

NGO Initiatives in Risk Reduction

Case Study no. 18

Education for safe building

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Names of NGOs: International Cooperation for Development (ICD), Oxfam, Concern, Redd Barna

Location: Yemen

Dates: 1982-86

Hazard: earthquakes

Key words: building, education, traditional construction

Background and aims

In December 1982 an earthquake hit the central highlands of the Yemen Arab Republic. It killed about 2,000 people, injured more than 2,000, left 300,000 people homeless and caused extensive damage to traditional buildings in the Dhamar region.

Villages in this area have large stone houses, on several floors, normally built high on rocky outcrops, surrounded by agricultural terraces. These traditional homes proved vulnerable to earthquakes: 25,000 houses collapsed and 40,000 were severely damaged.

As a result of assisting with relief work in the immediate aftermath of the disaster, and realising that earthquakes are not unusual in this area, a group of international NGOs initiated the Dhamar Building Education Project to educate local builders and the general population about strengthening traditional homes and other buildings, with a view to assisting in the reconstruction of safer housing.

Activities

Organisation

The NGOs worked closely with local government to develop the training programme. Only a small number of staff were required. ICD, for example, provided one expatriate builder to carry out training. The other NGOs variously provided funding, collected data, assisted villagers searching for loans, organised publicity and ran the training.

Tuition at the training sessions was free to the builders, but they had to fund their own transport, food and accommodation. Apart from building a ‘model’ training centre in Dhamar, the NGOs were not involved in large financial outlays. For example, all the labour, materials and land for new homes built by trainees were paid for by the homeowners themselves.

Training

Most village communities in the Yemen highlands have men considered ‘builders’ who are employed by villagers to plan and set out buildings, organize materials and supervise construction. The education programme addressed these men, who were in a position to influence their clients and also to control the quality of construction on site.

The training of builders was done through a building advice centre, training workshops, manuals, videos and mobile support groups. The project began by building the Dhamar Building Centre, a traditional-style structure incorporating new earthquake-resistant features. This served both as a ‘model’ house and as a training/advice centre. Other model houses were built by trainees on the roadside, and groups from villages that had been flattened came in each day to look at them.

The training for local masons had three basic aims:

- to make them more aware of the need for reinforcement
- to enable them to build safer houses for themselves
- to improve their skills in less-familiar techniques (i.e. cement blockwork)

These aims were modest and realistic. At all stages the training was based on the materials available to villagers, on the limits to local skills and on indigenous (but often forgotten) traditions, such as knowledge of tying beam ends into walls. Each course lasted three to four days.

The project found that drawn illustrations were particularly effective – for example contrasting poor building practice with an improved technique by means of a pair of drawings. Such drawings were used mainly as an introduction to discussion, during which the technical point could be more fully explained.

A mobile education team travelled daily to the earthquake-affected villages to contact the builders, advertise the training and offer advice on building in progress. Both the mobile team and the Building Centre were staffed by local men, and the whole project was developed with the specific cultural context in mind: for example, using traditional oral presentation and relying on the authority of the village sheikhs to ‘send’ builders to workshops.

The most effective format for video films proved to be a ‘soap opera’ type of scenario, illustrating the need for builders to persuade house-owners to pay for reinforcing. However, such films help to raise awareness, but are not necessarily instructive.

Technical Issues

Structural improvements to reduce earthquake damage were suggested, while still using local materials and traditional construction measures. Weak spots in the old buildings were identified as follows:

- The composition of walls – the two tiers of stones without a functional connection between them meant that the walls were liable to split apart during shaking.

- The conical shape of cut face stones encouraged instability and movement of the blocks, adding to the likelihood of wall collapse.
- The weight of the roof and its poor wall connection increased the likelihood of roof collapse.
- The lack of a tie beam connecting the outer walls and corners resulted in wall separation and collapse.

A limited set of technical messages was devised to serve as the basis of the education work, covering:

1. the importance of level, stable foundations
2. the advantage of using properly mixed cement mortar
3. the benefits of good stone bonding
4. the need to consider the size and position of openings in walls
5. the advantages of continuous horizontal reinforcement in masonry
6. the need for strong connections between wall-head and roof

Achievements

After the project had been running for three years almost half of the 638 affected villages had been visited by the project's mobile unit. The response had been good and nearly a quarter of potential builders in the region had been trained (820 certificates had been issued).

An evaluation in 1985 found that a significantly larger proportion of homes built by trainees (84%, as compared to 40% by non-trainees) were built using horizontal reinforcement, and with better quality construction. In interviews with masons, many remembered the theory of what had been taught, even when they had been trained up to two years before. However, the implementation of the training often hinged on builders' relationship with their client, and their ability to persuade him to pay for strengthening materials.

Problems

The process depended on the builders having work. Although the approach to dissemination was highly appropriate, the collapsed economy and lack of building work had a serious effect on builders' opportunities to use their new-found skills. Furthermore, the model buildings which the project helped to build cost between 15 and 30 per cent more than unreinforced examples. This was a major inhibiting factor in terms of the adoption of earthquake-proof building methods.

Another problem was that the Yemeni government promised thousands of new homes to those affected by the earthquake, which meant that many people held out for new government houses rather than employing local builders to re-build their traditional ones.

Issues

Several lessons were learnt from this project:

- The project was notable for trying to demystify technical issues and giving priority to consultation with those who would have the greatest impact on post-earthquake reconstruction – villagers themselves. This is an empowering approach to disaster mitigation.
- Through training, it tried to ensure that disaster mitigation was literally built in to potentially earthquake-vulnerable communities.
- The project chose to preserve the unique nature of vernacular architecture – thereby working with tradition rather than against it.
- Persuasion was the only realistic tool in circumstances where building legislation was non-existent.
- The lack of resources to enable building improvement was a crucial factor and was not addressed in this project. The improvements were designed to be the basic minimum for good protection of a house, attempting to keep within a minimum budget. However, even this budget was often too expensive for most people.
- Many buildings by trainees did incorporate improvements and strengthening, and those trainees involved in construction did have a small effect on the quality and safety of the building stock.

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NGO Initiatives in Risk Reduction' is a series of short case studies designed to introduce project planners and managers to the range of NGO work in this area, and to highlight some of the issues arising. It is one of several outputs from a study carried out by a team of independent researchers, funded by the Department for International Development and managed by the British Red Cross Society. The case studies (and the project's other outputs) can be downloaded from the project's web page <http://www.redcross.org.uk/dmp>