any trapped person are severely limited, and after 12 days, almost nonexistent (Pretto et al, 1992).

Disaster response systems, then, constitute a distinct type of dynamic network that not only emerges out of interactions among organizations that converge on a disaster scene to assist stricken community residents,

but also adapts to the severely damaged context of a disaster-stricken region. This adaptation creates the basis for transition to the next phase in the evolving process of disaster risk reduction for the community, recovery and reconstruction. In many cases, the same organizations are involved in recovery, but their personnel may change, the organizations may perform different functions, interact with different agents, and achieve different results for the community. The goal of the action system also shifts from the clear, urgent goal of life safety and survival in disaster response to a more nuanced set of multiple and sometimes conflicting goals for economic, social, and political development during recovery, with different strategies affecting different groups in different ways. How the disaster response system forms, what degree of effectiveness it achieves, at what rate it develops over a given time period and how it is perceived both by internal and external actors become critical factors in determining the shape and performance of the transition to sustainable recovery

■ **THE ASYMMETRY OF INFORMATION, KNOWLEDGE, CAPACITY, AND SKILLS**

The consequence of gross disparities in wealth, education, and employment opportunities, limited civil and technical infrastructure, a fragile government, and an essentially cash economy has created an asymmetry of information available for problem solving and capacity for collaborative action in Haiti. Although the efforts of the international organizations to plan and provide assistance for disaster recovery are well-meaning, generous, and often creative, in large part the ensuing plans have been constructed without substantive participation by Haitian policy makers and managers and with little knowledge of Haitian conditions, culture, or capacity. This asymmetry of information widens to broader discrepancies in knowledge, experience, and skills. In Haiti, with few opportunities for employment outside the governmental sector, few Haitians have had the experience to develop the kinds of proposals and terms of reference that are standard requirements for participating in the international project management process. This asymmetry has, inadvertently, increased the distance between the international donors and national managers who are engaged in the recovery process. Although neither group of actors can function without the support and assistance of the other, it becomes challenging at best and dysfunctional at worst when the gap of knowledge, capacity, and skills between them widens.

Despite the near ubiquity of cell phones, the use of computers and access to web online services remains limited to a very small proportion of the population in Haiti. This discrepancy is accentuated by the unreliability of basic infrastructure. Only 12% of the population has access to reliable electricity. Without electrical power, many opportunities for interacting with other individuals and organizations disappear. The interdependencies that have kept Haiti mired in poverty and stagnated in economic and social development can and should be broken. If access to electrical power is critical to communications, this may be a threshold point of change where international engineering services can make a substantive contribution in working with local Haitians to build this capacity.

The question is how to break the asymmetry in information, knowledge, and skills between international organizations seeking to offer assistance and Haitian organizations eager to recover and rebuild a stronger, more stable society. Thoughtful managers in both international and national organizations are seeking new forms of organization and practice that will build the capacity of Haitians to manage their own recovery and reconstruction process. In fact, in a small nation that has had limited educational opportunities for the majority of Haitians, it will be essential to rely on either international experts or members of the Haitian diaspora, now living abroad, in the initial stages of planning and action for recovery. The Haitian diaspora includes Haitians who left their country for education abroad and who, for economic and professional reasons, found it difficult to return. Many members of this diaspora, living in Miami, New York, Montreal, and Paris, retain close ties with family members in Haiti, sending regular remittances and continuing to support them from earnings gained in jobs held abroad.

One approach to reducing this asymmetry between international and national organizations in the long-term recovery process is to consider the recovery system as a large network that has links between both sub-systems, national and international. The nodes in the network represent the major actors in each sub-

Table 2: Network Centralization Descriptive Statistics

NETWORK DESCRIPTIVES	DEGREE	NRM DEGREE	SHARE
Mean	2.881	2.667	0.009
Std Dev	3.895	3.606	0.012
Sum	314.000	290.741	1.000
Variance	15.169	13.005	0.000
SSQ	2558.000	2193.073	0.026
Minimum	1.000	0.926	0.003
Maximum	24.000	22.222	0.076
Overall Network Centralization	19.92%		

The overall measure of degree centralization, at 19.92%, shows a loosely connected network with four clear nodes of interaction in Figure 1, centering on the Government of Haiti, Caribbean Community, Caribbean Disaster and Emergency Management Agency, and the Government of Jamaica, with a lesser focus on the Office of the President of Haiti. The international public organizations connect largely through these nodes, but not noticeably with one another. More surprising is the ring of disconnected organizations that surround the central nodes and appear to be operating largely without contact with the Haitian organizations. Key organizations play bridging roles, such as the Government of Jamaica, in linking international public organizations to the Government of Haiti. Table 3, Appendix, lists the degree centralization for individual organizations. Note that the Government of Haiti ranks third, with CARICOM and the Government of Jamaica in first and second place respectively. On this list, MINUSTAH ranks fifteenth, and the US and Canadian Governments rank 21st and 22nd respectively.

The data reported in this analysis is taken from CANA, an online news source based in the Caribbean that focuses largely on regional interactions. While the CANA data capture more fully the interactions among the Caribbean nations in response to the Haiti Earthquake, it does not cover fully the actions taken by the larger international community, nor does it capture in detail actions that were taken by Haitian organizations. For example, the network map shows only one local nonprofit organization (black square), the Children’s Brigade, when in fact there were many localized efforts to set up IDP camps on private property. These camps were privately financed and serviced by Haitian families and organizations, which provided food, water, and latrines for the people housed in them.⁵ A second content analysis of news reports in the *New York Times* offers a distinctly different perspective of the network of organizational interactions, focusing largely on the substantive efforts of the U.S. Government through the U.S. Department of State, Department of Homeland Security, U.S. Agency for International Development, Office of Foreign Disaster Assistance, Federal Emergency Management Agency and the Centers for Disease Control. The *New York Times* content analysis is not reported in this article, and the CANA analysis is presented only as illustrative of regional support for disaster response and recovery in Haiti, not as a definitive analysis of the network of organizations engaged in response and recovery operations.

■ RECOVERY AS SUSTAINABLE DEVELOPMENT

The transition from response operations to recovery following a disaster is one major step. The next is the transition from recovery into sustainable development. This step, long ignored by the development

⁵ Personal observation, Field trip to Port au Prince, May 2-9, 2010.

community, is now recognized as increasingly important by international disaster managers and policy makers (ISDR, 2007). It is, however, not an easy transition to make. Just as the transition from response to recovery depends upon the decisions made, relationships forged, and patterns of interaction and accountability established during the response process, the transition from response to recovery builds on the base of knowledge, experience, insight and relationships nurtured in recovery to ease the transition from recovery to sustainable development. The process is cumulative and it creates the basis for coordinated action in the next transition, from recovery to sustainable development. This transition will mark the full implementation of Haitian management of its own risk and resources.

Undoubtedly, as a small nation struggling to find its place in a wider international arena, Haiti will need to rely on international guidance and support its transition to long-term development. Yet, incorporating the bases for sustainable economic and social development into its recovery plans will smooth that transition significantly. Haiti has the opportunity to use new strategies of marketing, enhanced by Internet technologies and visualization, in its drive to develop a viable economy to support a sustainable society. This effort requires a new vision of Haiti as a strong, independent, responsible, self-organizing society with sound strategies for employment, education, health care, security, and shelter. This vision will gain strength as Haiti participates fully with its Caribbean island neighbors in regional operations, such as the Caribbean Community (CARICOM) for economic trade and the Caribbean Disaster Management Agency (CDEMA) for disaster risk reduction. The international community, including its major collaborative institutions, such as the United Nations, World Bank, and InterAmerican Development Bank, can facilitate this process by updating its vision of enabling developing nations to initiate their own processes of self organization and innovation in matching available resources to existing needs.

■ THE GLOBAL BURDEN OF DISASTER RISK MANAGEMENT

The case of Haiti represents a larger issue for global risk reduction. The immediate response of the international community to the devastation in Haiti illustrates the responsiveness and capacity of donor nations to come to the aid of developing nations when disaster strikes. But the cost of such reactive strategies is high. Given the initial conditions in Haiti, the degree of devastation was no surprise. The question is whether the same amount of investment, time, and attention from the international community, if given *before* the earthquake, may have reduced the losses in lives, time, money, energy, *after* the earthquake. This burden, if not redirected, will surely fall on the international community again...if not Haiti, then Kathmandu,

Kandahar, or Kyrgyzstan. In an interconnected global community, the risk of sudden, disruptive events is shared. Learning to manage that risk means integrating the science of disasters into disaster policy, and the including design for disaster risk reduction into urban landscapes and practice. For the past ten years, the International Strategy for Disaster Risk Reduction has acknowledged this need (ISDR, 1999). The lessons from the Haiti Earthquake underscore the significance and urgency of taking action.

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**APPENDIX 1: ANNEX DEGREE CENTRALITY FOR INDIVIDUAL ACTORS,
HAITI RESPONSE SYSTEM, 1/13/10 – 2/4/10**

ACRONYM	DEGREE	NRM DEGREE	SHARE
Caricom	24	22.222	0.076
Govjam	21	19.444	0.067
Govhai	17	15.741	0.054
Govdom	16	14.815	0.051
Cdema	12	11.111	0.038
Oas	9	8.333	0.029
Jcg	8	7.407	0.025
Govhaipre	8	7.407	0.025
Govant	7	6.481	0.022
Odpem	6	5.556	0.019
Idb	6	5.556	0.019
Jdf	6	5.556	0.019
Govstl	6	5.556	0.019
Govbar	6	5.556	0.019
Minustah	5	4.63	0.016
Wfp	5	4.63	0.016
Govgre	5	4.63	0.016
Govtt	5	4.63	0.016
Eccu	5	4.63	0.016
Govstv	5	4.63	0.016
Usgov	4	3.704	0.013
Govcan	4	3.704	0.013
Caricomsg	4	3.704	0.013
Govhaipm	4	3.704	0.013
Jamcc	4	3.704	0.013

Note: Displays all actors with value greater than 4.

APPENDIX 2: LIST OF ACRONYMS AND ORGANIZATIONS PARTICIPATING IN HAITI RESPONSE SYSTEM, JANUARY 13 – FEBRUARY 4, 2010

act	Action of Churches Together Alliance	govstv	Government of St.Vincent and the Grenadines
airjam	Air Jamaica	govsuri m	Government of Suriname
alp	Antigua and Barbuda Labour Party	govtt	Government of Trinidad and Tobago
axco	AXCO (London-based Insurance Company)	govuk	Government of United Kingdom
bas	Bermuda Aviation Services	govven	Government of Venezuela
bda	L.F. Wade International Airport, Bermuda	haswm	Haitian Art Society of the Washington Metropolitan
bdf	Barbados Defence Force	hgf	Haiti Group of Friends
braarm	Brazilian Army	icc	International Cricket Council
caic	Caribbean Association of Industry and Commerce	idb	Inter-American Development Bank
canarm	Canadian Army	ifc	International Finance Corporation
cannav	Canadian Navy	iica	Inter-American Institute for Cooperation and Agriculture
caricom	CARICOM	iii	Insurance Information Institute
caricomch	Office of Chairman, CARICOM	ijmg	Irie Jam Media Group
caricomscr	CARICOM Secretariat	imf	International Monetary Fund
caricomsg	Office of Secretary General, CARICOM	impacs	CARICOM Implementation Agency for Crime and Security
carilec	Association of Caribbean Electric Utilities	irc	International Red Cross
cb	Children's Brigade	jamcc	Jamaica Chamber of Commerce
cbu	Caribbean Broadcasting Union	jcaa	Jamaica Civil Aviation Authority
ccc	Caribbean Conference of Churches	jcg	Jamaica Consulate General
cccc	CARICOM Consular Corps	jdf	Jamaica Defence Force
ccrif	Caribbean Catastrophe Risk Insurance Facility	jona	Jordan Official News Agency
cdart	Canadian Disaster Assistance Response Team	liat	LIAT (Antigua-based Airline)
cdb	Caribbean Development Bank	lime	LIME (Dominica Communications Company)
cdema	Caribbean Disaster Emergency Management Agency	minustah	Mission des Nations Unies pour la Stablisation en Haiti
cdru	Caribbean Disaster Relief Unit	msf	Doctors Without Borders
cedaw	Committee on the Elimination of Discrimination against Women	nlcr	New Life Children's Refuge
cfu	Caribbean Football Union	norceca	North, Central America and Caribbean Volleyball Confederation
cmc	Caribbean Media Corporation	nyasnp	Office of Assemblyman Nick Perry, State of New York

concacaf	Confederation of North, Central American and Caribbean Association Football
crs	Catholic Relief Services
cto	Caribbean Tourism Organization
daic	Dominica Association of Industry and Commerce
dexia	Dominica Export Import Agency
dfid	Department for International Development, UK
digicel	DIGICEL
diojam	Diocese of Jamaica and the Cayman Island
domnert	National Emergency Response Team, Dominica
dpf	Dominica Police Force
ec	European Commission
eccaa	Eastern Caribbean Civil Aviation Authority
eccu	Eastern Caribbean Currency Union
eif	Entertainment Industry Foundation
eqecat	Eqecat Inc.
eu	European Union
fao	Food and Agricultural Organisation
fdem	Florida Division of Emergency Management
fifa	Fédération Internationale de Football Association
fivb	Fédération Internationale de Volleyball
flgov	Office of the Governor, State of Florida
fpoor	Food for the Poor
gfdrr	Global Facility for Disaster Reduction and Recovery
govant	Government of Antigua and Barbuda
govaus	Government of Australia
govbah	Government of Bahamas
govbar	Government of Barbados
govber	Government of Bermuda
govbra	Government of Brazil
govcan	Government of Canada

nymay	Office of Mayor of New York City
oas	Organisation of American States
odpem	Office of Disaster Preparedness and Emergency Management, Jamaica
oecs	Organisation of Eastern Caribbean States
ofmh	Office of Foreign Minister, Haiti
osehc	Office of Special Envoy on Haiti, CARICOM
pa	Port Authority
padf	Pan American Development Fund
pagov	Office of the Governor, State of Pennsylvania
paho	Pan American Health Organization
ptwc	Pacific Tsunami Warning Centre
rcab	Antigua and Barbuda Red Cross
rcjam	Jamaica Red Cross
rg	Rio Group
rgpf	Royal Grenada Police Force
rms	Risk Management Solutions
rss	Regional Security System
tcisl	Government of Turks and Caicos Island
ttcic	Trinidad and Tobago Chamber of Industry and Commerce
ttpf	Trinidad and Tobago Petroleum Fund
ua	University of Arkansas
um	University of Miami
un	United Nations
unban	Office of the General Secretary, United Nations
undp	United Nations Development Programme
unfpa	United Nations Populations Fund
unga	United Nations General Assembly
unicef	United Nations Children's Fund
unifem	United Nations Development Fund for Women, Caribbean Regional Office
unrc	United Nations Relief Coordinator

govchi	Government of China
govcr	Government of Costa Rica
govcub	Government of Cuba
govcz	Government of Czech Republic
govdom	Government of Dominica
govdomr	Government of Dominican Republic
govfr	Government of France
govger	Government of Germany
govgre	Government of Grenada
govguy	Government of Guyana
govhai	Government of Haiti
govhaicgn y	Office of Consul General to New York, Haiti
govhaiim	Office of the Interior Minister, Haiti
govhaiisw	Institute of Social Welfare, Government of Haiti
govhaimh	Ministry of Health, Haiti
govhaipm	Office of the Prime Minister, Haiti
govhaipre	Office of the President, Haiti
govhaisam	Office of the Minister of Social Affairs, Haiti
govhaiyl	Office of Legislator Youri Latorture, Haiti
govira	Government of Iran
govjam	Government of Jamaica
govjamol	Office of the Opposition Leader Portia Simpson Miller, Jamaica
govjampm	Office of the Prime Minister, Jamaica
govjap	Government of Japan
govmex	Government of Mexico
govmon	Government of Montserrat
govskn	Government of St.Kitts and Nevis
govspa	Government of Spain
govstl	Government of St. Lucia

unsc	United Nations Security Council
usbcli	Office of the ex-president, Bill Clinton
usbush	Office of the ex-president, George W. Bush
usclin	Office of Secretary of State, United States
uscon	Office of Congressman, United States
usconc	Office of Congresswoman Yvette. D. Clarke, United States
uscone	Office of Congressman, Eliot Engel, United States
usgov	Government of United States
usgovaj	Office of Ambassador to Jamaica, United States
usgovam	Office of the American Ambassador in Haiti, United States
usgovds	Department of State, US
usgovhs	Department of Homeland Security, US
usgs	United States Geological Survey
usmil	United States Military
usnav	United States Navy
usobama	Office of the President, United States
usofda	United States Office of Foreign Disaster Assistance
ussen	Office of Senator, Government of United States
ussenp	Office of Senator Parker, United States
ustc	United States Transportation Command
ut	University of Texas at Austin
uwi	University of West Indies
uwjam	United Way of Jamaica
watbot	Dominican Water Bottling Company
wb	World Bank
wcc	World Council of Churches
wfp	World Food Programme
whit	Whitchurch
wicb	West Indies Cricket Board