National Disaster Management Information Systems & Networks: An Asian Overview

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Over the last few decades, the importance of effective management of information is being increasingly recognized in the disaster management sector in Asia and Pacific regions. A number of countries have set up disaster management information systems according to their own specific needs. The applications of these systems range from emergency response planning to short-range early warning to long-range mitigation and prevention planning. This paper is structured in three parts. The first part makes an attempt to outline the information needs of disaster managers in different phases of disaster cycle. The second part briefly reviews and compares the work that has been done in some of the Asian countries setting up disaster management information systems over the last few decades. The third part presents some recommendations for integration of national, regional and international level efforts.

1.0 Information Needs In Disaster Management

The information needs of disaster managers fall into two distinct, but closely related, categories of activities viz:

- *pre-disaster activities*: analysis and research (to improve the existing knowledge base), risk assessment, prevention, mitigation and preparedness; and

- *post-disaster activities*: response, rehabilitation and reconstruction.

Accordingly, there are two categories of disaster-related data:

- Pre-disaster *baseline data* about the country and risks; and

- Post-disaster *real-time data* about the impact of a disaster and the resources available to combat it

The ability of leaders and administrators to make sound disaster management decisions - to analyze risks and decide upon appropriate counter-measures - can be greatly enhanced by the cross-sectoral integration of information. For example, to understand the full short and long-term implications of floods and to plan accordingly requires the analysis of combined data on meteorology, topography, soil characteristics, vegetation, hydrology, settlements, infrastructure, transportation, population, socio-economics and material resources. This information comes from many different sources and at present it is difficult in most countries to bring it all together.

There are two essential preliminaries to establishing a disaster management information system:

- ***Defining the purpose of the system***

Ask *who will be the main users and what end product do they require?* The system must be appropriate to the level of management at which it is used. Failure to have a very clear idea of the purpose of the system is likely to lead to the creation of an unnecessarily elaborate one which attempts to do more than is really necessary, with the attendant risks of it being costly, time consuming to maintain, the data being out of date and the system itself being *in*appropriate to the real needs of its users.

- ***Investigating the existing databases and integrating with them***

Often the information needs of disaster managers overlap those of other organizations and the data may, therefore, already be stored elsewhere. Disaster managers should resist the temptation to establish their own all embracing database. At the national level there are almost certainly existing databases for a wide variety of purposes. An example of a disaster-related international database is a commercially developed one on hazardous substances. UNEP is planning to introduce a similar one for environmental matters.

2.0 Components of a National Disaster Management Information System

Key components of a Disaster Management Information System would be a database of

a) Hazard Assessment Mapping
b) Vulnerability Assessment
c) Demographic Distribution
d) Infrastructure, Lifelines and Critical Facilities
e) Logistics and Transportation Routes
f) Human and Material Response Resources
g) Communication Facilities

The usage of Disaster Management Information Systems (DMIS) would be in 3 contexts

- Preparedness planning
- Mitigation
- Response & recovery

The hazard and vulnerability assessments and mapping components of a DMIS are the cornerstone of preparedness planning as well as planning and implementation of a mitigation program. All data is of critical use in the preparedness plan as well as in the actual response operations.

It must be recognized that the development of these databases in country has to be built bottom up from the lowest administrative unit in country i.e. the sub-district and district corresponding to the level of the disaster preparedness plan. The district databases would feed into the state/provincial database and then into the national database.

3.0 Examples of Some of the Existing Information Systems in Asia and Pacific Countries

3.1 **Indonesia**:

(a) **Indonesia Disaster Management Information System** (SIPBI):
Developed by the National Disaster Management Coordinating Board (Bakornas PB) in the context of the UNDP funded project on Strengthening Disaster Management In Indonesia, SIPBI is aimed at enhancing Bakornas PB's decision making capability besides increasing and ensuring flows of reliable and up to date information on various disaster events and related disaster management measures. The main objectives of SIPBI component were: (i) formulate concept and design, (ii) establish operational mechanism on pilot basis at national level and in 4 project areas, (iii) standardize disaster management information/data, (iv) formulate standard operating procedures for system operations, (v) facilitate development of similar system in other disaster-prone districts and provinces. The scope of SIPBI development are: (i) development of computer networking system, (ii) development of database for disaster management and (iii) development of Geographic Information System (GIS) for disaster management. The GIS Component aims at developing risk maps at the national, provincial and district level. The national (1:500,000) and provincial (1:250,000) level maps are used to determine priority provinces and areas for disaster management activities, planning and installation of early warning systems. The district level maps (1:50,000) are used for district contingency planning. Under this project, a number of modules on Forest Fires, Earthquakes/Tsumani, Volcanic Eruption and Social Unrest, for building database system in an internet mode have been underway. A need to synthesize these modules has also been identified. Technical support in the establishment of SIPBI is provided by the Research Centre for Natural Disasters at Gadjah Mada Universtiy, Yogyakarta. For more details browse http://www.bakornaspb.or.id

(b) **KOMPAK**:
Kompak meaning "solid community" in Bahasa Indonesia, is a forum for concerted national disaster mitigation organizations, research, training and community organizations in order to acquire basis for common understanding and implementation of sustainable urban disaster mitigation and is a part of the information and networking program of the Indonesian Urban Disaster Mitigation Project (IUDMP) which itself is the country project of ADPC's Asian Urban Disaster Mitigation Project (AUDMP). Kompak also aims in enhancing public awareness and preparedness through information dissemination and build public and private networks as a forum for exchanging information and experience on urban disaster management. The Kompak has both an internet based communication network as well as a newsletter for communication among members. The internet has 2 components: an intranet and extranet; the intranet restricted site to member organizations and individuals in Bandung, as well as national and provincial agencies; while the "extranet" is the open access site to all particularly NGOs, individuals and institutions in other parts of the country. With the establishment of the Centre for Disaster Management and Mitigation at the Institute of Technology, Bandung, the role of KOMPAK is expected to expand. For more details browse: http://www.kompak.or.id

3.2 **India**

(a) **National Natural Disaster Knowledge Network**:

In 1999, the Government of India has established a high-powered committee to address the multiple facets of natural disasters in India. One of its major decisions in 2000 has been to set up a National Natural Disaster Knowledge Network (Nanadisk-Net). This Knowledge Network is being planned as a "network of networks". It will be a platform to facilitate an interactive dialogue with all government departments, research institutions, universities, community-based organizations and even individuals. The network will act as a digital library service and will facilitate access to global databases and early warning systems in a significant way. The Knowledge Network is designed to give a fillip to technical cooperation among developing countries and to expand international relationships to include exchange of information and transfer of technology. Nanadisk-Net will also promote e-training and will have the feature of many languages through a translation software.

(b)**Vulnerability Atlas of India**:

In 1997 the Government of India, Ministry of Urban Affairs & Employment constituted an Expert Group to prepare a Vulnerability Atlas taking into account three natural hazards which are the most common and damaging to India, namely earthquakes, cyclones and floods. The zoning maps on macro level for the three hazards are available on small scale for the country as a whole. To make this information readily available to the planners, administrators and disaster managers, these maps were prepared on larger scale, state-wise, showing all the administrative units, namely, the district boundaries, for easy identification of the areas covered by the zones of various intensity levels. The Vulnerability Atlas contains the following information for each State and Union Territory of India:

(1) seismic hazard map
(2) cyclone and wind hazard map
(3) flood prone area map
(4) housing stock vulnerability table for each district, indicating for each house type, the level of risk to which it could be subjected some time in the future.

The Vulnerability Atlas has been published by the Building Materials and Technology Promotion Council (BMTPC) and is an important input into the State level Disaster Management Planning. Given that a DMIS would require digitization and information collection on key indicators at various levels, the Atlas is an important step in the establishment of DMIS and represents the kind of work required to be done in each country.

(c) **State Level Disaster Management Communication, Network and Information System in Maharashtra, Indi**a

The Maharashtra Emergency Earthquake Rehabilitation Program (MEERP) implemented from 1995-1998 after the Latur Earthquake, India with World Bank funding included a component of developing a Disaster Management Plan for the State of Maharashtra supported by a communication network and DMIS.

The Communication Network comprised of (1) State Level VSAT network, (2) Intra District VHF Network. The VSAT network with 37 fixed network stations in each District Control Room (DCR) provides a direct link with a variety of Telecom services linking each DCR with the State level EOC including video conferencing facilities. The VHF network has been established within 11 districts of the State, comprises 600 base stations, 56 repeater stations and 190 mobile stations.

The GIS-based Disaster Management Information System was created on 1:250,000 and 1:50,000 scale for all the districts of Maharashtra. The creation of DMIS was primarily meant to compile, store and update information related to hazards, facilitating integrated analysis of the spatial and non-spatial data and generation of hazard maps for flood and epidemics, earthquake, accidents, industrial hazards, fire and cyclone. The Government of Maharashtra assigned the work of creating the DMIS to the Maharashtra Remote Sensing Applications Centre (MRSAC), Nagpur.

The DMIS on 1:250,000 scale for all the districts has been completed. The digitization of data on 1:50,000 scale has been completed for 17 districts. In a second phase, the digitization of remaining districts will be completed and elaborate query design too will be taken up.

The MRSAC secured the remote sensing data from the National Remote Sensing Applications Centre, and got it interpreted through a number of sub-contractors in the private sector. Once the thematic maps were made available, the experts checked these maps and validated it with the ground level findings. After the validation, the digitization of these maps would be done in the MRSAC, and the physical and socio-economic data attributed to the maps. Another round of validation takes place, before the database is finally approved. The important inputs in this exercise are the remote sensing maps and physical and socio-economic data. Further, it required an intensive work to digitize these data, and validate them.

Though the primary objective of the DMIS is to plan for disasters, the database has been organized in such a way that it could be extensively utilized for resource planning. A number of departments, like the Water Supply, Water Conservation, PWD, Forests, etc. are using the database for their own applications.

The Maharashtra program is a forerunner of such a program at the national level and has become a model for other states in the country. A similar program is now under implementation in the state of Uttar Pradesh . Significantly it was implemented in the course of an externally funded rehabilitation program, and linked to a program of undertaking state and district level disaster preparedness plans.

3.3 **Philippines**:

The National Disaster Coordinating Council (NDCC) is the highest policy making body in disaster management in the Philippines. In 2000 NDCC has started installing an Emergency Management Information System that will link up all their regional centers electronically and make available vital information to the public through the internet. The new system will have four components: Emergency Reporting and Monitoring, Emergency Logistics Management, Emergency Fund Management and Geographic Information System. The Advanced Geographic Information Display System has been established at the Philippines National Disaster management Center in Camp Aguinaldo, Manila. It is linked to all member organizations of the NDCC as well as the regional offices of the Office of Civil Defence which form the Secretariat of the Regional Disaster Coordinating Councils. The Integrated database comprises spatial information comprising Digitized Maps, Aerial Photos, Satellite Data while the Non Spatial Data on display covers History of Disasters, Demographic Database, Response Teams and Directory of Key Contacts and Resources. NDCC is also assessing the existing systems for early warning to identify areas for upgrading and

enhancement.

3.4 **Vietnam**:

Vietnam's main disaster co-ordination body, the Central Committee for Storm and Flood Control (CCSFC) is located in the Department of Dyke Management and Flood and Storm Control in the Ministry of Agriculture and Rural Development. It's Standing Office, the SOCCFSC – is the agency with the main responsibility for monitoring the effects of storms and floods, gathering damage data, providing official warnings, and co-ordinating and implementing disaster response and mitigation measures – relies on the administrative structure of the Dyke Department to carry out its disaster assessment, disaster reporting, and emergency co-ordination duties. When a flood or storm occurs, the district level officials are responsible for sending a district disaster assessment report to the provincial level, who collate and verify them and forward them to SOCCFSC, which in turn collates the provincial reports to produce a national damage assessment report.

To expedite the transmission of this information, SOCCFSC has set up a **disaster communications system**, an emergency electronic mail network that links provincial dyke department offices with the SOCCFSC. The disaster communications system was started in 1995, and by late 1998 was extended to every province in Vietnam. The Government of Vietnam put a large portion of its own funding with additional funding received from UNDP, the Government of Luxembourg and the BP and Statoil Alliance. The system operates 24 hours per day, 365 days per year, and has become the official, obligatory mechanism for transmitting disaster damage and needs data to the SOCCFSC. It is also used to issue disaster prevention or mitigation directives to its staff in the field, i.e. the provincial dyke department officials and district dyke monitors. The system was used effectively during the 1996 to 2000 flood seasons as a tool for gathering damage data and particularly, in the aftermath of Typhoon Linda in 1997 and in Floods of 1999 and 2000 for co-ordinating disaster relief activities between the SOCCFSC and disaster affected provinces.

The SOCCFSC has created a Department-wide **Intranet**, accessible both to central disaster management authorities and to officials in the localities in Vietnam, with the assistance of the UNDP Disaster Management Unit in Hanoi to serve as a repository for:

- Assembled laws, decrees, directives and procedures on disasters and disaster management in Vietnam;
- Summaries of disaster conditions in Vietnam and announcements of storm forecasts and warnings;
- Official Damage Assessment Reports released by the SOCCFC;
- Archived disaster damage data and media reports on disasters in Vietnam;
- Hydro-meteorological data for river basins and regions throughout the country; and
- Additional archived Disaster Management Reference Materials.

The Intranet is regularly updated with essential corporate information, and serve as a general reference tool for disaster managers in their day-to-day work.

To make disaster information available to the public, the SOCCFSC's mechanism for this has

been Internet Web technology. With the help of the Disaster Management Unit, the SOCCFSC maintains a bilingual, Web-based public information system called the **DMU Web** for:

- Encouraging information sharing regardless of sector; and
- Disseminating key information on disaster management to the aid community.

Some of the key information provided in Vietnamese and English on the DMU Website includes:

- Summaries of disaster conditions and announcements of storm forecasts and warnings;
- Official Damage Assessment Reports released by the SOCCFSC;
- Archived disaster damage data and media reports on disasters in Vietnam;
- Disaster Management Reference Materials; and
- A database of DMU sponsored and other disaster management programmes in Vietnam (training projects, humanitarian aid, etc.).

This Disaster Management Website was also the prototype for the SOCCFSC Intranet mentioned above. As a result, the content of the public information system is similar to that which is being created for the Intranet, though of course the Intranet contains much additional, strictly internal information and documents used by the SOCCFSC and Dyke Department in their daily operations.

A vital link is SOCCFSC's automatic receipt of the Hydro-Meteorological Service's vital flood and typhoon forecasts. The forecasts are received up to four times per day and form, along with the SOCCFSC's computerized mathematical models of discharges on major reservoirs, the basis of the SOCCFSC's disaster warning work. The official hydro-meteorological reports, based on which the SOCCFSC sends official directives via the disaster communication system to its staff in the field, are posted on the Website. For that matter, the SOCCFSC supplements the official hydro-meteorological bulletins with forecasts, satellite images, and graphics downloaded from the Internet (notably from the websites of the American Joint Typhoon Warning Center and from the Regional Office of the World Meteorological Organization in Japan).

The last system being adopted with the development of the UNDP **Disaster Management Unit** is the **Geographic Information System**. The DMU GIS has been organised as a simple way to organise and present highly complex disaster management and relief needs data on Vietnam and as a vital decision support tool.

By producing thematic hazard and vulnerability maps using selected variables (economic value, population, flood risk, and age of infrastructure, for example), the GIS can identify risk areas and clarify how best to respond to or to mitigate the risk of disaster. Similarly, the GIS can display disaster damage data and needs analysis by district or province, which makes it easier for international organizations and Vietnamese decision makers to target disaster relief aid.

For more details browse: http://www.undp.org.vn/dmu/

3.5 Sri Lanka:

Under the Ministry of Social Services (MOSS), Sri Lanka has established a disaster management information system called Social Management Information System (SOMIS). The National Disaster Management Center (NDMC) of Sri Lanka is developing a database which will incorporate various aspects of disaster management integrated with SOMIS and the software would be compatible to commonly used operating platforms.

5.0 Review and conclusions

This preliminary review of recent initiatives in five countries of South and South East Asia of efforts to establish national or provincial Disaster Management Information systems reveals the felt needs of the Disaster management structures in each of the countries. Certain significant features can be noted:

1. Many of the systems have been established as part of capacity building and institutional development projects in the disaster management sector.

2.They use national technical institutions to implement the system and draw on the available data and information in country .

3. They are responding to felt needs within the sector primarily for preparedness planning and post disaster assessment and needs analysis. Relatively limited initiative has been made to use the systems for mitigation.

4. Each initiative makes use of IT and improved communication systems to speed up both the collection and compilation of data as well as to package the information in usable products as part of a decision support system.

5.Many of the new systems have been developed based on international funding either as part of broader capacity building projects or within a post disaster reconstruction program such as is seen in both the state level projects implemented in India.

The review points to the need for a more exhaustive study of each of these initiatives as well as other similar efforts in other Asian countries as well as the need for organising of an opportunity to provide for exchange of information and experience in the development of national DMIS. It also points to the need for greater financial and technical support through international development assistance to upgrade these systems to fully harness their power to both mitigate disaster risks and improve disaster response.