

Information and communication technology for disaster risk management in the Caribbean: subregional solutions to the challenge of limited human resource capacity

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Executive Summary

This document was adapted from a paper originally presented to the 8th Annual Caribbean Conference of Comprehensive Disaster Management, held in Montego Bay, Jamaica in December, 2013. It summarizes several activities that ECLAC has undertaken to assess the current state of information and communications technology (ICT) in the field of disaster risk management (DRM) as practiced in the Caribbean. These activities included an in-depth study that encompassed a survey of disaster management organizations in the region, an Expert Group Meeting attended by the heads of several national disaster offices, and a training workshop for professionals working in DRM in the Caribbean.

One of the notable conclusions of ECLAC's investigation on this topic is that the lack of human capacity is the single largest constraint that is faced in the implementation of ICT projects for DRM in the Caribbean. In considering strategies to address the challenge of limited human capacity at a regional level, two separate issues are recognized – the need to increase the ICT capabilities of disaster management professionals, and the need to make ICT specialists available to disaster management organizations to advise and assist in the implementation of technology-focused projects.

To that end, two models are proposed to engage with this issue at a regional level. The first entails the establishment of a network of ICT trainers in the Caribbean to help DRM staff develop a strategic understanding of how technology can be used to further their organizational goals. The second is the development of “Centres of Excellence” for ICT in the Caribbean, which would enable the deployment of specialized ICT expertise to national disaster management offices on a project-by-project basis.

I. Introduction

The professionals responsible for the coordination of disaster response face difficult challenges in times of disaster. This is especially true in the case of small island developing states (SIDS), where resources are particularly scarce. Managing priorities, capacities, locations, and the expectations of governments and the public is a complex and dynamic endeavour. In addition, given the turbulent nature of disaster situations, the people and systems at disaster management offices are subjected to information overload, which can obstruct timely and accurate decision making. Systems that can help bring order to this chaotic flow of information have the potential to help disaster managers save lives and property.

Information and communications technologies (ICTs) can be used to support the practice of disaster risk management (DRM) in times of crisis, as well as for and reconstruction. Indeed, if ICT systems were used to facilitate a logical and structured information flow during the planning stage, this could help to reduce the impact on society. ICT systems can be used to help mitigate the effects of storms before they occur, by identifying potential hazards and by facilitating informed land-use decisions.

However, ICT utilization for DRM activities in the Caribbean remains unevenly applied and significantly underdeveloped. While there are occasional bright-spots of innovation – such as the usage of geographic information systems (GIS) for disaster impact modelling in Jamaica (Powell and Stewart 2013) – there are significant shortfalls throughout the region in terms of infrastructure, human resources capacity, data sharing and ICT governance.

In 2013, ECLAC performed an in-depth investigation into the current state of ICT infrastructure and use for disaster risk management in the Caribbean. This paper draws from ECLAC's experience in undertaking this initiative. It summarizes ECLAC's methodologies and conclusions, and seeks to provide insight into ways to improve and expand the technological capabilities of DRM agencies in the Caribbean.

Specifically, this paper takes a closer look at one of the key challenges identified by this investigation – that the major limiting factor in the effective use of ICTs in DRM is the lack of human resource capacity in ICT operations and project development. Finally, this paper proposes options as to how these limitations on human capacity can be addressed at a regional level.

II. Methodology

In 2013, ECLAC completed several activities to assess the current state of ICT usage for DRM in the Caribbean. These included a formal study, which comprised a survey on ICT issues sent to disaster management offices in the region, an expert group meeting that was convened to discuss a preliminary draft of that study, and a two-day workshop on ICT for DRM that was conducted with staff members from regional disaster management offices.

Twenty-four national disaster management offices in the region were invited to participate in an on-line survey of disaster management. Thirteen offices responded and completed the survey. The survey sought to find out what tools were being used in these offices, to assess the current level of ICT integration into their operations, to understand the level of sophistication of ICT usage, and to identify gaps in information and communications strategies.

The full analysis of this survey was included in a report, published as part of the ECLAC Studies and Perspectives Series, entitled “Information and communication technologies for disaster risk management in the Caribbean.”

As part of the review process for the publication of this report, ECLAC convened a meeting of a group of regional experts in the fields of disaster risk management and ICT. The group of experts included heads of disaster management offices from Antigua and Barbuda, Barbados, Jamaica, and Montserrat, as well as representatives from the Caribbean Disaster Emergency Management Agency (CDEMA) and the Caribbean Association of National Telecommunications Operators (CANTO). The outcome of the deliberations of this group was incorporated into the text and conclusions of the final draft of the report. A summary of the conclusions and recommendations of this expert group may be found in the appendix to this document.

Following the expert group meeting with organizational leaders of DRM organizations, a two-day workshop was held with operational staff members of the same organizations. The workshop, on the topic of ICT for DRM, was based on a training curriculum developed for the “Academy of ICT Essentials for Government Leaders Programme” from the Asian and Pacific Training Centre for Information and Communication Technology for Development (APCICT), which is a part of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). This particular program was considered a valuable candidate for adaptation to the Caribbean region due to its successful implementation in the Pacific, which is home to small island developing States (SIDS) that have many commonalities with countries in the Caribbean, including vulnerability to a similar set of disaster risks and development constraints.

III. Findings of the study and expert group meeting

The study noted that an array of ICT technologies are currently employed by Caribbean disaster management offices. These include the standard suite of modern Internet-based communications tools such as email, websites and, increasingly, social media. It also included specialized DRM applications, such as WebEOC – which is a web-based tool for the dispatching of emergency personnel – and DEWETRA – a tool developed by the Italian government and provided to Caribbean nations, which is used to determine risk for flash-flooding and wildfires. Geographic Information Systems (GIS) were also widely employed, although with differing levels of sophistication.

Unfortunately, there are still some significant gaps in the overall level of ICT systems maturity in the Caribbean. One example of this is in the area of adoption of mobile technology as an enabler of early warning systems. The expert group agreed that mobile phone-based messaging systems could be quite useful for providing early warning systems to inform populations about an impending hazard, or to communicate to the public in a post-disaster scenario. However, these messaging systems have not been widely implemented. Moreover, those systems that have been implemented are largely based on basic SMS messaging capabilities that have been made obsolete by more scalable and robust mass mobile-communication techniques (Williams and Phillips, 2014).

The study produced three major conclusions:

- ICTs hold the potential to greatly improve the efficiency and effectiveness of disaster risk management as practiced in the Caribbean
- Inadequate human capacity is the single largest constraint on the implementation of ICT for DRM in the Caribbean
- Individual countries in the Caribbean have seen a number of successful ICT projects, but integration is lacking at the regional level.

The study had several recommendations that addressed these conclusions. These included:

- Building greater connections between the DRM community and the ICT community, as well as with policy makers and other communities of practice;
- Modernizing ICT infrastructure for DRM;
- Considering a regional e-Strategy for DRM;

- Improving ICT governance and interoperability guidelines; and
- Developing programmes of ICT human capacity development as a matter of priority.

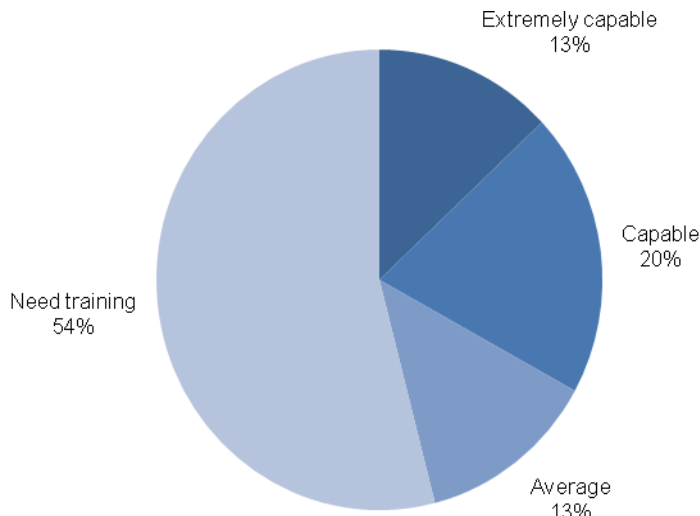
In reviewing these conclusions and recommendations, the preeminent, recurring theme is that the development of human capacity in ICT is crucial in order to improve the efficiency and effectiveness of disaster risk management practices in the Caribbean. The concept of “human ICT capacity” covers both the ICT capabilities of DRM professionals, as well as organizational access to the specialized ICT expertise required to effectively implement technology-based projects.

A second major theme gleaned from the conclusions of the study concerns the importance of regional cooperation in furthering the goal of improvements to ICT practices in DRM. This paper will focus on these two themes. Specifically, it will examine how regional cooperation can further the goals of increasing the human capacity needed to effectively make use of technologies within the sphere of disaster risk management.

IV. Limitations of human resource capacity

The study concluded that the lack of human resources capacity is the biggest factor retarding the successful implementation of ICTs at disaster management offices in the Caribbean. This conclusion was supported by the agreement of the expert group as well as by many of the responses to the survey. When asked specifically about the perceived capabilities of DRM staff regarding the use of ICT in implementing disaster preparation activities (Figure 1), the majority of survey respondents said that additional training was needed.

FIGURE 1
RESPONSES TO THE SURVEY QUESTION:
“HOW WOULD YOU RATE THE ICT CAPABILITY OF YOUR STAFF
ENGAGED IN [DISASTER] PREPARATION ACTIVITIES”?



While some survey respondents answered that ICT staff capability was not a constraint, the majority answered that it was. “There is much hardware and many ICT tools, but not sufficient specialised human capacity in the relevant offices,” one respondent commented.

In many cases, survey respondents indicated that ICT staff members are not routinely included in their country’s DRM organization, but that ICT support for these offices comes from other departments in the government, or from the private sector. “We have no internal technical ICT personnel on staff,” one respondent reported, “thus, we always have to seek outside aid. Certain minor jobs the staff can manoeuvre.” (Williams and Phillips 2014). The implication of this separation between ICT and DRM staff is that ICT solutions are not organically integrated with disaster risk management and hence are not as effective as they could be.

To compound the problem, the expert group felt that DRM was not being prioritized by ICT organizations. While there are many opportunities for ICT staff to be used to improve DRM performance, those ICT resources that exist are stretched among many other functions. Moreover, it was noted that the public sector wages are not competitive in comparison to opportunities that may exist for skilled ICT staff in the private sector. The quality of ICT staff can be an issue, as well as the problem of the limited quantity of such skilled personnel. (ECLAC 2013a)

Thus, it is clear that DRM offices could benefit from equipping staff – even non-ICT staff – with additional training in ICT skills. The study therefore recommended that the development of programs for increasing the ICT capacity of DRM staff should be addressed as a matter of priority, and that organizations should perform assessments of ICT capabilities so that gaps can be identified and relevant training can be targeted to improve operational capacity.

V. The APCICT academy model for regional training

One model for equipping DRM professionals with increased ICT knowledge is represented by the two-day training workshop that was held at the ECLAC offices in Port of Spain in September 2013. At this event, professionals from several different disaster management offices participated in a training workshop on the topic of how ICT can be used to increase the effectiveness of disaster management operations. In general, the attendees of this training were not in managerial or leadership positions, but rather were officials working in technical roles in their respective organizations.

Workshop attendees were instructed on how ICT could be used to support disaster offices during the four phases of the disaster risk management cycle – mitigation, preparation, response, and rehabilitation. The activities in the workshop included power-point based instruction, round-table discussion, and small-group work. Examples discussed included a determination of requirements for early warning systems, and the possibilities and limitations of mobile-phone based alerting. Imaging systems and disaster mapping were discussed for their value as planning tools.

Additionally, representatives from each of the participating disaster offices presented a case-study on how ICTs were being used to address DRM issues in their country. These case studies contributed important views on how ICTs are being used on the ground in Caribbean countries, and also reflected on the challenges that were being faced in the implementation process; they brought a valuable real-world element into largely theoretical discussion.

The attendees provided positive feedback on the value of the workshop. They agreed that the workshop helped them gain a better understanding of major concepts and principals – both in ICT and in DRM. Some attendees shared the view that they would like to see the training made available to other disaster offices in the Caribbean. They said that they particularly appreciated the value in bringing personnel from different disaster offices together because it fosters the exchange of ideas between different countries (ECLAC 2013b).

The workshop's content was based on a curriculum developed by APCICT for use in Asia and the Pacific. This curriculum represented one module in the "APCICT Academy" series, which is a set of learning materials designed to instruct policymakers and other government officials on means of developing ICT strategies for the pursuit of national development goals. APCICT has developed a network of instructors in Asia and the Pacific who deliver this training material, and this ICT for DRM course at ECLAC represented the first time it had been used for training in the Caribbean.

ECLAC has been investigating how a sustainable network of trainers could be established in the Caribbean, to perform training in a similar manner to what APCICT does in the Caribbean. The APCICT model is not without its limitations – cost being one of them. While Asia is home to many large governments that have enough critical mass to support trainers dedicated to a single country, the governments of small-island Caribbean countries would be hard-pressed to support dedicated trainers for this curriculum. Thus, it is clear that a network of trainers would have to be supported at a regional level. The APCICT model, as used in the Pacific, entails the use of roving trainers who move from country to country – that model could be a strong fit for the Caribbean.

This model does have limitations, however. APCICT-style workshops impart a broad view of ICTs use that is appropriate to the needs of planners and managers. However, these are not “hard” ICT skills that are applicable at the systems implementation or application development level. For example, the workshops can teach awareness of GIS systems, and spread understanding about their value and potential uses, but the actual technical know-how needed to implement running GIS systems on the ground are well beyond the scope of the APCICT training curriculum. Similarly, though workshops do not equip disaster management officials with deep expertise in systems design, this type of course could at least help them to understand issues like the importance of planning for redundancy and the maintenance of backup systems, and can better equip them to question vendors of ICT services.

VI. The need for regional ICT expertise

The APCICT Academy model represents an example of how non-ICT staff can learn about ICT-related issues and opportunities. These strategic ICT skills can represent a valuable addition to the day-to-day operations of their organizations. However, there are some instances in which increased ICT training of non-ICT staff will not be sufficient to meet the requirements of implementing new initiatives using technology. These are cases where true IT experts are needed to advise DRM organizations of their options, and to help implement the chosen solutions to problems. The need to ensure the availability of this type of expertise is an important challenge, as illustrated by the example provided by the Montserrat Disaster Management Coordination Agency (DMCA) at the ICT for DRM workshop, discussed above.

The case study described the Montserrat DMCA's experience in undertaking a project to streamline the management of the diverse array of early warning systems surrounding the Soufriere Hills volcano. In the pursuit of this project, the DRM specialists of the DMCA faced challenges that may have been best addressed by experienced ICT professionals. The DMCA was limited by a lack of internal capacity to design the system needed, and had little knowledge of available technological options. They also lacked the ICT project management resources and quality assurance capabilities which would have better equipped them to deal with vendors and to make more informed decisions regarding the implementation of technology (DMCA 2014). Such experts could also have helped by transmitting knowledge to the staff of the DMCA, so that they would have been better equipped to manage the day-to-day operations of the system.

Another example of the value of ICT expertise can be found in the experience of Jamaica in implementing Geographic Information Systems (GIS). The Jamaican case study offers a model of how a single government can ensure the availability of IT expertise to disaster management offices, as well as to other government agencies. Jamaica has established an entire agency – the National Spatial Data Management Division – focused on the implementation of GIS programmes across the government (Blake 2009). This “Centre of Excellence” model ensures that experts in the field of GIS are available to provide services to the Office of Disaster Preparedness and Management (ODPEM) as one of many client agencies. Crucially, from the perspective of human resources capacity building, this model also ensures GIS professionals are able to develop a depth of expertise in GIS solutions that would not be available if they had simply been working as an isolated unit within ODPEM.

The experience of Montserrat shows the need for disaster management offices to have access to technological expertise, and the Jamaican model offers one possibility of how such expertise can be provided to offices as a service. However, it cannot be expected that all governments in the region will

have the capacity to implement well-staffed Centres of Excellence, or that any one country will have the critical mass of need that is necessary to implement the model in all areas of ICT that affect DRM.

This, in turn, underlines the need for regional coordination in the sharing of expertise. As one respondent to the survey of disaster management offices noted, “[a] regional network of trained specialists would help us as a region keep up with the new technologies and also provide a platform through which we all could share our experiences and collectively decide on a best way forward as a region rather than individual countries as we combat the common threat of disaster.”

Perhaps it would be possible to operate the Centres of Excellence model on a regional level, in which ICT specialists could apply their expertise to similar problems across multiple countries. Staff provided through the Centre of Excellence would provide technical leadership, support, and training to local staff engaged in project development. Implementation costs would be reduced through the facilitation of shared computing resources, and by enabling the replication of systems that have already been successfully implemented in other countries.

A Centre of Excellence model would promote the spread of best practices, and serve as a locus for the training and development for new experts in the field. A harmonised system at the regional level could allow for the collection of ‘big data’ that can be analysed to find about specific areas of vulnerability and successful risk management approaches, which can inform policy across the region. Moreover, this infrastructure would support ICT practitioners in their efforts to innovate, experiment, and create solutions to disaster-related problems.

Some potential ICT concentrations for which the regional Centres of Excellence model could be useful in the DRM context include:

- GIS applications development
- Knowledge management systems design
- ICT project management support
- Digitization of paper records
- Implementation of mobile-phone-based early warning systems.

The logistics and modalities of managing such a regional network of experts does present significant challenges. There would need to be a strong support structure to manage the many organizational difficulties of managing ICT professionals in a cross-border context. There would need to be buy-in from governments, and a mutual understanding of how resources would be shared between them. ICT experts would need to be identified and trained to staff these Centres of Excellence – staff time might be contributed by governments, regional organizations, and the private sector. Additionally, some mechanism for the exchange and retention of the expert knowledge developed by these Centres would have to be implemented, so that systems and practices are well documented and can be replicated.

Finally, a sustainable funding structure would need to be put into place. This is no easy task, given the fiscal difficulties experienced by Caribbean governments. It may be possible to get such a system up and running through donor money from private or international institutions, and nurtured through the auspices of one or more existing inter-regional organizations. However, for long-term sustainability, these Centres would ultimately need to be able to produce enough value-added to client organizations that they could manage to pay their own way, by drawing funding from the budgets of projects to which they provide services.

VII. Conclusion

This paper has summarized the experiences and findings of ECLAC's investigation into the field of information and communication technology use for disaster risk management in the Caribbean. It has documented the investigation's recognition that limitations on human capacity are the biggest factor holding back technology-driven improvements to efficiency and effectiveness in disaster risk management operations.

In further exploring the implications of this ongoing challenge, two potential models for subregional solutions to this problem come to light. The first of these models – the implementation of a regional network for training in strategic ICT issues – has already been piloted in the form of a single training workshop given to DRM professionals. It needs further development to be scaled into a region-wide resource for the delivery of ICT training, but the experience of APCICT in Asia and the Pacific shows that this is possible to accomplish. The second model – the implementation of Centres of Excellence for ICT in DRM – is perhaps more ambitious, and would require significantly more development as an idea before it could be translated into a service for countries in the region.

Taken together, these two specific ideas have a strong potential to positively impact the development of ICT for DRM in the region. Regardless of whether these two specific ideas are ultimately implemented, there is a need for concerted regional efforts to expand the availability of ICT skills to disaster risk management organizations in the Caribbean.

Bibliography

- Blake, Cecille (2009). *Making Geospatial Data Available and Accessible in Jamaica*. http://unstats.un.org/unsd/geoinfo/RCC/docs/rcca9/presentations/9th_UNRCCA_econf.99_IP21_pres.pdf
- ECLAC (Economic Commission for Latin America and the Caribbean) (2013). “Report on the Expert Group Meeting on Information and Communication Technologies for Disaster Risk Management in the Caribbean.” LC/CAR/L.419. Port of Spain.
- ECLAC (Economic Commission for Latin America and the Caribbean) (2013). “Report on the Subregional Workshop on Information and Communication Technologies for Disaster Risk Management in the Caribbean.” LC/CAR/L.426. Port of Spain.
- Montserrat Disaster Management Coordination Agency (DMCA) (2013). ICT in DRM – Montserrat Case Study on CAP [PowerPoint slides]
- Powell L. and Stewart C. (2013) *Use of GIS for Scenario Planning*. Jamaica Office of Disaster Preparedness and Management (ODPEM). [PowerPoint slides]
- Williams, R. and Phillips, A. (2014) *Information and Communication Technologies for Disaster Risk Management in the Caribbean*, ECLAC, Port of Spain.

Annexes

Annex 1

The following is the excerpted Decisions and Recommendations from the Report of the *Expert Group Meeting on Information and Communications Technologies for Disaster Risk Management in the Caribbean* [LC/CAR/L.419]. The meeting was held on 16 September, 2013 at the ECLAC Subregional Headquarters for the Caribbean in Port of Spain, Trinidad and Tobago.

1. It was agreed that information and communication technologies (ICT) have an important role to play as an enabler of disaster risk management (DRM). Specifically, there is much value to be gleaned from the use of Geographic Information System (GIS) in the area of risk mapping and planning, in the use of mobile phone-based technologies, in the area of early warning systems and post-disaster response coordination, and in web-based systems for cross-organizational coordination.
2. Lack of human resource capacity was cited as the major factor holding back the adoption of ICTs in DRM. In many cases, disaster management offices lack dedicated ICT staff and are reliant on ICT support from outside the organization. However, even non-ICT staff can benefit from ICT skills; it was therefore recommended that development of programs for increasing the ICT capacity of DRM staff should be a matter of priority. Organizations should perform assessments of ICT capabilities so that gaps can be identified and relevant training can be targeted to improve operational capacity.
3. Data sharing was identified as another limiting factor in ICT usage, both within governments, and between DRM offices and other organizations. Barriers can exist between different ministries that make government entities reluctant or unable to share information with disaster offices and regional organizations; these problems can include issues of security, privacy, and difficulties related to data standards for information exchange. Cooperation from telecom operators was also cited as a limiting factor.
4. Improved governance was also identified as an important issue. Even with systems in place, issues exist beyond the technological level, which require the creation, implementation and maintenance of formalized governance policies regarding information sharing and utilization. The purpose of these policies should be to ensure that disaster risk reduction plans are implemented in advance of a disaster and that support structures for disaster response management will be made available in a post-disaster scenario.
5. It was agreed that improved ICT governance should not be treated as merely an internal need, nor should it be limited to specific DRM agencies, but should embrace wider networks at the national level and beyond. In particular, national ICT policies should be updated to reflect the need to support disaster offices in the event of an emergency. These policies should not only provide for the availability of a national government's ICT resources, but also those of non-governmental organizations, organizations in the private sector and resources available at a regional and national level. Telecom operators, specifically, need to be brought into formalized agreements with regard to providing emergency support for disaster response and recovery operations.
6. It was also recommended that governance policies with regard to use of social media be put into place at disaster management offices, given the facility that social media channels offer in reaching the public. In light of the reputational importance that can be attached to social media communications, these governance policies should include determination of who is responsible for the release of information through social channels and should establish standard procedures for ensuring that these messages are appropriately vetted. In addition, these policies should cover both how social media is used on a day-to-day basis, as well as how social media tools are to be used in early

warning situations, and in communicating information to the public in the hours, days and weeks following a disaster.

7. Finally, it was agreed that follow-up on this meeting was important for the purpose of building cooperation and engagement with this issue in the region. It was suggested that the recommendations of the associated study on ICT and DRM be presented to the Conference on Comprehensive Disaster Management, which will be held in December, 2013 in Jamaica.