

REHABILITATION FOR LONG-TERM DISASTER MITIGATION LESSONS FROM LATUR

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Background

In recent times Latur earthquake rehabilitation programme has been one of the biggest and most visible programmes in the aftermath of a natural disaster in India. Hence, there is much to learn from that which could be put in to use in the rehabilitation programme that is being envisaged now in Gujarat. In that programme there are things that happened and those that did not which need to be looked at from the angle of **long-term safety for most number of people of a community**. The programme also has long-term socio-economic implications that must be looked in to since they could have adverse effect on the life-style of the masses. But before that it is important to understand what the major constituted its major components.

Latur Rehabilitation Programme

The programme had two major components, namely (1) Reconstruction and (2) Repair & Retrofitting of existing damaged structures.

(1) **Reconstruction** of a village involved...

- Identification of beneficiaries.
- Acquisition of land.
- Adoption of each village by an agency – Non-governmental or Governmental
- Preparation of house design and village plans – These were generally done in big metros, far away from ground zero.
- Getting the house designs approved for earthquake safety by IIT Bombay and SERC, Chennai.
- In some villages “people’s participation” in the form of “approval” of houses designs and villages plans.
- Construction of old villages in new location (**Not all houses were destroyed**).
- Construction of “earthquake safe” new houses.
- Construction of infrastructure including roads, electric lines, water lines, and earthquake safe public buildings including Panchayat office, post office, primary and secondary schools, anganwadis, primary healthcare centers, community centers, libraries, places of worship etc. either by the adopting agency or the govt. (**Not all of this was destroyed.**)
- Use of big non-local contractors.
- Occupation of houses.

(2) The **Repair & Retrofitting (R&R)** programme had an unique arrangement that involved...

- Preparation of Technical guidelines by the govt. for this component. The use of mud mortar as a binder banned even in the partial reconstruction of existing stone and brick walls that were built with mud mortar in contradiction of the Bureau of India Standards guidelines.
- Training of govt. engineers
- Opening of special bank account for each household in the local district cooperative bank to receive the cash assistance from the govt.
- Govt. engineers appointed to advise the house-owners for the work to be undertaken (most engineers some how dissuaded the house-owner from opting for R & R, and instead encourage them to opt for the construction of a small 9'x9' room, thus making their own task significantly lighter).
- Plan and estimate prepared by the govt. engineers for each house.
- Transfer of funds in installment by the govt. to the special bank account.
- Materials, namely cement and steel disbursed in installments to house owner.
- Procurement of other materials by the house-owner.
- Appointment of a local petty contractor by house-owner.
- Execution of work by contractor under house-owner's control, monitored by the govt. engineer.
- Release of subsequent installments following the approval by the engineer (many house owners complained of bribes demanded by the engineers).
- Completion of work.

Although, the reconstruction was a centrally controlled operation, the **R & R was controlled by the respective house-owner**. The house-owner had a choice of what to do and when, and with whose help.

Outcome:

The outcome of both the components was rather similar.

Reconstruction Component

In new villages...

- Houses got built with modern cement and steel based building technology,
- Suburban house plans adopted,
- In many villages the issue of construction quality caused dissatisfaction and worry for the people,
- Peoples' participation remained limited to a maximum of approving or disapproving the village layout and house plan,
- People remained ignorant of the earthquake resistant building technology
- People quickly retrieved the material from the debris in the old village and started building additions to the new houses using no seismic safety elements.

R & R Component

In the less damaged villages...

- Before the programme started a large number of existing houses were dismantled by the people out of fear, and materials sold off at a fraction of the market price,
- At the onset, the programme moved at snails pace since people just did not understand the programme and options,
- People were unable to perceive the Repair & Retrofitting of their house as an option.
- Stone, the most common local material, got rejected since stone masonry in cement mortar is much more expensive than stone masonry in mud mortar.
- The people opted for the construction of new 9'x9' "pucca" room adjacent to the old house or in place of a part of that house,
- The old house continued to remain vulnerable to a future moderate intensity earthquake,
- The gray market cement became easily available in the villages,
- In a due course the people began using the vulnerable portion of the old house (that was much bigger and possibly more comfortable than the new room with tin roof) as before,
- Soon after the end of the programme, the people continued to build pretty much in the same way as before.

Lessons From Latur –

A number of important issues emerged that need to be looked at one after another.

1. **Construction Technology –**

Selection of construction technology in the reconstruction is the most important item since it is the buildings that take lives and not the earthquake. Construction Technology has major long and short term implications. This will also have a direct effect on the shape of the programme. In Latur most of the technologies used in reconstruction were complicated and expensive. This automatically eliminated the house-owners from playing a significant role in the construction. The big contractors from places like Bombay, Pune and Hyderabad executed the construction.

**Is it necessary that one has to use only steel and cement based technology to make structures earthquake safe?
Is it necessary that the use of steel and cement ensures the safety against a future earthquake?**

No!

- a. **Replicability:** In the rural areas while building houses, the people depend on their own know-how and that of the artisan who is going to actually undertake the work. Engineers, architects, builders, by-laws etc. do not exist in the villages. If long-term safety against future disasters for the masses is of any importance to the decision makers then the technology that is to be used must be replicable.

To be replicable the technology must...

- **Be affordable**
- **Be easy enough for villagers to use**
- **Not require material and skills not available locally**
- **Require as little water as possible**

While looking into this option the water availability is indeed the most important factor since most of the quake affected area in Gujarat is facing acute drought. In Latur which too has been drought prone serious problems of curing were encountered. This in turn did adversely affect the quality in some of the villages as reported by the villagers. But prefabricated house is not an answer to the situation. The traditional rural technologies use significantly less water than the cement based technologies. Replicability, however, is the “acid test” for the technology selection. **Generally the traditional technologies most commonly practiced by the rural people are most replicable.** Giving due consideration to the seismic safety, the local technology would have to be upgraded to include the earthquake resistant features. This would ensure earthquake safety at the cost of little water.

Hence, the technology consisting of walls made of stone, brick or mud block masonry or simply mud, and roofing consisting of pitched clay tile roof, with earthquake resisting features such bands, vertical reinforcement of some sort, RC stitching elements etc. in walls, and in-plane diagonal ties and gable anchors in pitched roofs would be the most ideal technological option for the masses for earthquake safe new construction.

b. **Technology Transfer:**

Are new ideas, even simple ones, easy to transfer in rural areas?

No!

It is important that the technology used for reconstruction is effectively transferred to the people so that the people are able to use it in the absence of those who brought it in to the area. But the technology does not get transferred by itself simply through its use. This requires deliberate planning. It is necessary that the local artisans are trained in the project and subsequently employed in it rather than bringing the outside artisans. This also requires that the people are made aware of the technology through exhibitions, videos and printed matter in

addition to the model construction. It has been observed that the technologies that are alien are hard to transfer.

The programme must include the hands-on training of masons and carpenters, and the intensive awareness campaign using a variety of communication media to result in to the transfer of technology to the community.

c. Eco-friendly Options: Giving due consideration to the ecological aspects which also affect the sustainability it is important that the option makes use of renewable materials in a manner that permits substantial recycling. The traditional technologies generally meet this requirement. In addition the perpetual water scarcity demands that the softer option of community and domestic rainwater harvesting be made an integral part of the programme. **In other words, the upgraded local building technologies are most eco-friendly and, hence, must be promoted. Simultaneously the water conservation options must be used.**

d. Contribution to Local Economy:

Unemployment and income generation are major problems in rural area. In the disaster and drought hit area these problems are even more acute. If a technology permits the use of local materials and local skilled/unskilled labour to the maximum, it could make a significant contribution to the local economy. In Latur in reconstruction the outside contractors came in with their own building crew, thus creating very little local employment. Rupees three crores that the state government envisages to spend in the reconstruction of the relocated villages could substantially enrich the village if the upgraded local technologies are used.

2. House plans –

**How appropriate is a 3 piece suit for an Indian farmer?
Just as appropriate as a suburban house!
The 3 piece suite may indeed excite the imagination of the farmer for a little while until he puts it on.**

In Latur rehabilitation programme typical “suburban house” plans were used in the houses that were rather alien and unsuitable for the rural lifestyle. The grain storage bins could simply not be accommodate in the new houses and, hence, were discarded. This compelled people to sell the grains when the prices were lowest. There was no place for the wood fire smoke to escape making the interior black. It was impossible to hang things on the walls in most cases since walls were made of concrete.

In rural Latur, just as in rural Gujarat, the local houses are in tune with the local needs. Hence, the agriculturists have ample semi-covered spaces. But Latur programme houses had much lower percentage of smicovered spaces. On the other hand a weaver would need to accommodate his loom in his house in addition to other things. A carpenter would need a large semi-covered space for doing his work. The cooking, even today, involves burning of timber or coal. Hence, in-built vents are most important. The plans should also permit easy future expansion that would ensure the earthquake safety of the added portion.

It is, hence, necessary to maintain flexibility in the building plans so that people can adopt the plan that suits them the best.

3. Safety of Existing Houses

After an earthquake disaster major concentration is always on the reconstruction. But the houses that were not destroyed in the quake could perish in the next earthquake. Hence, it is of great importance to strengthen or retrofit them while repairing them. In the earthquake prone areas of Maharashtra

there are some 3 million such houses. The Latur programme had the largest single component to seismically strengthen many of these existing houses. But it failed to do so. Instead, barring a miniscule proportion, the houses were left in the vulnerable state and single 9'x9' "safe" rooms were built. This happened since there was little effort to bring the option of retrofitting to a common man in a manner that would inspire confidence. But retrofitting is the most economical and efficient option for ensuring one's safety when compared to building anew.

Hence, for the long-term safety of the masses the programme must lay most stress on seismic retrofitting of the existing houses. This will result in to a significant saving of resources as well as ensuring of safety of the whole household rather than that of only its part.

4. Felt need for safety –

People, when left on their own, manage to take care of their problems one way or another. But taking care of those problems must be their felt need. For example in most parts of India providing privacy to the woman of the house for bathing is a felt need. Hence, the people create an enclosure of some sort for this purpose on their own without any external assistance. But that is not the case with sanitation, in rural areas as well as in the urban slums. As a result the government toilet programmes failed to improve the sanitation. In much the same way if the safety against a future quake is a felt need then the people will act to take care of it. In Latur a large number of households sold 20 out of the 40 cement bags that they received as an assistance in the gray market since they simple were not worried about the future quake.

It is, hence, critical that the rehabilitation programme takes up an effective awareness campaign in the public so the felt need for safety against an earthquake does not die after a few months when the actual execution of the construction or repair & retrofitting begins when the fear may die down.

5. Confidence Building

Is it necessary to use much cement and steel to reassure the people?

No!

What is required is confidence in the building system.

In Latur, the people in their new earthquake safe houses simply did not sleep indoors for months after occupying them since they had little confidence in them.

It is very important that the people have confidence in the technology options available to them. This would include all different type of building technologies as well as seismic retrofitting. If the house owner is able to relate the safety of his family with the use of the specific technology he will certainly adopt it to the fullest. In Latur, many house owners omitted the RCC Band and simply made a look alike belt with the plaster to fool the government engineer since they were just not able to relate to their safety with the belt. For the same reason when the house owners built an additional room with their own money they did not install that bend since they felt that because it was not the government aid that they were using they were not obligated to use it. It was this very reason of lack of knowledge and lack of confidence that the people did not opt for retrofitting in the programme and instead opted to build a small 10'x10' room with the assistance. It is also this reason that the people inflict heavy losses upon themselves through the dismantling of the damaged house out of fear rather than retrofitting it. Latur saw dismantling of tens of thousands of houses. Confidence building will also help remove the myths. It will also allow a rational choice of the option. People will opt for cheaper option that would permit them to have larger safe area if they have confidence in the cheaper alternative.

Hence, confidence building must be an integral part of the programme so that people adopt the option fully and thus ensure their own safety against a future quake.

6. External Agency – Builder or Facilitator? & People – Receiver or Builder?

**Is it necessary to give ready made houses to people?
Are people incapable of building their own houses after a
disaster with some assistance?
Would it take longer if people built their houses instead of an
external agency?**

No!

The approach of adopting the villages in Latur resulted in to elimination of the people from most of the rehabilitation process. This made them dependent on the outside help and, hence, incapable of ensuring their own long term safety against a future quake. This also resulted in to people losing their self-respect to the extent that even rich well to do farmers asked the visitors for dole. Another fall out of the process was non-stop complains and unrealistic demands from the people. In many cases this was to such an extent that the agency that was doing the reconstruction got fed up and simply handed over the incomplete houses to the government and left the scene.

In many cases this role of external builder also resulted in to large overheads since a large number of technical people were required to supervise the work. Instead if the people were to carry out the work after thorough training they themselves would have had worried about the quality. They will have no one to complain but themselves if they do not do it right.

In case of large rehabilitation programme it is often believed that only a large contractor could build fast. But that is not necessarily true. Instead of one large contractor there could be fifty petty contractors. The speed would hinge primarily on the availability of the materials and skilled labour. If the government ensures the supply of the needed materials the necessary labour will be automatically generated through the influx of the outside labour.

In Latur, in the Repair & Retrofitting component of the rehabilitation programme a similar model was adopted where the house owner and the local petty contractors did all the work. The government engineers monitored the work to an extent. If more time

were given to the programme then the need for the government engineers would have had greatly reduced, and, hence, the overheads.

Thus, the rehabilitation model with the external agency (adopting agency) being the facilitator and the people being the builders is desirable for the true rehabilitation of the quake affected communities.

Competition In Adoption

In regards to the adoption of villages there is one more lesson from Latur that must be taken in to account. In Latur a large number of organizations had adopted various villages. The government had given them free hand in deciding their course of action as long as the house designs had taken in to consideration the quake resistance. Each agency came with its own building technology which progressively saw increasing use of steel and cement. In other words the technologies became more and more expensive and complicated. This resulted in to a sort of a competition among the agencies and also caused much jealousy among the villagers.

Hence, it is important that a reasonable ceiling on the expenditure must be imposed in house construction under the programme.

7. Re-location of Settlements

**Does relocation really reduce the risk against future earthquake?
Is removing debris an insurmountable problem?
Is relocation any cheaper than rebuilding in the old site?
Is relocation simpler than building in the old site?**

The Latur experience says “NO”.

In Latur on the grounds of safety against future seismic activities satellite imagery was used to identify the “safe” sites and the settlements were shifted. It is true that certain ground conditions lead to amplification of earthquake intensity. But there are numerous other factors that also affect the performance of a house in an earthquake.

In Latur the difficulty of debris removal was considered as a major factor favoring the relocation option. But subsequent to the abandoning of the old sites the villagers themselves got the debris hauled away to their new village or to the local crushers in a period of no more than six months

Relocation, however, is an extremely expensive option since much of the existing infrastructure including water distribution system, street lighting, electrical lines, etc. are totally lost. In some places some of the public buildings also are still standing. The relocation precludes the use of existing foundations. If the reconstruction is done in the same site, with proper management of the debris, much of it could get recycled without any transportation cost. In Latur, the people had to spend much resources on hauling it.

In the history, the great cities like London, Moscow, Warsaw etc. were rebuilt in the same place after the second world war. San Francisco was also rebuilt in the same place after the great earthquake of the last century that had destroyed the city.

In addition there are also socio-economic issues which, although not related to the buildings and the safety, are very critical since they too have long term implications. In Latur, it has been observed that the sudden increase in the distance to the fields has created much problem for the farmers. The social life too has been disturbed since in the new villages the families that were living in close vicinity have broken up on account of the allotment of houses in different parts of the new settlement. Since the new villages were made much larger in the name of eliminating the congestion, the socializing among the people reduced a great deal with increasing walking distances. Large open areas without shade that existed in the old villages are much hotter. Lastly, the village panchayats with little income have found impossible to maintain the additional number of street-lights and longer roads.

Hence, in Gujarat, the use of the option of relocation should be discouraged unless justified by some compelling reasons.

There are many other lessons from Latur which too should be looked at. But those covered here are the most critical, especially from the angle of the long-term safety of

the most number of people. It will, however, suffice to say that to ensure the meaningful rehabilitation much time will be needed. The undue haste will result in to serious problems at a later stage. The completion of, even a limited rehabilitation programme could take as much as four to five years. Hence, the need of the hour is the short term, long lasting, habitable shelters which are quake and cyclone resistant, and not unbearably hot in summer. These shelters must be such that the people can put them up, take care of them, expand them as and when necessary, and not prohibitively expensive.

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