Communications During Disaster Response

A Simple Approach to Unite Efforts

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Introduction

The recent fires that occurred in the Amazon jungle, which endangered a large area of wild ecosystems on the planet and caused political tensions in the search of solution mechanisms, show how the threats derived from climate change are increasingly affecting the planet. The response of the armed forces in the region was fundamental for the mitigation of damages and gave an example of the convenience that comes from cooperation and integration of countries' resources. For example, observation satellites from different countries constantly collected information on the status of the incident while specialized aircraft performed fire-extinguishing work. However, disaster response also involves other public and private organizations and even extends to non-governmental organizations (NGOs), thus telecommunications between these actors play a fundamental role in the success of a mission. This article details the medium and long term projected risks for Latin America, the peculiarities of communications needed to respond to disasters, as well as an approach aimed at facilitating standardization and integration under a criterion in which simplicity prevails over sophistication.

Despite the high economic performance of Latin America and the Caribbean, the Inter-American Development Bank reports that countries in the region face potentially devastating economic and social costs from natural disasters, and highlights the need to do more to reduce risks and prepare in the event of catastrophes. Earthquakes, floods and storms caused economic losses of US$34 billion between 2000 and 2009 in the region. In 2010 alone, total disaster losses exceeded US$49 billion, including US$7.8 billion due to the earthquake in Haiti and US$30 billion due to the earthquake in Chile.[1] According to the Global Climate Risk Index published by Germanwatch, of the ten most affected countries in the world during 2017, three (Puerto Rico, Dominica and Peru) were located in Latin America, while during the 1998-2017 period, Latin American countries accounted for 50 percent of the ten most affected in the world (Puerto Rico, Honduras, Haiti, Nicaragua and Dominica).[2]

Figure 1 details the expected impact of threats derived from climate change in the region, where virtually no region is safe, and areas of possible cooperation in the face of common problems, which should frame the regional governments' agenda in forthcoming years.

Figure 1. Climate change impacts expected by 2050

Source: Prepared by R. Landa, presented in Gráficos Vitales del Cambio Climático para América Latina y El Caribe (Vital Graphics of Climate Change for Latin America and the Caribbean).[3]

Although it is government's responsibility to protect and assist their people when a disaster occurs, state agencies are often affected by the event and lack the capacity to respond adequately. This sometimes leads to international actors replacing governments' role, which paradoxically has the effect of weakening national capabilities by masking the resources needed for the response. The humanitarian response system developed in recent decades is composed of a multitude of actors (agencies of the United Nations (UN), the Red Cross, NGOs, military forces, and non-traditional actors), and this proliferation of participants has created enormous coordination problems. A system that can be effective with 20 or 30 participants becomes overextended with the influx of many dozens of organizations.[4]

As far as preparedness, although multilateral training takes place through organizations such as the System of Cooperation among American Air Forces (SICOFAA), which has increased the effectiveness of combined operations, it has also been noted that even when military response was good; solutions were found as the result of civil-military cooperation. That is, through the interaction of people with different cultural backgrounds, abilities and motivations, in which communication plays a fundamental role. Figure 2 presents a model of civil-military relations which demonstrates how cooperation is made easier when the interaction occurs in peacetime—therefore, this current era is the most conducive for its development.

As can be expected in an environment of limited resources and different priorities, civil-military coordination becomes difficult in emergencies. This is in part due to the technical aspects of telecommunication requirements not usually being analyzed until events occur, when it becomes necessary to implement support networks by whatever means are available. At the international level, armed forces depend on highly specialized (and often classified) communications systems; while in marked contrast, the response of the humanitarian community is to use unclassified and open systems to easily integrate new actors. Except for formal alliances such as the North Atlantic Treaty Organization (NATO), many armed forces operate their own independent communications systems, which are not easily integrated with those of other countries.[5]

In light of this, one option could be to equip armed forces with specific resources to develop their own capabilities in areas that do not correspond to the nature of their mission (such as civilian medical response) in order to reduce response times. However, this could generate a duplication of efforts when compared to properly using existing resources from other government agencies, as well as multilateral cooperation institutions, in order to face a phenomenon of great impact but sporadic frequency. Therefore, there is an advantage to addressing disaster response as a combined inter-agency effort, which would require the laying the foundations of interoperability between specialized military and civil agencies; with the starting point being the standardization of communications under an integration-oriented scheme.

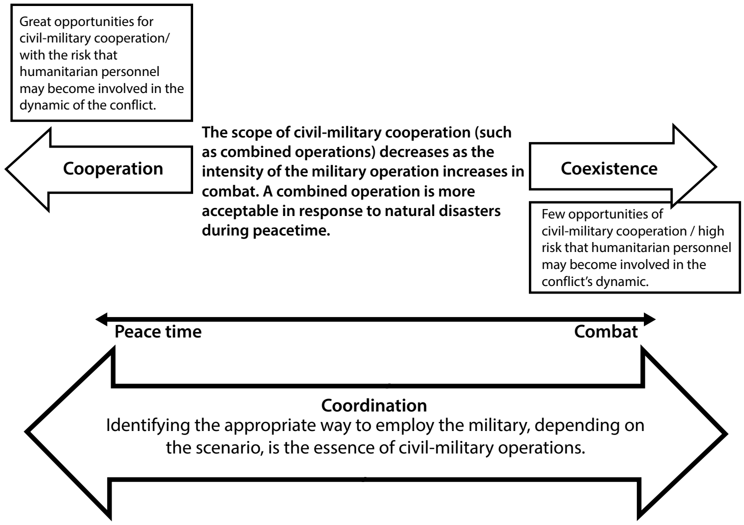

Figure 2. Variety of civil-military relations
Sorce: Presented by Ibrahim, Abdullah and Roslan "Relations between civil and military in response to disaster recovery".[6]

Common standardization framework

The International Telecommunications Union (ITU) recognizes that disaster response operations and military operations share common characteristics. One example is the physical and social environment in which they are carried out, which changes rapidly and unpredictably; and the need to make immediate decisions at all levels. Therefore, communications requirements for both are similar.[7]

The same international organization establishes that Information and Communication Technologies (ICT) for disaster management should be guided by four principles:[8]

1. Multi-disasters: Which include earthquakes, cyclones, floods, droughts, tsunamis, volcanic eruptions and fires. For all disasters, ICT play a critical role in facilitating the flow of vital information in a timely manner.
2. Multi-technological: To mitigate the effects of natural disasters, ICT promotes the use of different technologies and information and communication networks, to include satellite, radio, mobile networks and the Internet, which contribute to the improvement of capabilities and reducing vulnerability to populations.
3. Multi-faceted: ICTs are critical at all stages of disaster management: mitigation, preparedness, response, and recovery.

4. Multi-involvement: The local community, government, private sector, disaster management agencies, meteorological organizations, civil society, humanitarian agencies, and international organizations must ensure access to ICTs to better coordinate the activities of disaster management; with partnerships being the best way to accomplish this task.

The Oslo directives, issued by the UN to provide guidance on the use of foreign military and Civil Defense for disaster response, advise that, since it is impractical to request that humanitarian organizations adopt military communications systems, military forces must learn and practice the efficient use of existing humanitarian ICTs to improve their performance in civil-military coordination.

This means a change in the traditional military paradigm of strategic, operational, and tactical communications networks, in order to take advantage of shared resources and popular platforms. The change to a standardized use of ICTs for information dissemination and coordination will allow for not only organizational and efficiency improvement, but also a better and faster response.[9]

With the standardized use of ICTs as a goal, normalization establishes provisions for common and repeated uses when dealing with problems, to obtain an optimal order in a given context. Normalization is the ideal solution to ensure compatibility and interaction between all communications networks, at least within tactical and strategic communications. For the implementation of norms, it is convenient to review the framework already established by organizations such as ITU, to help identify non-military actors needing integration, in order to formulate communications protocols together with their cooperation. Nonetheless, emergency operations constitute a temporary activity and those who participate in it do not necessarily perform a routine and habitual task.[10] Hence, the need to conduct training accompanying the issuance of the norms, in order to put them in practice.

Divergent terminologies represent another challenge. Any international humanitarian mission, or with multiple agencies, will have experienced this difficulty. There are also great differences in the use of the lexicon used, not only between military and civilians, but also between civilian actors themselves. However, and despite what one might initially think, the standardization of these terminologies is not a realistic solution, because the terminology describes practices; and practices are at the center of the values of an organization. It is therefore difficult to imagine the military using doctrinal or operational concepts created by humanitarian workers and vice versa. A more useful and concrete step is to increase the actors' knowledge of divergent operational terminologies. This can happen by example and through combined training.[11]

In addition to communications networks and terminology, another factor to consider is the handling of information to facilitate decision-making. The lessons learned from the coastal phenomenon of El Niño of 2017 in Peru indicates that emergency information and communications systems need to be strengthened in order to facilitate the flow of data needed for decision-making. Coordination is required in the analysis and interpretation of the information collected, as well as the integration of systems to make better decisions and to better communicate with the population.[12]

When referring to information, the demand is no longer just for voice and data. Coordination efforts include the dissemination of resource management (for example, where resources are located), situational awareness (dissemination of geographic information), and command and control (such as the deployment of assistance units) information. Civil society adds yet another participant to a system already struggling with information flow between military, non-military government agencies, and private organizations. According to Sagun and others' studies, four distinct channels of information flow occur during disaster management: communication within the organization, between organizations, from the public to organizations, and vice versa. Therefore, it becomes necessary to harmonize procedures in order to obtain a common situational picture by combining information that reaches the different agencies involved.[13]

For this effort, health sector organizational involvement is fundamental, as they interact intensively and permanently in the mentioned flow channels. The task of collecting data after the disaster, analyzing and interpreting them in operational terms and transforming them into an actionable response is complex and not always carried out properly. The health sector generally relies on situation rooms for the collection and analysis of information on epidemiology, communicable diseases and other relevant public health information. However, these situation rooms do not always link to emergency operation centers, which centralize response actions. Despite significant advances in information management, many countries in the region are lagging in the creation and empowerment of health sector teams to collect, evaluate, and make available health information in the first 48 hours of an emergency.[14]

Case Studies

In order to know how the role of telecommunications in disaster response has evolved, the study of recent events is in order: the earthquakes in Nepal (2015), Haiti (2010), and Japan (2011).

With more than 8,600 fatalities and 8.1 million people affected, the international community quickly reacted to the 7.8 degrees on the Richter scale earthquake in Nepal. Not only did organized actors take action, but also the "digital humanitarian community" (concept developed by Patrick Meier in his book Digital Humanitarians: *How Big Data is changing the face of humanitarian response*), using information and communications technologies such as crowdsourcing (the practice of engaging a crowd for a common goal, often for innovating or solving a problem), using social networks to encourage participation from different locations, at different levels, and organizations (according to www.crowdsourcingweek.com).

Social networks and numerous platforms facilitated the collection of information, its fusion, and dissemination. This included systems, applications, and software that made it possible to verify personnel safety, identification and recovery of missing individuals, provision of satellite aerial images and terrain mapping, infrastructure damage, displaced persons' camps, and other humanitarian needs. This proliferation of digital activity, with the aim of helping humanitarian response in the field, highlights the dramatic changes in the information environment for humanitarian response since the 2010 earthquake in Haiti.[15]

In the case of Haiti, with more than 220,000 deaths and more than 1 million people who lost their homes, the 7 degrees on the Richter scale earthquake made more than 460,000 people flee the capital and take refuge outside affected areas. Almost 170,000 people displaced around the border with the Dominican Republic, generating a burgeoning problem for that country. In addition, key buildings such as the Presidential Palace and the Headquarters of the UN Stabilization Mission were affected, which meant greater difficulty in proper response actions. In addition to the support received through the armed forces in the region, the support of NGOs such as Télécoms Sans Frontiéres, allowed the installation of high-speed data connections in strategic coordination centers, as well the provisioning of telephony and Internet at high levels of government. Of interest, this NGO, in addition to providing the necessary equipment and connectivity, established a technical support group to solve hardware and software configuration problems. This allowed the population to access services such as satellite telephony and FM radio, which led to reunification of affected families as well as dissemination of information on the assistance being provided.[16]

The integration of large-scale external actors, supported by the evolution of ICTs, made a difference. However, what remains to be seen is how humanitarian and military response, each with their own methods and systems for information dissemination and technological coordination, can take advantage of this digital revolution in order to engender even more effective coordination.

The earthquake and tsunami that hit Japan in 2011 was 9.1 degrees on the Richter scale, which left almost 16,000 dead, 92 percent from drowning. This event is relevant for having occurred in a country that intensively uses ICTs for all its activities, which allows projecting how the latest sophisticated technology systems and networks respond to disasters. As a result of this analysis, an article presented by Sakurai and Kokuryo, found that information systems research lacks a methodology for the design of resilient systems to support the different stages of disaster relief and recovery. Modern societies have become dependent on ICTs to carry out almost all activities in advanced economies, and disasters illustrate the fragility of this dependence.[17]

One of the most significant findings of this analysis was the immediate problem that arose after the earthquake, entailing the lack of the necessary support infrastructure to operate information systems.[18] Not only were transmission and reception equipment affected, but electricity was lost at the most critical phase (immediately after the event). Despite the precautions taken, information systems designed to deal with disasters were useless because almost none of the affected towns had foreseen a long period without energy. Even when there were electric generators, there was not enough fuel to keep them running.[19]

The Japanese government had implemented the National Disaster Victims Support System, a Linux-based system widely supported by the public sector. It consisted of several subsystems to cover areas such as relief operations, evacuation centers, victim registration, and so forth. Although several local governments had used it, others rejected it for various reasons, such as lack of specialized human resources, long learning curve, difficult installation on servers, incompatible data formats, and so forth, to include the added difficultness of carrying out software development or modification efforts, while tending to the emergency.[20]

Given the situation and the need to respond, some local governments abandoned the national system and used simpler tools, such as Access or Excel spreadsheets. In these cases, members of the various work teams were already accustomed to these tools because of their personal use in daily life, which significantly facilitated their adaptation. Another important finding of this Japanese case was that information systems that are not used on a daily basis are not useful in an emergency.[21]

A new concept based on simplicity

Collecting the lessons from the previous cases and knowing that unexpected failures in information systems are very likely to occur, the concept of using *frugal* ICTs (information systems developed and implemented with minimal resources to meet the main goals of the user) is useful.[22] A highly specialized and sophisticated implementation of ICTs for disaster response (as in the Japanese case) is counterproductive due to the cost of development, maintenance, and the highly qualified operators required. Additionally, their sporadic use during exercises and divergence from the tools which participating personnel are used to raises the risk that their expected performance will not be met, and instead of summoning unity of effort, they'll be rejected for being considered complicated.

The UN Office of Risk Reduction believes that there must be a broader and more people-centered approach to reduce disaster response risk. Risk reduction practices must be multi-hazard and multi-sector, inclusive and accessible, in order to be efficient and effective. It is necessary that the public and private sectors, social organizations, as well as academia and scientific institutions work more closely and create opportunities for collaboration.[23] Faced with such a large number of actors, a *frugal* system that takes advantage of the most current common trends and practices, such as web-based tools, common office tools' formats, cell phone apps, operation over fixed and mobile broadband connections, or use of data files in text format transmitted by HF radio; will allow assimilating a large number of sources, and will contribute to informed decision making based on open exchange and dissemination of disaggregated data.[24] This approach avoids the implementation of exclusive proprietary products and promotes the use of cross-platform solutions to easily integrate the power of existing cooperation in the digital humanitarian community.

A big difference, when compared to Japan, is the actual state of communications in Latin America, especially with regard to access to broadband connections, which makes the use of *frugal* ICTs even more important. In 2010, the penetration of mobile and fixed broadband was practically the same (about 6.5 percent). Since then, the deployment of mobile broadband far exceeded that of fixed broadband. In 2016, mobile broadband reached 64 percent market penetration, compared to 11 percent for fixed broadband. The gap between the countries in the region and the countries in the Organization for Economic Cooperation and Development (OECD) was 21 percentage points in fixed broadband and 35 percentage points in mobile broadband that year.[25] Within the region, the largest gaps are also recorded in mobile broadband, with a 90 percentage point gap between the best and worst situated countries.[26] Although mobile service is one of the first to be lost in times of disaster, when restored it becomes an important ally for response management in remote areas, due to its great popularity and availability thanks to modern equipment being in the hands of the majority of the population today.

Conclusion

The threat of climate change has been increasingly affecting the region. Given the magnitude of its consequences, the success of response efforts is linked to the efficiency of civil-military communication. The potential assistance offered by external non-military actors can be better exploited using *frugal* communications systems to integrate information from multiple sources in a single great effort. ❑.

Notes

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