



EFFECTIVE NATURAL DISASTER MANAGEMENT SYSTEM FOR HIGHWAYS

There is no country, no community and no person who is immune to the impact of natural disasters. India is constantly challenged by natural hazards like floods, landslides in coastal and hilly regions, periodic droughts, earthquakes etc. Natural disasters not only cause fatalities and injuries but also result in infrastructure damage, substantial social and economic impacts.

Natural disasters interrupt the society by claiming lives, creating victims, and destroying infrastructure facilities, at large. They lead to catastrophic failure such as sudden and complete failure of a major element or segment of the highway system that causes a disastrous impact on transportation services. A disaster is a serious disruption of the functioning of a community or a society causing widespread human, material, environmental losses which exceed the ability of the affected community or society to cope up using its own resources. All these result in dropping of GDP, immediately following severe natural disasters. When capital losses of this type recur, depreciation rates become higher than required to sustain economic growth. Increased depreciation rates cause the cost of capital to rise, so that the effect is qualitatively the same as that of an increase in the interest rate.

The physical damage to road infrastructure and the related hazards provide the beginning of an economic damage assessment. In our country, at present, policy-makers focus only on the physical damages or direct losses such as the repair or replacement costs for the damaged structures, roads etc. These direct losses are easy to notice and observe, since they are directly caused by the incident. However, they are only part of the total losses that are caused by the disasters. From an economic perspective there are indirect costs too, associated with the damage caused by natural disasters like temporary unemployment, business interruption, etc.

The existing Disaster Management (DM) approaches appear to be quite unstructured and are usually centralized in nature with the instructions flowing out through some sort of fixed hierarchy. These result in poor resource management and hence inefficiency. Since disasters themselves are unstructured in scope and as such cannot be managed centrally, there is a need for a user-centric decentralized independent approach, wherein even the end user is empowered suitably for quick and effective results. The first and foremost measure to be implemented immediately after a disaster strikes, would be to send relief and medical supplies to the affected areas. The immediate restoration of damages of roads gains utmost priority to ensure traffic movement and consequently the Highway Engineers at field level have to take initiative and shoulder responsibility with highest motivation and dedication. A decentralized approach, therefore, needs to be developed with adequate safeguards to minimize wastages ensuring prompt action.

The main challenge is data management of entire road network with adequate reliability level. This is particularly true in disaster situations to ensure effective performance. The data management has to guarantee efficient usage of the communication channels and the response time of the system should be largely independent of the number of the communication partners in the system. All Organizations involved in the rescue efforts need to interact closely at various levels. The hierarchy levels should correspond to aggregation levels at which gathered data is analyzed, put in the correct context and transformed in the form of reports and thereafter, effective instructions are passed down the level. Decisions are, often, required to be taken quickly. This cannot be done properly without ready access to required information supporting such decisions. Likewise, a workflow system by taking into account





the involved Organizations easily adapts to changing organizational structures and facilitates collaborative work within and across services.

Scheduled delays in providing immediate accessibility to a road affected by disaster and arranging rehabilitation facilities generally arise on account of lack of efficient agency coordination. In many cases, the duties of one agency cannot be started until activities that other agencies are responsible for have been completed. Delays can also arise internally among the functional units within the organizational structure of a highway agency. An analysis of potential delays will lead to taking of steps in order to minimize the devastating effect of disasters, in the future.

Planning for disaster preparedness for the road infrastructure is mainly based on know-how of magnitude of damages in the past and those anticipated in the future. Preparation of hazards zoning maps is the first pre-requisite in this regard. A promising tool for disaster management is the use of Geographical Information system (GIS) which can be used for storage, retrieval, mapping and analysis of geographic data. In the planning process, GIS can be used to identify and pinpoint risk prone locations of highways, identify the damages, assess them so that priorities for mitigation can be established. Earth observation satellites, as a means of remote sensing, also make it possible to monitor environmental changes and natural processes to forecast disasters.

Literature survey has revealed that in U.S.A, methods of preparedness and recovery have been developed to prioritize recovery activities in order to effectively aid in decisions concerning resource allocation for a highway agency in the event of a natural disaster. They have utilized multi-objective decision analysis in order to prioritize recovery activities based on available data pertaining to average daily traffic (ADT), population density and total estimated cost. Accordingly, the activities located in highly populated areas with heavy traffic flows have received high priority. It is felt that existing or upcoming technologies being currently used in developed countries include Bluetooth, 433/868 MHz RF technology, or IEEE 802.11 WLAN which should be widely used in order to set up wireless body/personal/local area networks. Special emphasis has

to be given to the development of a seamless networking infrastructure allowing smooth exchange of information between the local area network and the highway agencies.

A lot of research has been done on the traditional approaches regarding technology viz. Management of Technology (MOT), Mobile Governance (mGov) etc. towards a new transversal and comprehensive vision of technological management. However, studies have revealed that the traditional approaches have a failing ratio of about 60%.

A unique international programme viz. Coordinated Enhanced Observation Period (CEOP) has the capability of predicting the key elements for energy and water cycle observing system studies. These observational studies may be utilized for prediction of the water table for construction of highways in the disaster prone areas. The protection of embankment slopes plays an important role in mitigating the damages sustained by roads during floods and earthquakes. Time tested protection measures like grass turfing, benching etc. are quite useful. But latest construction methods like interlocked pre-cast members, usage of geo-textile membrane etc. should be largely used in the construction of embankments. In the hilly areas, usage of Gabions and Reno-mattresses with proper anchorage should be encouraged. Construction of berm with drains is an effective method to prevent land slipping and mud flowing.

Disaster management is thus, the continuous process by which all individuals, groups and communities manage hazards in an effort to avoid or minimize the impact of disasters resulting from hazards. Effective disaster management relies on thorough integration of emergency plans at all levels of government and non-government Organizations. Activities at each level i.e. individual, group, community affect the other levels. Improving strategic infrastructure like protective mechanism of roads is a must and is an area of priority concern, to ensure sustainability of development and welfare of the area even after occurrence of a disaster.

(V.K. Sinha)
Secretary General

