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POLICY DEVELOPMENT FOR REHABILITATION AND RECONSTRUCTION WORK AFTER SEPTEMBER 30, 1993 EARTHQUAKE

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ABSTRACT

An earthquake destroyed parts of Maharashtra and Karnataka states of India. This area was considered to be geologically stable and earthquake free. To assist the state in its rehabilitation and reconstruction works the Government constituted an advisory committee to prepare a policy framework. The work described herein deals with the comprehensive plan which have been developed and recommended by experts.

KEYWORDS

Earthquake damages, rehabilitation, reconstruction, relocation, management, policy development.

INTRODUCTION

Maharashtra and Karnataka states of India lying in the South-Western part are generally not seismically active. Earthquakes in these regions are rare and only some areas of Maharashtra have been identified to be having seismic status after the 1967 Koyna earthquake. People have never experienced earthquakes in this area and hence, construction practices have developed accordingly. After a good harvest people enjoyed the celebration of almighty Lord Ganesh in the villages. There was happiness and joy everywhere in the area. On the last day of the festivities people completed their religious functions and took their deity for immersion in the rivers. When they returned late in the night, all were exhausted and went to sleep for a good rest thinking that early morning they will discuss the festivities of the season with their families and friends. But for some very unfortunate ones, young and old, men and women it became an eternal sleep from which they never awoke. In the early morning hours when most people were fast asleep, the ground started trembling, with houses collapsing, dust rising, cries of pain and sufferings echoing, children shouting for their parents for help and within a few minutes several villages had become pile of rubbles.

EARTHQUAKE AND DAMAGE

A devastating earthquake of magnitude 6.3 jolted parts of Maharashtra and Karnataka on September 30,

1993 at 03h 55m 47.5s (IST). It was a shallow focus earthquake with an epicenter at 18.2N and 76.7E. This area has been known to be geologically stable and relatively earthquake-free. This happening baffled all believes of seismologists because firstly, they were puzzled, and now, all kinds of explanations are being provided. But the hard fact is that people lost their lives, family members, homes, and properties. This further brought a point that, the knowledge available now in certain discipline is still inadequate. The basic construction material used in the area were stone and houses were usually made very heavy to take care of extreme climatic conditions of heat and cold. With lack of past experiences, the structures were built absolutely non-earthquake resistant. Hence the damages of this magnitude is not surprising. Destructions of villages to rubbles were a common scene everywhere. About 10,000 people were killed and another 16,000 were injured. About 30,000 houses were destroyed or severely damaged in the two districts of Latur and Osmanabad. The physical destruction and death had been accompanied by extensive personal trauma, massive tragedy in families and severe dislocation of community life. Wells and water holes were clogged and work for the livelihood had been completely dislocated. Infrastructure for health care, education, and the daily activities of the people were badly destroyed. Physicians and psychiatrists who surveyed a few villages found that on an average, one person from every forty interviewed, was suffering from major depression or other post trauma stress. Based on the survey of the damages of buildings and other structures, isoseismal shown in Fig. 1. was prepared (GSI, 1993).

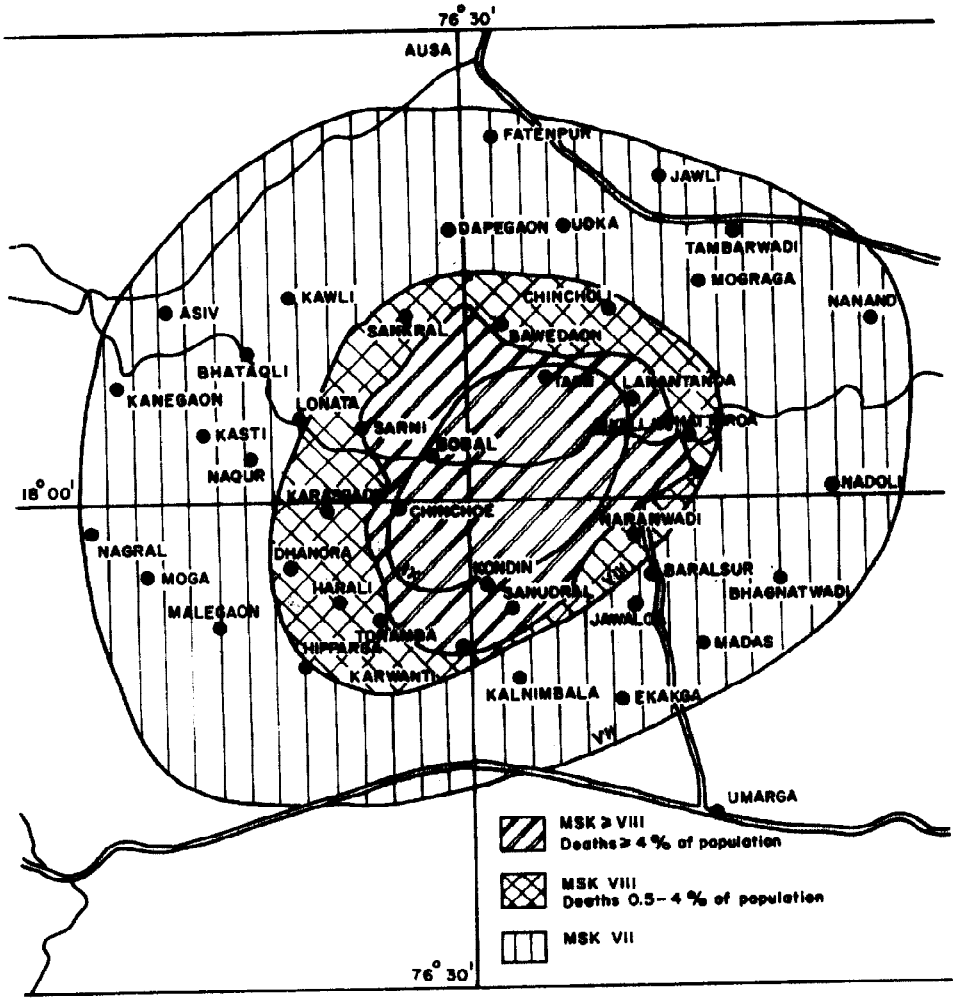

Fig.1. Isoseismal Map of Killari Earthquake

The maximum damage is estimated to have reached MSK intensity VIII to IX. An area of 350 sq km. spread in 43 villages around the epicenter zone of Khillari is covered by isoseismal VIII. Isoseismal VII covers an area of 850 sq km in 93 villages (excluding that under intensity VIII). Overall it was a tragic event as well as a heavy loss to everything and needed careful planning for rehabilitation and reconstruction.

THOUGHTS OF POLICY DEVELOPMENT

The extent and nature of destruction is needed to be carefully understood and any program development must encompass rehabilitation of individuals, families, and communities. Further, the program must also be forward looking due to the size of the population and economic growth, the area may undergo in future. It must have a general social acceptance considering the living patterns and cultures of the area. The rebuilding of destroyed houses, roads, and other physical facilities is one aspect of rehabilitation and technical people are generally good at this, provided they do it well. If there are resources available architects, engineers, planners, developers, and a large number of NGO's will be rushing to have the share and create a flood of ideas, policies, programs, and competitions among themselves without even any invitation and will be ready to transform the village to a town or to a nice modern village. But there is always a great danger that people may not like to live in such a modern village or a village turned to a city within months and thus the whole program will fail. Further in such programs, there is no capacity building aspect for the villagers to learn, develop, participate, and contribute. The result will be that they cannot proudly say that this was their own program as they had contributed in it and benefited from it. This will not bring them any motivation for long term gains too. Hence this time the Government of India was careful and created an advisory committee to prepare a report to lay down the policy for rehabilitation and reconstruction work for human settlement. The author had the opportunity to work as a member of the advisory committee in the policy program development. There are several examples of failures of projects or programs when a comprehensive approach has not been followed. The restoration of the confidence of the people and rebuilding of the communities and further bringing their life of normalcy is another aspect and in essence is more critical. The two basic objectives have to be always kept in mind while thinking about any policy development or program and as such the thinking went along these principles. Further the author also pushed that in a village situation these days success of any program depends largely as to how much the benefit it gives to the people directly. Secondly, people (men and women) must be involved at every stage of work from the beginning and their views must be heard, analyzed, respected, and as appropriate must be adopted. Based on these basic ideas a policy document outlining a comprehensive framework for rehabilitation and reconstruction has been developed.

POLICY DEVELOPMENT

The main points covered in the policy development consists of the following basic framework. (i) people's participation in reconstruction, (ii) reconstruction strategy, (a) relocation of villages, (b) new villages and layouts, (c) building materials and plan development, (d) new houses at existing sites, (e) repairs and strengthening of damaged houses, (iii) strengthening of vulnerable housing stock, (iv) strengthening of earthquake monitoring network, and (v) project management and coordination,

As stated earlier, India's northern provinces also had an earthquake a few years ago and there were many NGO's and other interested groups to assist the Government in its rehabilitation efforts. In the absence of any plans or policy recommendations people contributed in their own way and it was considered a non-successful program. The affected population did not benefit and with this experience, a proper planning had to be made from the beginning in this case. Still some NGO's were so enthusiastic that they pushed too hard and got some approvals for rehabilitation work in the area and started reconstruction work of their own without any proper recommendations from any competent technical authority. With this background, the initiatives of Government of India in this earthquake is commendable and worth praising and it is hoped that with this policy framework further work will be guided.

PEOPLE'S PARTICIPATION IN RECONSTRUCTION

After every earthquake the authorities are in a hurry to go for rehabilitation and reconstruction work in the name of helping the victims. They simply forget whether the program developed by them in the secretariat of the Government or planning body will be suitable for the affected areas or not. It must be remembered

that such a rehabilitation program within a short time frame has never been taken up before in India. There were a large number of donors, NGO's, Government organizations, financial institutions, artisans, and community at large who would like to contribute in this work. Hence any program development must account for this fact too. The donor agencies, and international development banks have their own way of assisting but ultimately all is going to affect the people. Experience world over has shown that people's participation is an essential requisite for the success of any reconstruction program. Typical cases of failures of rehabilitation programs after major earthquakes due to lack of involvement of the people are the Turkey, Chile, and Nicaragua. The problems of Yemen are also now being reported. It is coincidental that the author had prepared the damage survey report and provided technical recommendations for earthquake resistant construction for Yemen earthquake during 1982 but subsequently had no involvement in any reconstruction program. Involving people's participation has its own dynamics and is per force a slow process but once people are mobilized and motivated properly then a large number of people can become available to complete the work quickly. The response of village community will be ascertained in regard to relocation versus in-situ construction, village layout plans, layout of the houses, methods of construction etc.. The best and most practical way to ascertain the will and wishes of the community is through Village Council resolutions. After the earthquake a number of families which are only headed by women and widows. There are orphans and old men. The interests of these special groups as well as those of Schedule Castes/Tribes should be protected. In order to focus attention on the needs of women and young children it is necessary to provide for additional day care centers and also allocate projects of the Government which at present are not covered by the scheme. An awareness generation campaign should be launched to elicit community participation and for benefiting more women.

RECONSTRUCTION STRATEGY

For the development of reconstruction strategy extensive damage assessment must be done. It will be better to have all information about the village situation houses, properties, and people etc.. Here the following reconstruction strategy have been recommended.

Relocation of Villages

For those villages where houses are heavily damaged or destroyed and which fall within isoseismal VIII, their numbers stand at 38 and number of houses to be reconstructed are 16,408. Technically there are absolutely no ground for relocation of affected villages. People have a wrong belief and there is nothing like safe places in a seismic area. The most important thing is to build a safe house and strengthen the existing houses to make it earthquake resistant. The only possible technical reason for relocation of a particular destroyed village would be the large amount of debris whose removal would not be practical and cost effective here. Further the psychological factors arising out of the fact that in several villages the death toll has been very heavy and the dead has been cremated near the house sites themselves and the massive destruction of the house must be respected. The original idea proposed by the state Government authorities was that 83 villages should be relocated but the advisory committee and particularly the author examined all pros and cons after visiting the area and recommended for trimming the relocation of villages. Finally only 38 villages were identified for relocation. While acquiring land for new village sites care must be taken to see that there is no adverse effect on small and marginal farmers whose lands might be involved. The state Government's responsibility should be to fund the necessary infrastructure, viz. roads, water supply, sanitation, drainage and sewerage, electricity, civic amenities like schools, health centers, cremation grounds, and developed plots should be made available to the affected persons. Assistance for developing agribusiness opportunities for economic viability of the region should also be provided.

New Village Sites and Layouts

It is to be pointed out that the state Government had decided that the new village sites should be located on

hard murrum soil. In this process some villages could have been located far away from the agricultural lands which are located near the old village sites. It must be realized that soil condition are not of paramount importance, because with proper technology, which is also cost effective, earthquake resistant houses can be constructed on black cotton soil also. On the other hand, nearness to agricultural lands becomes an important criteria. There should not be any insistence on a particular layout (grid planning) as proposed by the State Government agency. A cluster type planning may be more suited in this situation. Therefore all layout plans should be presented before the villagers for their suggestions.

The old village sites which are going to be abandoned could be converted into memorial forests and developed under social forestry program. A few of the damaged houses which will be abandoned after relocation of village may be converted as permanent museum of earthquake. This could further be developed as a training center in the affected area. This center should cater the following:

(a) Showing typically damaged buildings (indicating how building got damaged during earthquake);
(b) Building typologies recommended for the construction to show different stages of construction to propagate the improved construction technology;
(c) Museum showing damaged and reconstructed villages; and
(d) Equipped lecture hall facility.

Building Materials and Plan Development

As soon as a layout is finalized, the plots should be allotted immediately. A house holder should know his plot right from the beginning so that he takes interest in his property and start contributing labor in putting up the house. Allotment of plots by a lottery system has certain infirmities. It is better that allotments of clusters are made to groups of villages through the medium of village council, where conflicting demands arise, they can be resolved through negotiations or through a system of lottery. Within a cluster, they can follow a system of lottery in deciding individuals house sites or any preferred way of distribution. The incremental concept of housing has been propagated but all incremental steps must follow earthquake resistant construction techniques. There is need to preserve the local architecture. Further local building materials should be used for rebuilding purpose on considerations of easy availability, low cost, etc.. There is a popular perception that houses built of stone has been cause of such a high death. Therefore some fear is associated with its use. It should be recognized that there is nothing wrong with the use of stone. But the structure must be made earthquake resistant and that is the key.

For rapid construction work machine made cement concrete blocks are recommended for use. It has a higher strength than hand made one. For roofing material there is a choice such as RCC slabs cast in situ, RCC planks (precast elements) and filler or cored slabs, and tongue and groove connection, or foam cement concrete. Use of timber is not recommended for want of availability. Leach pit technology is recommended for rural sanitation work.

New Houses at Existing Sites

As there are only 38 villages to be relocated at new sites, about 29 villages remain where new houses will have to be built at existing sites after clearance of debris. Reconstruction of collapsed houses in these villages will be a challenging task. Here people may feel that they are being neglected or getting less in assistance than those who are going to new locations. Second problem may be of technical nature. To help people overcome these shortcomings there is a need to do some demonstration construction at existing village. This should explain of construction and types of improvements that could be carried out to assure the people.

Repairs and Strengthening of Damaged Houses

Repairs of the damaged houses will be quite difficult and complicated process than the reconstruction of new houses. The damages can range from minor cracks to collapse of part of the wall, part of the roof, etc.. Thus assessment of damage would vary from house to house depending on the size of the house, type of damage, etc.. The technology option for repair and the cost of repair also would vary from house to house depending on the pattern of the house, the material used in the house, etc.. There has to be technical teams constituted who should follow a rigorous and uniform damage assessment procedure. The International Association of Earthquake Engineering have prescribed various damage categories. These should be used for categorizing the damage, and uniform documentation should be carried out for all affected villages. For the purpose a team of appropriately trained junior engineers and technical assistants should be constituted. These personnel should be provided adequate training cum demonstration by established institutions in India and in Bangkok, Thailand. Further due to the nature and volume of work, no outside contractor will accept it and hence village artisans should be trained to execute the work of repairs. These artisans again may be trained by established institution in India and in Bangkok. The work of repair should be started in a few selected villages first to gain experience and to establish the arrangements and also to develop confidence amongst the villagers about the scheme through individual and community participation. The technical personnel team would carry out damage assessment and prepare applications for financial assistance for submission to State Government and the Banks. The team would also monitor repair and strengthening works and certify the satisfactory completion of the work.

STRENGTHENING OF VULNERABLE HOUSING STOCK

The housing stocks in the district of Latur and Osmanabad and 11 other districts of Maharashtra where some damages have taken place and also in 3 districts of Karnataka runs into several hundred thousand. The district wise list of the number of houses needing strengthening has been developed and numbers are simply huge. A minimum of 200,000 to a maximum of 525,000 house in typical villages need strengthening. The exact number is a total of 5,062,000 houses. The survey has indicated that 85% of the total houses in the area are made of stone and earth walls and hence quite vulnerable to earthquake risk. It is felt that this work is enormous and the problem can only be addressed in a phased and sustained manner over a long period of time after giving due priority. A beginning must be made immediately by providing available resources and knowledge otherwise the opportunity initiated after this earthquake to a national risk reduction program will be lost. To do this gigantic work, masons and carpenters who normally take part in construction activity have to be properly trained with proper training in classroom first and then with practical demonstration with a view that they understand different types of strengthening situations and way of achieving it. It is recommended that strengthening and retrofitting can be taken in two parts:

(a) repair, strengthening and retrofitting within isoseismal VII area as a part the of World Bank program;
(b) the area in isoseismal VI and beyond as per strategy of the state and the country's program.

The retrofitting as in (a) and (b) above has to be essentially carried out by the householder himself utilizing the services of artisans or petty contractors. For program (a) the technical supervision will be provided by the junior engineers. The technical advise, technology for repair, strengthening, and retrofitting will be provided by the institutes in the country and Bangkok which has been identified for this work. Before the repair and strengthening program is under taken an awareness program be done in the village by local political persons, social workers, voluntary organizations to inform the people and to prepare for their further participation in the program. The responsibility of the Government would be:

(a) to give publicity to the package of technical measures for strengthening of houses and its method of execution;
(b) arrange for training of mason, carpenters, artisans, and builders;

(c) arrange for practical demonstration retrofitting and strengthening technology in some houses in selected villages; and

(d) to persuade local banks to evolve financing schemes so that those needing a loan can avail of the same for this purpose.

STRENGTHENING OF EARTHQUAKE MONITORING

Traditionally the seismology wing of the Indian Meteorological Department (IMD) has been the nodal agency for earthquake monitoring in the country. Unfortunately this agency has not moved and kept itself uptodate with developments in seismological monitoring and is still troubled with mostly outdated equipments. Further there is little in common these days between the sciences of meteorology and earthquake monitoring. In addition, presently, various agencies or organizations looking into different aspects of seismology also have installed some seismological equipments but there is no central nodal agency to coordinate their work. Several committees have developed useful proposals for seismic monitoring in the country with additional stations and state of art instruments. This will help in covering the whole country uniformly with an aim of recording Magnitude 3 earthquakes and locating and analyzing all earthquake of Magnitude 4 and above. It is also recommended that the cost of several essential instruments be met with World Bank loan with the cost of man power and maintenance for initial period of 3 years. After the three year period, the responsibility of continuing the observatories and monitoring be taken up by Department of Science and Technology, Govt. of India through IMD.

PROJECT MANAGEMENT AND COORDINATION

In the implementation of a project like this, a large number of agencies will be involved to do various administrative, training and demonstration, project execution, monitoring and evaluation, reporting, etc.. Apart from state and central government agencies, institutes, there will be a number of NGO's involvement too. If the project has to be executed smoothly, with speed, there will be a need of proper coordination and management arrangements between various agencies which ultimately will serve the village community. Coordination mechanism between various state funding agencies should also be established so that their funding is better utilized. The coordination will have to be achieved at various levels starting with the state level, district level, the village level and even at the cluster or neighborhood level within a village. The coordination has to come by a properly constituted and empowered Project Management Team (PMT). The State Government has already nominated Secretary of Earthquake Relief as Head of Project Team at state level and an Additional District Collector as Head of Project Team at District Level. Others will be duly constituted. There will be project teams at each village level as many things will have to be sorted out when work starts. The terms of reference and powers of the project teams at various levels should be clearly defined and made known to all concerned. They should be empowered to settle the disputes relating to provision of infrastructure, allotment of plots etc.. There should be transparency in application of the norms developed and people should be made aware. The PMT should be adequately staffed and should have its member secretary a senior Executive Engineer from the Government. The engineering personnel to be deployed at the village level should be drawn from Rural Development Department and those assigned for this work should not be transferred until the work is completed and they be given special pay to compensate for the onerous responsibility. For the appropriate technology transfer, training, production and construction assistance, the State Government has proposed establishment of 12 Building Centers in the earthquake affected districts. These Building Centers should be established, operationalised, and made functional at the earliest with logistics, financial, and organizational assistance to be given by Housing and Urban Development Corporation (HUDCO) to the District Administrations. This would help in the dissemination and propagation of earthquake resistant construction methods and also assist in strengthening the construction delivery system of new sites and construction at existing sites. Model demonstration houses using technology options could also be put up in the building centers. While the NGO's are doing extremely useful work here, yet there have been cases like in Uttarkashi earthquake where the work

initiated by NGO's under great enthusiasm was left incomplete and people suffered. It is hoped that such an experience would not be repeated here. NGO's and donor agencies who have chosen to help the community have a responsibility towards them to complete the job. The Government should see to it. A contractual agreement between NGO and the donor agency and the district level Project Team/the Government spelling out the responsibility of each party would be useful in smooth implementation of the project. This project has considerable technology inputs. Therefore it is suggested that Central Building Research Institute (CBRI) should be retained by the State Government as a Project Consultant/Monitor, to ensure proper application of technology.

DISCUSSION

India has experienced some of the biggest earthquakes and the destructions as well as deaths have been considerable. A number of state and central Government agencies get involved depending on the size of disaster and take various initiatives for providing relief and other necessary assistance to the victims. Further the measures are also initiated for helping the affected community in rehabilitation and reconstruction programs. But so far all these have gone in a routine manner and there have been no efforts to really look to the overall problems and provide guidelines. Several times adhoc decisions were taken. With the Uttarkashi earthquake of 1990 fresh in the minds of authorities, it was decided to develop a policy framework for assisting the state Government of Maharashtra after Khillari earthquake of 1993. India being an earthquake prone country a policy guideline development now will be very useful in the future too. The framework described above is the result of the experts who spared their time and pooled their knowledge for the benefit of victims and also for assisting the State Government.

CONCLUSIONS

For the first time in India a comprehensive policy framework after an earthquake disaster has been recommended for rehabilitation and reconstruction of human settlements. The document outlines the work needed to be done, how to achieve that with people's participation, training and demonstration, women's rehabilitation, financing arrangements, donor agencies and NGOs assistance, technology options, earthquake monitoring, project management, evaluation, and reporting. Although the recommendations suggested are quite comprehensive but it must be remembered that such a rehabilitation program within a short time frame has never been taken up before in India. The policy framework development is of advisory nature and has been submitted to Government of India for advising the State Government of Maharashtra and it is up to the state to accept it in full. Further the document preparation is one aspect of the problem solving where experts pooled their expertise and provided a comprehensive thoughts and experiences for achieving the best results but how the execution of this policy framework will take place is another aspect and it is still to be seen. Some time has elapsed and a new Government has taken over the administration of the state and it is hoped that this Government will also carry out the rehabilitation work in the same spirit. The State and Central Government of India deserves all praise for spearheading the idea of policy framework development. It is hoped that other developing countries which may suffer from earthquake disaster would derive benefits from this useful work for their own rehabilitation and reconstruction.

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