Dimensions of Natural Disaster Management in India

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The Government, through the National Agenda declared Housing for All as a priority area and have decided to focus on the housing needs of citizens in general and that of the poor and the deprived in particular. Toward this end, the Agenda and the National Housing and Habitat Policy sets a target of construction of 2 million houses every year with emphasis on the poor and deprived. The bulk of the growth of housing is expected to come from the informal and household sector and Government aims to play facilitatory role for the housing activity. It is recognised that most of the housing in the informal and household sectors is in the form of non-engineered constructions. India with its more than 60 per cent land area as disaster prone, is exposed to frequent natural hazards like cyclones, floods, earthquakes and landslides. Disaster mitigation and development being intimately connected, the International Conference on Habitat and Sustainable Development (December, 1997) also recommended to promote Disaster Mitigation measures for ensuring sustainable development in the long term perspective. It is in this context, as well as the rising concern of Government for losses of human life and property, the National Housing and Habitat Policy emphasises the need for promoting disaster mitigation and prevention strategies to minimise the impact of natural disasters on human settlements.

An Overview of Natural Hazards

A natural hazard is an event of nature, which causes sudden disruption to the normal life of a society and causes damage to life and property, to such an extent that normal, social and economic mechanisms available to the society are inadequate to restore normalcy. Viewed in this manner, a host of natural phenomena causes disasters to a society, whether they are related to an occurrence in micro-environment or not. In macro terms, the hazards, which cause widespread damage and disruption in India, are floods, cyclones, earthquakes and landslides.

Interaction of Hazards and Vulnerability

Over 8000 major disasters have been registered worldwide since 1960. The impact of these in terms of modality, the size of population affected and the financial costs shows an increasing trend. With its vast territory, large population and unique geo-climatic conditions, Indian subcontinent is exposed to natural catastrophes traditionally. The natural hazards like floods, cyclones, landslides and earthquakes are not rare. While the vulnerability varies from region to region a large part of the country is exposed to such natural hazards frequently which often turn into disasters causing significant disruption of socio-economic life of communities coupled with loss of life, property and infrastructure.

Indian Sub-continent is amongst the world's most disaster prone areas with :

- 55 per cent of land vulnerable to earthquakes
- 8 per cent vulnerable to cyclones
- 5 per cent vulnerable to floods

One million houses damaged annually + human, social, other losses.

Earthquakes

The Himalayan mountain ranges are considered to be the world's youngest fold mountain ranges. The subterranean Himalayas are, therefore, geologically very active.

Natural hazard map by NATMO

The Himalayas frontal arc, flanked by the Arakan Yoma fold belt in the east and the Chaman fault in the west constitute one of the most seismically active regions in the world. Four earthquakes exceeding magnitude 8+ have occurred in this region in the last 100 years.

- 12 per cent land is liable to severe earthquake (Intensity MSK IX or more).
- 18 per cent land is liable to MSK VIII (similar to Latur/Uttarkashi)
- 25 per cent land is liable to MSK VII (similar to Jabalpur quake)

Biggest quakes in: Andaman, Kuchchh, Himachal, Kashmir, North Bihar and North East.

Landslides

The Himalayan, the north-east hill ranges and the Western Ghats experience considerable landslide activities of varying intensities. The rocks and the debris carried by the rivers like Kosi originating in the Himalayas cause enormous landslides in the valleys. The seismic activity in the Himalayan region also results in considerable landslide movement. The heavy monsoon rainfall, often in association with cyclonic disturbances, results in considerable landslide activity on the slopes of the Western Ghats.

Floods

The country receives an annual precipitation of 400 million-hectare meter. Of the annual rainfall, 75 per cent is received during four months of monsoon (June-September) and, as a result, almost all the rivers carry heavy discharge during this period. The problems of sediment deposition, drainage congestion and synchronization of river floods compound the flood

Flood hazard map from Vulnerability Atlas of India

hazard with sea tides in the coastal plains. The area liable to floods is 40 million hectares; the average area affected by floods annually is about 8 million hectares.

- Floods in the Indo-Gangetic-Brahmaputra plains are an annual feature
- On an average a few hundred lives are lost
- Millions are rendered homeless
- Lakhs of hectares of crops are damaged every year

Cyclones

India has a long coastline of 8,000 kilometers On an average, about five to six Tropical cyclones form in the Bay of Bengal and Arabian Sea every year, out of which two to three may be severe. There are two distinct cyclone seasons: pre-monsoon (May-June) and post-monsoon (October-November)

- 1891-1990: 262 cyclones (92 severe) in a 50 km wide strip on the East Coast
- Less severe cyclonic activity on West Coast (33 cyclones in the same period)
- In 19 severe cyclonic storms, death toll > 10,000 lives

In 21 cyclones in Bay of Bengal (India + Bangladesh), 1.25 million lives have been lost.

Since 75 to 80 per cent of housing stock in the country belongs to non-engineered category, it is estimated that about 1 million houses are damaged annually due to one or the other natural hazard. So far the approach in India, like in most developing countries has been post disaster response for relief, rehabilitation and reconstruction The experience shows that post-disaster response is highly expensive and time consuming and fails in restoring the pre-disaster level of socio-economic life of the country.

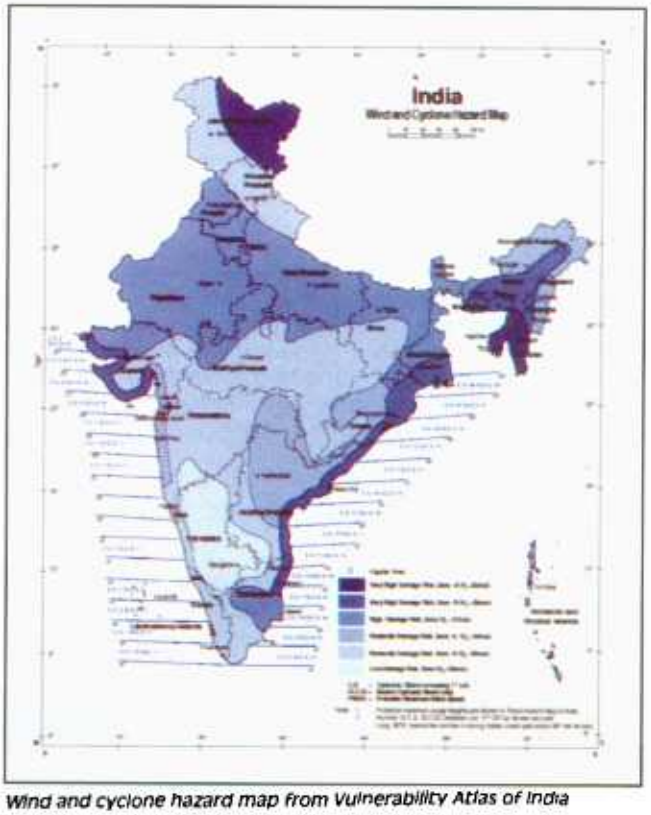
United Nations General Assembly had in its resolution 44/236 of 22 December, 1989 declared the 1990s as the International Decade for Natural Disaster Reduction. In the mid-term review Conference of IDNDR in 1994 the Yokohama Strategy and Action Plan was evolved to which India was also a signatory. This triggered a shift in our national policy from post disaster response to pre-disaster pro-active mitigation, prevention and preparedness. The concern of the Ministry of Urban Development emanated more from the fact that housing and building comprise the most expensive loss caused by natural calamities like earthquakes, cyclones and floods. The Ministry, therefore, constituted a high level Expert Group to study the following issues related to impact of natural hazards particularly with respect to housing and infrastructure:

i Need to identify vulnerable areas with reference to large scale natural hazards such as earthquakes, cyclones and floods, having a potential of damaging housing stock and related infrastructure.

ii. Preparation of a Vulnerability Atlas showing areas vulnerable to natural disasters and determination of risk levels of houses.

iii Formulation of a strategy for setting up Techno-legal regimes for enforcing disaster resistant construction and planning practices in natural hazard prone human settlements

The Group has made several recommendations with regard to prevention and preparedness and disaster resistant construction technologies which could be promoted through appropriate administrative action and modifications in the landuse zoning practices, building bye-laws and regulations. The Atlas, with the help of State and Union Territory wise hazard maps as well as housing risk tables for each district, indicates the overall vulnerability of different regions and the recommendations of the Group provide technical guidelines for construction of new houses as well as for retrofitting of the existing ones in different zones. One of the major recommendations is to establish well structured Techno-legal regimes for effective enforcement of disaster resistant planning and construction techniques.



Wind and cyclone hazard map from Vulnerability Atlas of India

A combination of local hazard intensity and vulnerability of existing house types based on observed performance has been used for carrying out risk analysis as indicated in the district-wise tables The Vulnerability Atlas, thus, provides ready information at the macro-level for use by the authorities concerned with natural disaster mitigation preparedness and preventive actions.

Initiatives for Disaster Prevention, Mitigation and Preparedness

The National Housing and Habitat Policy with its goal of Housing for All, lays adequate emphasis on promoting cost-effective building materials and technologies and disaster resistant design and construction methods. Recognising the loss of life and property and damage of nearly 1 per cent housing stock, and in keeping with the goal of 2 million additional houses programme, the Ministry of Urban Development has taken several initiatives to promote disaster resistant technologies.

One House Saved is One House Built

The Ministry has recently formulated a scheme to improve access of the people to low cost funds particularly for the households in EWS and LIG categories for retrofitting and strengthening of existing houses in 139 disaster prone districts of the country. The scheme once approved and implemented will greatly help in strengthening the existing housing stock both in urban and rural areas to prevent complete destruction in future events. This centrally sponsored proposed scheme aims at providing for adequate funds to the low income households and the technical guidelines as a part of the financial package for strengthening of the non-engineered existing houses.

Yet another initiative taken by the Ministry is to encourage State Governments for establishing appropriate Techno-legal regimes, which will enable introduction of suitable amendments in the building bye-laws and other regulatory instruments for promoting disaster resistant construction and planning methods in construction of buildings and land use and zoning practices. Recently, for example, the Ministry has approved amendments in the Unified Building Bye-laws of Delhi to incorporate suitable clauses which will ensure all new building construction to provide for earthquake resistant features in their design and construction. Since Delhi lies in Seismic Zone IV which can be subjected to intensity VIII (like what occurred in Uttarkashi, Latur & Chamoli), in the event of an earthquake, such a step will greatly help in preventing severe damage that may be caused to housing and building stock in Delhi if an earthquake was to occur. Other recommendations of the Group are further being examined by concerned authorities, with a view to formulate suitable amendments in the regulatory documents concerning planning, development plans, and development control rules

Preparedness and Mitigation Measures

India besides evolving effective post-disaster management operations, has also formulated and implemented pre-disaster mitigation programmes and sectoral development programmes to reduce the impact of disasters as well as reduce the socio-economic vulnerabilities. The reconstruction programmes in the aftermath of disasters such as cyclones and earthquakes are also aimed at building disaster resistant structures to withstand the impact of natural hazards in the future

In fond memory..

The entire engineering fraternity deeply mourns the sad demise of **Padma Bhushan Dr Jai Krishna**, the doyen in the field of earthquake engineering, who placed India in the international map with his outstanding contributions in the sector. He was 90 years old.

His pioneering contributions in the field of earthquake engineering have been trend setting. He was the Chairman of the Standardisation Committee of the Bureau of Indian Standards and was instrumental in the finalisation of the initial path finding series on Indian design codes and non-engineered, ready to use construction practices with various types of construction and materials. The work on the seismic zoning map had created a major awareness among the designers on earthquake resistant construction from the sixties. Dr Jai Krishna was the Head of the Department of Earthquake Engineering in the University of Roorkee and was subsequently the Vice-Chancellor of the University of Roorkee.

The contributions of Dr Jai Krishna would remain immortal and always remind the engineering fraternity of the man whose commitment to the cause knew no bounds and would ever remain an inspiration to the younger generations.

HUDCO fondly remembers the rich contribution of this doyen, on the occasion of the IDNDR Day.