Towards an IT-Based Platform for Disaster Risks Management in Algeria

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ABSTRACT

Disaster management and risk prevention in Algeria have undergone many changes in the recent years. Important efforts have been provided on the legal and organizational sides to set the right conditions for an integrated and collaborative framework for disaster management in the country. The aim is to address the lack of information sharing, coordination and collaboration among the involved organizations.

However, although the enhancement of the organizational arrangements, several problems persist mainly related to the implementation of these measures. To address this issue, in this paper, we propose an IT based platform in the field of risks prevention and disaster management (DM). This platform provides decision support, enables information sharing, helps to enhance public awareness regarding risks and disasters, supports communication and dissemination of information and alerts in disaster situations and facilitates the implementation of regulation related to disaster management.

Keywords

Disaster management, risk prevention, information sharing, collaboration.

INTRODUCTION

Managing disasters is a complex and multi-disciplinary process of planning and implementation of measures aiming at preventing/reducing the risk of disasters and enabling a rapid and effective response whenever an undesirable event occurs. The effectiveness of disaster management efforts depends mainly on the ability of the participating actors to work together and promote the information sharing practices to enhance decision making along the whole process (Bodeau et al, 2009).

However, collaboration and information sharing, in the field of DM, face several and diverse challenges. First, the complexity aspect resulting from the large scope of the problem and the underlying factors such as the large number of the involved organizations at different levels with their own specificities (culture, organization, processes, etc.), the multi-disciplinary nature, and the diverse and complex employed technologies are examples of such challenges. Other issues like the reliability and performance of communications (particularly in the response phase) threatened by the frequent failures and the low transmission rates may further complicate the situation and affect the quality and integrity of communication services mainly for contents requiring large bandwidth such as video and complex maps (Meissner et al, 2002). Additional complicating factors include uncertainty and unpredictability of the events and their evolution, in addition to decision making on the basis of incomplete and sometimes controversial information under time and resources constraints (Comfort, 2007).

Second, the DM process involves a myriad of organizations dealing with sensitive and crucial needs to save lives and properties. It requires commitment and agreement of all the stakeholders on the principle of working together and sharing a common vision to avoid misinterpretation of situations and consequently enhancing the management process at both levels strategic and operational.

Third, DM increasingly depends on the information systems of the organizations involved in the management

process and given the factors related to the complexity and organizational challenges, interoperability between these systems becomes an important issue on the organizational, technical and semantic levels.

Finally, the socioeconomic situation of the country generally and the targeted population especially also impacts the DM process. The economical, educational and cultural levels and religious particularities of the population have an important role in facilitating or complicating the work of relief teams.

Like many countries, Algeria has experienced many natural and manmade disasters. The consequences of these disasters consisted of thousands of casualties and very important damages. Managing disasters in Algeria faces almost the same problems as in many other countries. Actually, these challenges concern mainly the collaboration and coordination efforts. To deal with this, setting up a comprehensive framework for disaster management that takes into account the organizational and technical aspects is primordial and will be of a great value.

In this paper, we target this issue with respect to the Algerian case. We first present the national effort provided on the organizational side to prepare the success factors of the DM framework. Then, we develop the technical aspect to implement the organizational arrangements.

ORGANIZATION OF DISASTER RISKS MANAGEMENT IN ALGERIA

The most important text in the disaster management device in Algeria is the law no. 04-20, of 25 December, 2004, on "the prevention of major risks and disaster management in the context of sustainable development" which is considered as the national act of disaster prevention and management. It aims at: improving knowledge of risks, strengthening their monitoring and forecasting; taking into account the risks in land use, in the construction and for reducing the vulnerability of people and property to hazards; and providing mechanisms to enable a coherent, integrated and adapted support to any natural or manmade disaster (www.joradp.dz).

This act was enacted shortly after the tragic 6.6 MS earthquake of Boumerdès (a province at about 50 km at the east of the capital Algiers) in May 2003, after severe criticism of experts of the way in which disasters were managed (Benouar, 2007). Most of the criticism dealt with two main aspects related to the legislative and organizational sides. First, the limitations observed on the coordination and information exchange among different DM stakeholders at different levels of the country. This was due to the distribution of the DM legislation on several sectorial regulatory texts (Forest, public health, water, environmental protection, urban planning and development, rules related to security and panic ...) and the absence of an approach dealing with risks disasters within a global and comprehensive vision. Second, the legislation in force was not updated to reflect the socio-economical changes experienced by the country. Mainly, the emergence of private sector in almost all domains of life raised new challenges related to the mobilization of resources and means owned by private enterprises to organize relief operations.

Thus, the new DM device (mainly the law 04-20) covers both prevention and response stages and establishes a system for risk prevention and disaster management based on ten (10) types of risks (natural and manmade) and gives a particular importance to the public information, awareness and training regarding these risks. Moreover, this act ensures to citizens the access right to all kind of information related to risks and disasters and predicts suitable mechanisms to enhance the management process at both prevention and response stages. Figure 1 summarizes the new DM device covering both prevention and response stages.

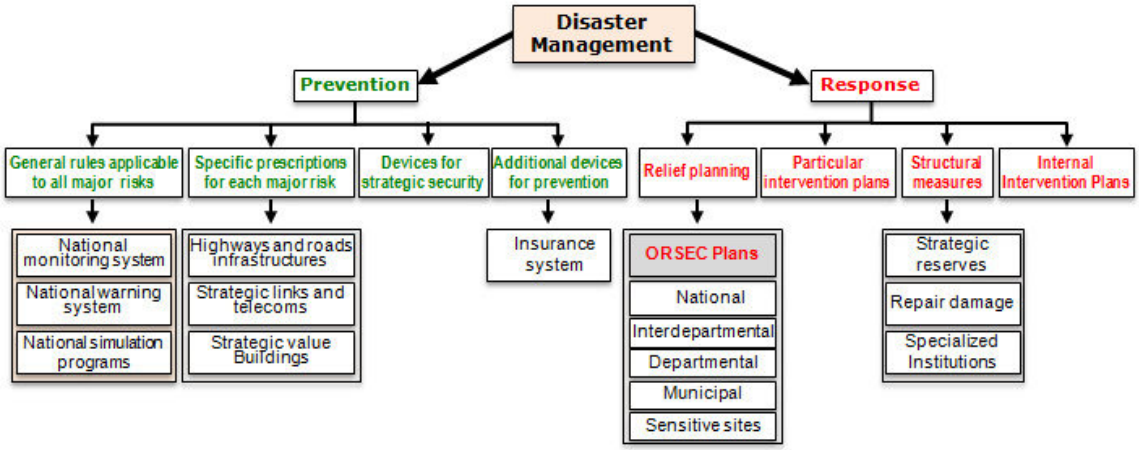

Figure 1. Disaster management device in Algeria

Considered as the most important component in the response device, an ORSEC plan may be at national, inter-departmental, departmental, and municipal or at a sensitive site levels, depending on the scope and severity of the disaster. Each ORSEC plan is composed of several modules to handle and manage all the aspects of a disaster such as rescue and relief, health and safety, management of aid, water supply, implementation of secure temporary accommodation sites and installation of power supply, etc.

The other plans aim to establish specific measures in response to each identified particular disaster risk; to protect the employees, the population, the properties and the environment and to constitute strategic reserves and establish the system of care for damage such as insurance and specialized institutions, respectively.

To consolidate the implementation of the national disaster risks management, the law 04-20 predicts the National Delegation for Major Risks (NDMR), created by the Executive Decree No. 11-194 of 22 May 2011, under the authority of the minister of the interior. This national structure is in charge of the coordination and evaluation of the activities undertaken within the national system for prevention of major risks and disaster management. In the same context, many other structures and devices in connection with major hazards and disasters management have been created at different levels of the government. These include the National Operational Center of Decision Support and the Commission of Communication related to Major Natural and Technological Risks. The main objective of these organisms is to set up the right conditions for an effective prevention and management of disasters and provide a global and comprehensive related framework (www.joradp.dz).

TOWARDS AN IT BASED PLATFORM FOR RISKS PREVENTION AND DISASTER MANAGEMENT

Ensuring that the previous organizational arrangements are properly implemented and respected by all involved parties requires the setting of sophisticated control mechanisms. To this end and in the absence of technical solutions in Algeria so far, we propose the adoption of ICT to implement a collaborative platform for DM given the increasing role of these technologies in promoting collaboration and coordination in different domains.

Many tools have been proposed to address the need for integrated tools to support coordination and information management in disaster situations. Among the most active projects we find SAHANA and USHAHIDI (Frassl et al, 2010; Paul et al, 2007). Actually, most of these tools are generic solutions and more oriented to relief efforts than long term risks prevention. Although they are very useful and rapid to deploy in disasters situations, their development does not reflect exactly the national regulations for risks prevention and disaster management. A national framework for DM requires more dedicated and well thoughtful solutions that implement perfectly the national vision of DM. The available tools (SAHANA, USHAHIDI, etc.), can be however integrated as complementary services for specific needs in national platforms of DM.

Objectives of the Platform

The collaborative platform will act as a central system to promote the information sharing and collaboration in the field of risks prevention and disaster management and improve public awareness regarding this sensitive domain, in the country. It offers the main following capabilities: inter-sectorial information sharing, enhancement of public awareness and participation, communication and dissemination of information and enforcement of the regulation control. Involved organizations and public will have access to these functionalities

depending on the needs of each category.

The IT based platform enables timely information exchange on data related to both pre and post-disaster phases. The former includes different sectorial risks and prevention devices, planned and ongoing disaster risk reduction (DRR) initiatives, educational and training and awareness programs, regulation related to DM, resources held by different actors that can be mobilized and utilized during disasters, information on previous disasters, etc. The second category consists of data related to different aspects of the disaster such as disaster situation reports, resources tracking per sector (health, energy, transport, etc.), volunteers' management, requests management, missing persons, victims, state of the roads, weather forecast, etc. Also, the platform enables citizens to access and visualize all kinds of information about risks and disasters and related protective measures in their living, activity or traveling areas. All these activities help to enhance communities' knowledge and public awareness regarding DM. In addition, the platform will provide early warnings and emergency response communication services to the threatened populations using different means such as broadcasting of alerts on hazards and potential undesirable events through SMS servers or media means in collaboration with national telecommunications operators. Furthermore, the platform may serve as a means to centralize information related to sectorial regulations, with underlying roles and responsibilities of each stakeholder, at the national authority for risks prevention and disaster management. Such an action prepares the right environment to build 'policy-based' controls in order to enforce and implement regulation related to disaster management.

Another functionality that may be integrated in the platform is to allow the citizens to interact with the system to propose their services as volunteers (experts, doctors, owners of means, etc.), to inform about potential risks or to declare the occurrence of incidents, etc. All these information is verified with special mechanisms provided by the national authority (NDMR) with the collaboration of the main actors in the field.

Finally, some other important features are not business capabilities but directly sustain the platform functioning such as security and the integration of advanced ICT like Web based technologies, Geographical Information Systems (GIS) and wireless communication networks (wifi, SMS...).

Design of the Platform

For both preventive and response phases and based on the role that each actor plays, the platform mainly offers two types of access: governmental and public. The first concerns governmental agencies and organisms directly involved in the DM process and it is achieved through a secure extranet. It enables only concerned actors exchanging sectorial information related to disaster prevention and management to achieve complementary missions in a coordinated way. As for the public access, it provides services to citizens and communities concerning risks and disasters related information and prevention devices, awareness programs and all kinds of useful information.

Moreover, it enables the public to provide information such as declaring incidents or proposing services related to the risks and disasters. The administration of the platform will be under the responsibility of the national authority for disaster risks management (NDMR), presented above.

The general architecture describing the operational use of the platform is depicted in Figure 2.

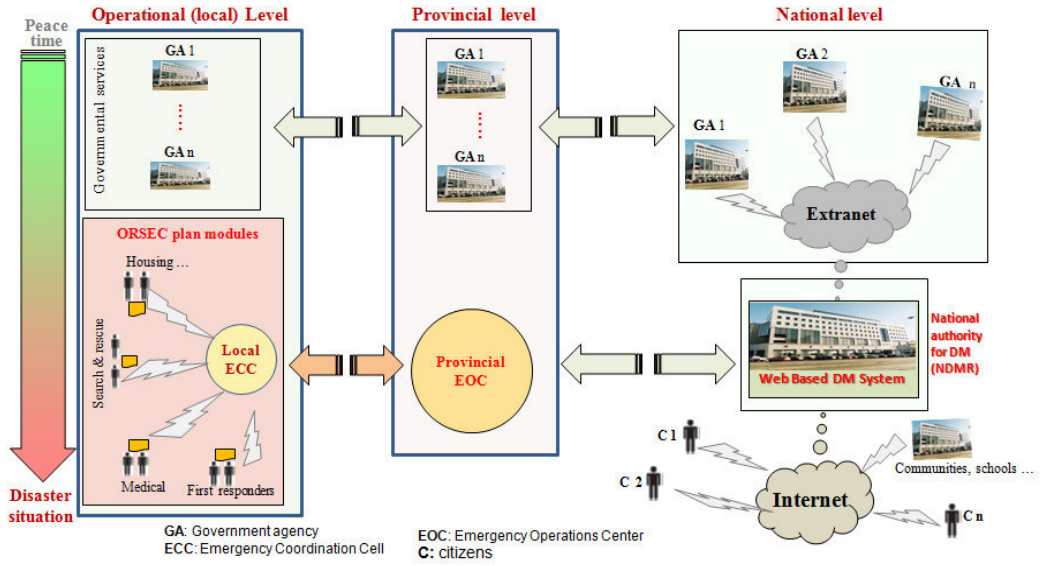

Figure 2. Operational architecture

During peace time, the national databases of the sectorial actors are fed through their provincial representatives who validate the information got from local sectorial services. As for disaster situations, the related information (damage, needs, etc.) flows from local emergency coordination cell to provincial emergency operations center then used to feed the national system for disaster management.

Technically, the proposed architecture represents a distributed virtual structure on the top of the existing web-based information systems architectures of the organizations involved in the DM process. This layer abstracts the information sources and enables the user to get information without caring about their locations and the used technologies in the local information systems. The most appropriate approach to implement these requirements is the Service Oriented Architecture (SOA). This approach preserves the autonomy of different and diverse information systems, belonging to the actors involved in the DM process, which helps to overcome the interoperability challenges (Linthicum, 2003).

For the implementation of this architecture, we rely on the common set of standard, platform independent and language neutral technologies for web services, mainly XML, UDDI, WSDL and SOAP.

The SOA based architecture is illustrated in Figure 3.

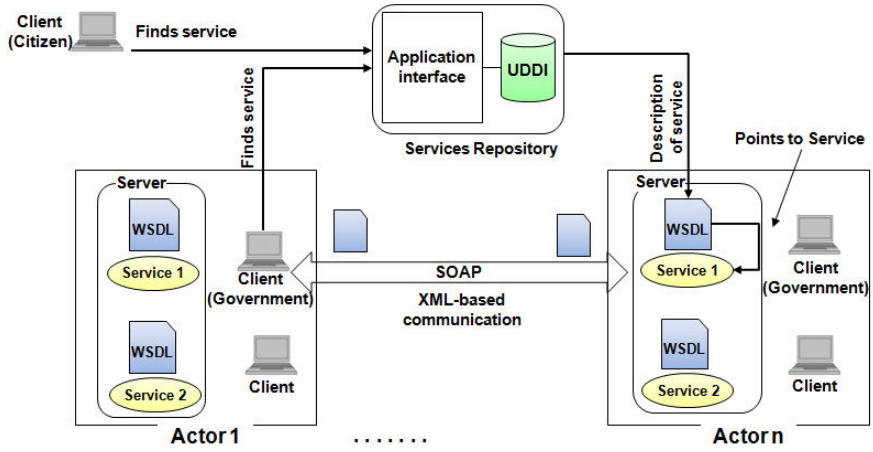

Figure 3. Technical integration architecture

The SOA and Web services based platform will be administrated by the National Delegation for Major Risks and used by governmental organizations and citizens to get all kind of services provided by the various stakeholders related to risks and disasters, according to the available regulations.

CONCLUSION

An important effort has been provided by the Algerian government, on the organizational level, to set up the right conditions for an integrated and comprehensive framework for disaster prevention and management. Many structures have been created to tackle the multiple aspects of the problem of disasters management at different levels. However, ensuring that the legal and organizational arrangements are properly implemented and respected by all concerned parties requires sophisticated mechanisms. We described our first steps towards an ICT based platform that will provide significant support to enhance the disaster prevention and management process. It offers several important capabilities for managers and population such as information sharing, the enhancement of the institutional and public awareness and the regulation control and enforcement for example by building 'policy-based' controls.

Our ongoing research work is the refinement of the platform design to include the semantic aspect through the provision of an ontology based approach.

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