AN INITIATIVE TO REDUCE EARTHQUAKE RISK IN MAHARASHTRA, INDIA:DEVELOPING A PLAN FOR THE FUTURE

Frederick KRIMGOLD[1], Marjorie GREENE[2], Svetlana NICOLIC-BRZEV[3], Jelena PANTELIC[4] And Krishna VATSA[5]

SUMMARY

After a devastating earthquake in September of 1993, the Government of Maharashtra, India, has undertaken a concerted effort to better understand and reduce earthquake risk. This has included the development of an extensive disaster management program. The program includes the elaboration of multi-hazard exposure studies, state-wide and district specific vulnerability studies and the development of a comprehensive mitigation strategy for the state. The disaster management program also includes the development of a dedicated disaster management information system and the preparation of comprehensive hazard maps using remote sensing and GIS. This initiative in Maharashtra provides a useful model for and approach to earthquake risk reduction in the context of a comprehensive disaster management planning and implementation effort. The example of Maharashtra may be of particular value for earthquake-prone developing countries with limited resources and a vulnerable traditional building culture.

INTRODUCTION

Background

A strong earthquake of magnitude 6.4 on the Richter scale struck the Marathwada region of south central Maharashtra on September 30, 1993. The earthquake killed over 8,000 people and injured another 16,000. Over 1,000,000 people lost their homes. Sixty-seven villages were completely destroyed and over 700 villages suffered extensive damage. The total property loss was approximately $333 million [GSI,1996; Gupta,1996; Jain,1994].

The magnitude of loss necessitated immediate state and central government intervention. It was recognized early on that a major rebuilding program would be necessary [GOM,1993]. The Government of Maharashtra through the Central Government of India requested assistance in the form of an emergency reconstruction loan from the International Bank for Reconstruction and Development (World Bank). Long term support was also provided by bilateral development agencies and other multilateral donors. One of several innovative components of the World Bank loan for the Maharashtra Earthquake Emergency Reconstruction Program was dedicated support for the development of an improved disaster management capability in the state [World Bank,1994]. The linking of post-disaster reconstruction funding to future disaster mitigation represents an important policy advance for international development lending agencies.

[1] *Virginia Polytechnic Institute and State university, 7054 Haycock Road, Falls Church, VA 22043, krimgold@vt.edu*
[2] *EERI, 499 14th St., Suite 320, Oakland, CA 94612, mgreene@eeri.org*
[3] *Sandwell Engineering Inc., 1045 Howe St., Vancouver, BC Canada V6Z 2A9, sbrzev@sandwell.com*
[4] *World Bank, 1818 H St., NW, Washington DC 20433, jpantelic@worldbank.org*
[5] *George Washington University, Washington, DC, harrald@seas.gwu.edu*

In the design and implementation of the rebuilding project, the agencies involved placed significant emphasis on reducing risks associated with future earthquakes. The priority of mitigation was evident in the project documents of the Government of Maharashtra and the World Bank. Two of the most prominent objectives of the project focused on mitigation: to enhance the earthquake resistance of buildings through improved standards of design and construction and to reinforce the capabilities of the GOM to respond more efficiently to possible future disasters. This emphasis on mitigation resulted in extensive training and demonstration activities in the course of the reconstruction and the creation of an elaborate disaster management initiative.

Disaster Management Initiative

The Government of Maharashtra supported the development of a comprehensive disaster management program that included the development of response plans at the state and district levels, the identification of risks and vulnerability for each district and the state and the identification strategies at the state, district, and village levels. The Government of Maharashtra is now continuing with a mitigation implementation program which will bring vulnerability assessment and mitigation planning to the village level.

The need for the disaster management initiative was recognized in the initial working papers of the the World Bank project team[World Bank,1993]:

The principal purpose to engage in disaster management is to reduce vulnerability of the population and the built environment before disasters occur; to minimize life and property loss, enhance populations resilience by providing providing development opportunities, and to ensure environmental viability for future generations.

Disaster management rests on the foundation of disaster preparedness planning, mitigation and prevention, and is informed by the knowledge generated by research on earthquakes, floods, high winds and other natural hazards. Disaster management cannot be viewed separately from environmental management, and jointly they must be integrated into the development activities of a country or region.

As function of social and economic conditions of the population, disaster vulnerability cannot be successfully dealt with as a single focused item on the policy agenda of most developing countries. Commonly, lesser developed countries can ill afford even the most urgent everyday development programs, such as access to safe water supply, basic health care and education to the majority of their citizens…neglecting vulnerability reduction may be a costly choice, since disasters tend to bring about substantial destruction and significantly slow down the normal development process. [World Bank,1993]

THE PLANNING PROCESS

1995 Disaster Management Conference

After the initial World Bank appraisal mission in 1993, The Government of Maharashtra and the World Bank team began the disaster management process by organizing a workshop involving all the relevant state government agencies, NGOs central government representatives and representatives from the private sector. With funding from the U.K. Overseas Development Administration (now Department for International Development),an International Workshop on Disaster Management was held in May 1995. Approximately 60 representatives participated in the two days of presentations and discussions that focused on developing ideas which would improve mitigation, response and recovery at the state level.

Management Structure and Committees

The May 1995 Workshop resulted in an Action Plan which outlined the tasks of the disaster management process. The plan established a management structure , defined products and assigned agency responsibilities for development of the disaster management program. The Disaster Management Council was formed, Chaired by the Chief Minister and including the key Secretaries. Supporting the policy level Disaster Management Council there is a working council which includes 11 Deputy Secretaries, an NGO representative and a District Collector (local administrator).

The Disaster Management Council met for the first time in January 1996 and outlined a structure for completing the disaster management plan for Maharashtra. It was decided that the most effective formulation of disaster management would address all the important hazards facing the population of the state. This is particularly important because even as this effort was launched in response to an earthquake, the Council recognized that it

would not be feasible to maintain and effective organization directed exclusively toward earthquake or even exclusively toward natural hazards. This multi-hazard orientation is reflected in the structure of drafting committees established to develop the Action Plan:

Subject	Committee Chair
Floods and Cyclone	Secretary, Relief and Rehabilitation
Earthquake	Secretary, Earthquake Rehabilitation
Industrial and Chemical Hazards	Secretary, Industries
Road Accidents and Fire	Transport Commissioner
Epidemics	Secretary, Health

Each committee consisted of technical experts and NGO representatives and state government officials. The planning process was open and participatory. Broad participation by interested parties from the academic community and the private sector were encouraged. Each committee was to identify and review all existing plans, studies and data sources related to management of their assigned hazard. [GOM,1998]

It is important to note that the principal natural hazard affecting Maharashtra, drought, was not included in the hazards addressed in the disaster management planning process. The drought management and response organization in Maharashtra is well developed and considered quite successful. The existing drought plan was referred to and a example for structure and process.

Access to data can pose a serious problem in India. Some data such as seismological records are collected by central government agencies while other data such as that relating to buildings is collected by state and district level agencies. Such data is often not easily shared between agencies or between levels of government. Data collected by research institutions and the private sector also is considered proprietary. Assembly of appropriate data for the planning process can present a major challenge even when it has been collected and is in the hands of public agencies.

Under the authority of the Disaster Management Council the Government of Maharashtra defined the structure of the Plan. First, risk and vulnerability assessments were prepared for the state and a model response plan would be prepared for the state. The planning process was initially extended to six representative districts. Then, with support from the United Nations Development Program similar plans were developed in the remaining 25 districts, including Mumbai. Finally, a mitigation strategy was prepared at the state level.

THE DOCUMENTS

Risk and Vulnerability Analysis

The first document produced as a part of the planning process was a risk and vulnerability assessment for the State of Maharashtra. This document was developed with the assistance of national and international consultants. It provided comprehensive background information for state level planning for both disaster response and disaster mitigation. The state plan also provided a prototype format for the district level risk and vulnerability assessments which were carried out in each district.

The Government of Maharashtra identified a number of factors contributing to vulnerability:

- **Economy.** Floods and cyclones can have a devastating effect on agriculture, so the primary economic comes under threat from these two hazards. The impact of the disaster may be more severe for women workers and wage laborers in the rural areas; the situation would be similar for male workers in urban areas.
- **Poverty.** The people most affected by a disaster are those with the most limited resources and little access to food and shelter. Poverty leads to vulnerable housing, since poor people primarily occupy the uninhabitable areas, hillside slopes, slums, settlements near storm-water drainage systems, etc. Lack of access to education can also make populations more vulnerable in the event of disaster.
- **Social Structure.** Most of the poor in Maharashtra are from the scheduled castes (generally landless laborers; scheduled refers to castes that are enumerated in a schedule of the constitution) and scheduled tribes (indigenous peoples), making them more vulnerable. These castes and tribes have a lower rate of

literacy as well as fewer job opportunities and fewer opportunities to participate in decision making, particularly critical decisions related to mitigation and rehabilitation.

- **Urbanization.** Urbanization increases vulnerability because of high rates of incoming migration and the high density of population. An increasing influx of poor immigrants th the state's urban areas adds pressure on the existing infrastructure and land resources.
- **Infrastructure.** Warning messages are generally communicated through the mass media, which may not be accessible to all threatened populations. Poor road conditions and lack of public transportation makes some remote villages particularly vulnerable, as they are either trapped or inaccessible.
- **Housing.** Construction materials, age, and poor maintenance contribute to the vulnerability of the housing stock.

As part of the planning process, the state and individual districts continue to collect data on risk and vulnerability. The data will help the government prioritize limited resources, integrate with other priorities, and direct their attention to the most vulnerable areas and populations . Information regarding poverty alleviation policies will also be factored in, as they would reduce vulnerability. These include programs such as social welfare, employment generation for youth, and the development of social and economic programs for women and children in rural areas[GOM, 1998]

Disaster Management Action Plans (DMAP)

The Disaster Management Action Plans focus on the state and district emergency response actions, building on the need for coordination and effective information flow. The action plans also call for significant involvement on the part of NGOs and the private sector. An Emergency Operations Center (EOC)"Control Room" in Mantralaya, the state government headquarters in Mumbai, was created as a part of this plan.

In each district, a District Control Room was organized in a similar fashion to the Emergency Operations Center. The flow of information is clearly prescribed for both disaster and normal conditions. The plan is to be disseminated at three levels; to district authorities, government departments, NGOs, and other institutions and agencies in the state and through the mass media to the general public. In addition to the dissemination of literature, the Relief Commissioner is to ensure that disaster response drills are conducted regularly and that the DMAP is updated annually. The Commissioner is to organize an annual conference for DMAP, where all concerned departments and agencies are to participate and to give recommendations on specific issues.

Mitigation Strategy

The goals of the mitigation strategy are as follows:

- To substantially increase public awareness of disaster risk so that the plublic will demand safer communities in which to live and work;
- To significantly reduce the risk of loss of life, injuries, economic costs, and destruction of natural and cultural resources that result from disasters.

The main elements of the mitigation strategy are as follows:

- Risk assessment and Vulnerability Analysis. This element of the strategy calls for further studies on risk and vulnerability, including the involvement of local communities in identifying their own vulnerabilities.
- Applies Research and Technology Transfer. The strategy calls for expanding observational and monitoring systems, particularly in areas of the region where data is scarce and risk is high. There is a great need to establish or upgrade observational equipment and networks, monitor the hazards, and improve the quality of forecasts andwarnings, disseminate warnings quickly through the warning system, and undertake simulated disaster management excercises.
- Public Awareness and Training. Training is needed for officials and staff at both the state and district levels. The Center for Disaster Management at Yeshwantrao Chavan Academy of Development Administration (YASHADA) will play a pivotal role in this training for state and district officials and the officials from line departments, as well as providing training for NGOs and the private sector. The upgrading and strengthening of this organization is an important part of the mitigation strategy.
- Institutional Mechanisms. A permanent administrative structure needs to be identified to monitor developmental activities across departments and to provide suggestions for incorporating necessary

mitigation measures. Existing bodies such as the Chamber of Commerce, Confederation of Industry, and Agriculture Produce Market, will also be asked to promote mitigation measures among their membership.

- Disaster Management Legislation and Relief and Rehabilitation Policy. Over the years, government efforts to regulate relief and rehabilitation after disasters have resulted in a number of policy guidelines and orders. These need to be evaluated and brought together under more coherent disaster management legislation and relief and rehabilitation policy.
- Incentives and Resources for Mitigation. The mitigation strategy calls for making mitigation a priority in all state actions and linking it with incentives, grants, and loan programs. The state has proposed creating a Vulnerability Reduction Fund at the state level that can provide funding for mitigation activities. The state has also called for research into the feasibility of disaster insurance, available not just for life but also for household goods, cattle, structures, and crops.
- Land Use Planning and Regulations. The mitigation strategy calls for long-term disaster reduction efforts that aim at promoting appropriate land use in disaster-prone areas, particularly the formulation of land use policies for long-term sustainable development. Sensitivity to the use of land within a settlement is importan

CONCLUSIONS

In the aftermath of the 1993 earthquake in Maharashtra, India there was a very creative and constructive collaboration of International, national, state and local government agencies, NGOs and the private sector to both manage a highly successful recovery program and to initiate a vey noteworthy comprehensive disaster management program. The disaster management program of the Government of Maharashtra provides a useful example of what can be accomplished to reduce disaster risk even under conditions of resource constraint. The elements of the planning process and the implementation program for disaster management may well be considered for adaptation in disaster-prone developing countries elsewhere in the world.

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