



## Evaluation of a program for the reconstruction of houses in India

### Ignacio PAYÁ-ZAFORTEZA

Dr. Ingeniero de Caminos  
Universidad Politécnica de  
Valencia  
Valencia, Spain  
*igpaza@cst.upv.es*



### Pedro CALDERÓN-GARCÍA

Dr. Ingeniero de Caminos  
Universidad Politécnica de  
Valencia  
Valencia, Spain  
*pcaldero@cst.upv.es*



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### 1. Introduction.

On January 26, 2001, a devastating earthquake hit the Indian sub-continent. The epicentre was in Bhuj in the Gujarat State and the effects extended to six northern Indian states and parts of Pakistan and Nepal (Figure 1). Magnitude was 7.9 degrees on the Richter Scale and maximum intensity on the MSK scale reached value X. Approximately 20,000 people were killed and 165,000 injured. 170,000 houses were completely destroyed and 440,000 seriously damaged. The magnitude of the catastrophe moved many governments and other organisations to action, including the Spanish NGO Intermón-Oxfam (IO), which, among other initiatives developed a program for the reconstruction of housing and schools. At the request of IO, this program was evaluated by a team of researchers from the Universidad Politécnica de Valencia (UPV) and Mumbai University. The team's principal objective was to produce recommendations that would improve the organisation's response in similar emergency situations. The paper describes: a) The characteristics of the IO housing construction program; b) The methodology followed in the evaluation, and; c) General recommendations applicable to similar projects.



Fig. 1: Map of India. Location of Gujarat (left). Effects of the earthquake (right).

### 2. Characteristics of the IO housing reconstruction program.

After the Bhuj earthquake, IO built or repaired a total of 1064 houses of three different types:

- Type-A houses: Houses of 29.6 square metres with reinforced concrete frames as main structure on which rests a pitched roof of metal joists and ceramic tiles. Outer walls were non-structural and made of brick. Most were built in pairs and shared a partition wall to keep costs down. The guiding concept was "progressive houses" at low cost to reach as many beneficiaries as possible. Houses



were handed over without plastering, individual beneficiaries being responsible for the finishing.

- Type-B Houses: These consisted of buildings with an average area of 19 square metres with a structure formed of load bearing brick walls strengthened by reinforced concrete confining columns and bands. The flat roof was a reinforced concrete slab. In this case, the houses were finished and painted inside and out and equipped with items of carpentry. The house was of basic design to which its owners could add items at their own discretion and expense.

- Type-C Houses: These consisted of masonry houses repaired and strengthened after the earthquake, according to the appropriate earthquake-resistant techniques. Work was individually planned in each case by a team of engineers according to the damage sustained in the earthquake, and was carried out by the owners with the help of supervisors trained by the aid organisation. Training in earthquake-resistant constructions was also given to more than 500 building workers within the context of the program.

### 3. Methodology employed.

The program was evaluated in accordance with the classical criteria of evaluation of development cooperation projects: suitability / effectiveness / efficiency / cover / participation. The work was divided into the three following phases: The study of existing documentation (housing projects, reports by IO and partners, applicable regulations, etc.); b) Inspection of the houses and interviews with those involved in the operations; and c) Writing the evaluation report and delivering it to IO.

Techniques used to gather information were: a) The study of existing documentation; b) Questionnaires; c) Detailed interviews; d) Open interviews; e) Group dynamics; f) Non-participating observation; and g) Testing materials used in constructions. Finally, interviews were held with technical personnel from another NGO, the Vicente Ferrer Foundation, who had taken part in housing reconstruction in the same area. This provided information from another point of view and helped to make the report more objective.

### 4. Conclusions.

The evaluation provided the following recommendations applicable to any housing reconstruction program following a catastrophe:

1. For the success of a housing reconstruction program, it is essential that: a) Work is carried out by a multi-disciplinary team formed by building experts and social workers; b) The opinions of the beneficiaries should be taken into consideration from the start.

This means that a considerable amount of time will have to be given to selecting beneficiaries and the right type of construction, involving additional costs and delays before tangible results are achieved. In our opinion, these disadvantages are vastly outweighed by the improved final results.

2. When houses are to be built for the poorest members of society, fully finished houses are always preferable to "progressive houses", since the beneficiaries often have so few resources they are unable to finish them, and this may create social divisions.

3. All construction programs in earthquake danger zones should include the training of building workers in earthquake-resistant housing, and, if possible, the population should be taught the dangers resulting from earthquakes. In spite of the efforts in this direction, it was apparent that: a) Non-earthquake resistant stone houses are still being built in the area; b) Some of the beneficiaries impaired earthquake resistance when making extensions or modifications to the original plans.

4. Building repair and reinforcement is preferable to construction of new buildings for the following reasons: a) Costs are lower and the impact on beneficiaries is reduced since they are not moved from their familiar surroundings; b) It allows beneficiaries to make a greater contribution in the form of labour, which forms a higher percentage of costs than materials. It also provides them with training and makes them aware of the importance of building correctly in seismic areas.

5. It is advisable that the technical evaluation of a building program should be carried out at least in the three following phases: a) When the project planning has been completed; b) When work has been started; and c) When work has been finished.