J. Ind. Geophys. Union (July 2007)
Vol.11, No.3, pp.171-173

Geo-tectonic movement and natural hazards: Strategy for disaster preparedness and mitigation

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ABSTRACT

In India, the incidence of natural hazards have increased in recent times and their intensity and impacts have increased. Though the natural hazards like earthquake in Indian sub-continent cannot be prevented, because of the active tectonic disturbances and resulting incidence of earthquake of different intensities in sensitive zones, with a better preparedness and mitigation plan, the loss of life and property can be minimised to a greater extent. Though the scientific and technological knowledge is available for disaster preparedness and mitigation in different disaster prone regions of the world, the lack of disaster management system in disaster prone regions is causing collateral damages causing enormous environmental costs in form of loss of life and property and the cost of rehabilitation. The neglect of the development of disaster management system for minimisation of the impact of such disasters have caused a huge cost, even a fraction of which could help in disaster management capacity building in disaster prone regions.

This paper identifies the regional pattern of disaster sensitive zones, the causal relation of tectonic movement on sismicity and resultant cummulative impacts of earthquake, landsliding, changes in landforms and meandering of rivers causing floods and other cummulative human interface.On the basis of such analysis, the model framework is suggested for disaster preparedness and mitigation plan in the sensitive zones.

1. INTRODUCTORY REMARKS

1.1 In India, the incidence of earthquakes has increased as can be evidenced by the earthquakes of Latur, Uttarkashi, Bhuj and now the earthquake in Indian ocean causing Tsunami. In all these earthquakes, the damages of life and property has been very heavy. One of the main reason of the incidence of earthquake in Indian peninsular region is the result of tectonic movement of the Indian plate and collision with the Tibaten plate and the occurence of the earthquakes along the fault lines and the sensitive zones. In India, the Himalayan region and the coastal zones are the most sensitive regions and are related with the tectonic movement. In the Himalayan region, the earthquakes are causing landslides, meandering of rivers and resultent floods of the sub-Himalayan plains in Gangatic basin in Bihar and the Brahmputra basin in Assam.

The recognition of the scientific facts of causes of earthquakes in view of the tectonic movements, fault lines, erosion of the land and floods as a cummulative causation of geo-physical processes at differnt sensitive zones of the occurance of earthquakes can help in formulating zonal level strategic disaster preparedness and mitigation plan.

1.2 The most of the damages of life and property could be drastically minimised if the housing and other constructions in the built up environment are made on the earthquake resistant construction technology. The advance warning system which are available could be used for evacuation of the people in the earthquake sensitive zones. Despite the scientific and technological capabilities already developed and applied in earthquake sensitive regions like Japan and other countries, the Indian government has not adopted and developed these capablities in most of the sensitive regions. This indicates the lack of planning even after the series of environmental disasters caused by earthquakes. Though the national disaster management fund and disaster management group have been created at the national level, these are hardly implemented for the sensitive regions.

II.TECTONIC MOVEMENTS AND NATURAL HAZARDS

2.1 India has many environmentally sensitive regions where the geo-physical structure and the processes are very active and frazile. One of the important geo-physical processes is the active movement of Indian plate towards the north which is colliding with the Tibaten plate resulting in gradual rise of the Himalayas. This has resulted in not only the tectonic activities along the fault lines but also in the Himalayan zones which are geologically of recent evolution. this process has created not only the earthquake sensitive regions, but also is causing the disturbances in the land forms resulting in land sliding, erosional activities and meandering of rivers causing floods in the sub-Himalayan basins of nort Bihar and Brahamputra basin. The islands and the coastal regions of the Arabian sea and Indian ocean are also very sensitive from the cyclonic impacts. The phenomena of Tsunami resulting from the earthquake in the sea resulting in strong tridal waves in Indonesian, Srilankan and Indian coastal and island regions of Andman and Nicobar have resulted in heavy loss of life and property.

2.2 All these activities are interrelated and need to be managed in system dynamic approach. The disaster preparedness and disaster mitigation requires institutional, organisational, technological and scientific approach to strategic preparedness planning, management plan and monitoring. The strategies of management of the earthquakes of Latur, Uttarkashi and Bhuj have been generally ex-post mitigation strategies. Despite of the heavy loss of life and property in these earthquakes zones, the information and the impact assessment have not been properly utilised for disaster preparedness planning.

III. DISASTER MANAGEMENT INFORMATION SYSTEM

The data and information relating to the cause and effects of earthquake covering the scientific, economic, social and psychological can be helpful in disaster preparedness planning and mitigation. The geo-physical and other scientific information can explain the causes of the occurence of the earthquake, it's geographical spread etc. The economic data is required for economic impact assessment which can be used for the economic damage minimisation plan. Similarly, the social impact assessment will help in the social planning in the disaster-prone zones including housing pattern, health infrastructure, social awareness and preparedness. The psychological data will help in gathering the information related to the impact on different age and sex group of the communities including the public agencies and governmental and non-governmental organisations which can be helpful in both the awareness and mitigation plans.

All the informations and data of the earthquake prone zones and the impact zones need to be compiled and regularly monitored in such zones. The information of other such regions which are earthquake prone may be exchanged both for monitoring and management and planning purposes. For example, Japan and Canada could provide enough information because of the Japan being an Island and the Canada having Rockies and Andes mountainious regions similar to Himalayan regions in India. The informations of the coastal and the mountain zone disaster management and planning systems from Japan and Canada may be heplful both for disaster preparedness and mitigation plans in India.

IV. PROCEDURE OF DISASTER PREPAREDNESS

The procedure for disaster preparedness in the disaster prone regions not only requires the informations of the region in terms of historical and regional data but also special organisations with manpower properly trained and motivated for regularly managing and monitoring all the human activities in such regions. The existing organisations of administration and management may not be responsive and trained to prepare the contingent mitigation plan due to the lack of information, institutional, technical and financial capabilities etc. The deployment of defence personnel and the civilians in such disaster management tasks in India exibit the lack of preparedness in such situation and movement of men and materials for management has a long gestation period resulting in increasing casualities of life and loss of property.

Disaster preparedness requires organisational framework for planning and management of the disaster in ex-ante and ex-post context. This will require organisations for information management and monitoring, research and development and disaster management organisations for rescue, contingent health management and management for water supply, electric supply and other mitigation activities in such regions. Specialised training to the different public agencies and the people need to be provided in such zones, so that they can effectively participate in rescue and safety operations.

V. STEPS OF DISASTER PREPAREDNESS PLAN

The disaster preparedness plan would require organisational set-up which is capable of preparing long-term, medium and short-term and contingency plan for disaster management. Such agency is required to be developed in disaster prone regions. This agency will be required to work in active collaboration with the agencies which are engaged in collection of information and monitoring and the different specialised agencies of management and administration of different services and activities in the disaster prone areas.

The steps to organise the disaster management plan and preparedness plan will require the following steps in each of the disaster prone regions.

(1) Organisational setup: The disaster management and preparedness requires not only the disaster management and planning organisation but also the agencies which will implement the management and planning activities in such regions. This will include contingent health, water supply, rescue operation, alternative shelter etc. The legislative decisions need to be made according to the disaster management policies of the central government at the regional and local levels.

(2) The disaster preparedness information system: The scientific, technological and management information systems including R & D activities to monitor the different activities in the region and elsewhere is needed for preparedness plan and mitigation plan. Such organisations are needed at the regional and local level to help in preparation of long-term, short-term and contingency plans.

(3) Development and reorganisation of the implementing agencies: The different types of plans need to be implemented in shortest possible time in view of the frequency of occurrence of disaster in such regions. However, the existing civil administration dealing with health, public safety etc. may not be properly geared to undertake the long-term and short-term plans. Hence, such problems could be resolved by developing specialised agencies to undertake the different specialised activities in such regions. Specialised training to the civil administration and public awareness need to be provided in these regions.

(4) The non-conforming activities in the disaster prone areas particularly the construction of housing and other economic activities need to follow the environmental standard. The earthquake resistent building and construction design for housing, water supply, electric supply, transport and industrial activities need to be promoted and regulated.

(5) Advance warning system: The damage of life and property caused by Tsunami has resulted due to the non-availability of advance warning system in the Indian ocean, whereas such technological and management information systems are already available in Pacific ocean regions. This shows the lack of public awareness about such disasters. With the available scientific and technological capabilities in India, such facilities can be acquired or developed not only for India but also for the Indian sub-continent. The increasing environmental threat in Himalayan and sub-Himalayan and the coastal region could be minimised only if advance warning system and the management of disaster follows according to the preparedness plan.

VI. CONCLUDING REMARKS

The incidence of disasters and their impacts are increasing in India. With the increasing population and economic enterprises in the coastal regions as a result of growing international trade, the likelihood of threat to life and property has increased enormously in coastal regions. Moreover, the Himalayas in the environmental epicentre for India. The frequent earthquakes and tectonic movement in these regions require long-term and short-term environmental and economic management plan for minimising the threat to life resulting from land slides and floods. Recognising the geo-physical process of tectonic movements and environmental sensitivities, a national policies for disaster preparedness and mitigation plan need to be urgently prepared for all the environmentally sensitive zones.

REFERENCES:

1. White, G.F. & J.E. Haas, (1975), "**Assessment of Research on Natural Hazards**", Cambridge,MIT Press, 115-121.
2. Jasanoff, S., (1986), "**Risk Management and Political Culture**", New York, Russell, Sage Foundation, 89-95
3. Wildavsky, A. (1988), "**Searching for Safety**", N.J; Transaction Publishers, 62-69.
4. Lang, Kurt & Gladys Lang, (1964), "**Collective Response to the Threat of Disaster**", 23-25.
5. National Research Council, (1983) "**Risk Assessment in the Fedaral Government: Managing the Process**", Wasington D.C., National Academic Press,118-125.
6. Schroeder-Frechette, K.S., (1991), "**Risk and Rationality**", Berkeley, University of California Press,217-228