2-7. Disaster Management Internet GIS

2-7-1. Objective of Disaster Management Internet GIS

The objective of the Geographical Information System (GIS) is to make full use of spatial data (data input and output, analyses, storage, and updating) beyond the limits of conventional paper maps. The term "spatial data" refers to data consisting of "geographical data" and "attribute data". Geographical data relate to distribution, locations, and configurations of topographic features (elevations, rivers, etc.), and features of human activities and social environments (railroads, roads and streets, buildings, land use, vegetation and population), while attribute data consist of attributes (name, class, numerical value, etc.) of such feature items. A GIS has various functions that help users to take decisions and to perform environmental or disaster impact assessments. Such functions include: visualization using selective overlay of spatial data or by legends (classifiers), statistical processing using spatial analysis, extraction (buffering) of disaster-affected areas, and selection of shortest paths. Usually, to use GIS resources, dedicated hardware, software and databases are necessary. A Web-based GIS has the advantage that it can be devised to enable analysis, display and acquisition of data using the Internet without requiring the user to install any special GIS software. This is a very important point in the handling of disaster information, because it helps reduce equipment investment and facilitates information sharing.

The accessibility to the Internet varies considerably among ADRC member countries. However, it is certain that Internet user populations will increase in these countries, along with easier access to faster and cheaper connection services. Moreover, the problem of unavailability of fixed-telephone lines is steadily diminishing thanks to the steady development of the satellite Internet connection technology. Thus, Internet GIS resources can be expected to be a more important component of a disaster risk management system in an emergency.

2-7-2. Toward Wider Use of Disaster Management Internet GIS

ADRC will closely observe current and future developments in the relevant fields, and seize opportunities to further promote the use of its disaster management Internet GIS in Asia.

2-7-2-1. Creation, Distribution and Use of Hazard Maps

It seems that cities around the world have been becoming more vulnerable to disasters because of rapid development, urbanization, and population growth since the second half of the 20th century. Municipal governments of capitals and major cities of countries in Asia, including Teheran, Istanbul, Kathmandu, Manila, Ulan Bator, Tokyo, and Yokohama, have prepared estimates of earthquake damage. Flood hazard maps have also been prepared in Asian countries. As for forest fires, the ASEAN countries, for example, have developed an Internet GIS network to share hazard data collected using satellite imagery and observation.

It is important to study and implement the methods of integration of hazard maps into city planning (disaster preparedness), zoning, building standards, and public disaster awareness raising campaigns from various perspectives including international cooperation, central government policies, and local community activities. It is not enough that the government provides hazard maps to citizens. A mechanism should be devised in order to incorporate citizens' view points into updated data. Equally important are cross-organizational information exchange among relevant ministries and agencies, cooperation among the public, private, academic and NGO sectors, and disaster education curricula for schools. A disaster management Internet GIS open to anyone is indispensable for all these purposes.

2-7-2-2. Integration of Mobile Telecommunications with Disaster Management Internet GIS

Mobile phone networks can be developed with a smaller initial investment than fixed telephone networks. Therefore, mobile phone networks are rapidly expanding in Asian countries, developing countries in particular. According to some estimates, the world's mobile phone number will exceed 2.6 billion in 2009. There are already many successful cases of transmission of early warnings and disaster emergency information using wireless telecommunications technologies such as cell-phone short mail services. The ongoing diffusion of broadband connections will influence the way mobile phones are used. It will become more common than it is today to use mobile phones for interactive transmission of image data in addition to text and voice data.

To display GIS data on the small screen of a mobile phone, it will be necessary to develop a new data format different from the existing Internet GIS data formats, as well as a whole new set of data. Therefore, it is likely that mobile phone-based GIS data will first become available for major cities and surrounding areas. It is also important, in terms of cost effectiveness, to develop cell phone-based GIS networks as a useful multi-purpose urban IT infrastructure not only for disaster reduction, but also for daily social life and tourism.

Once they become widely used, cell phones bundled with sophisticated digital camera and GPS functions will provide a powerful Internet tool for semi-realtime GIS data sharing between affected areas and disaster management headquarters in disaster emergencies. It is also considered that cell phones will become a useful ubiquitous communications tool for raising disaster preparedness awareness among local populations and promoting “participatory disaster-resistant city planning.”

2-7-2-3. Utilization of Satellite Imagery and Aerial Photography

Satellite image data and aerial photographic data are useful to enable the user to associate map data with physical geography. The problems are: that these data are expensive, that raw data need reformatting for integration into GIS databases (data conversion and management), and that satellite image or aerial photograph data for areas or times of interest are often unavailable at preferred resolutions.

Recently, there is an increasing number of satellite image and aerial photograph databases being created and released as part of international cooperation or as national policies. As of February 2008, there are 162 countries and 16 regions participating in the “Global Mapping” project, Moreover, Geographical Survey Institute is publishing vector map data as well as satellite image data which covers a lot of regions in Japan (available in Japanese only. http://mapbrowse.gsi.go.jp/airphoto/index.html).

A national spatial database created primarily with taxpayer's money is a common property of the nation. The Japanese government should continue taking the initiative in the development of this kind of databases.