

Benfield Hazard Research Centre

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**TECHNOLOGY, POST-DISASTER HOUSING
RECONSTRUCTION AND LIVELIHOOD
SECURITY**

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Note: This discussion paper was originally written for the ‘technology for sustainable livelihoods’ website hosted by ITDG (now Practical Action). It has been reproduced here unchanged, except for layout.

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Introduction

Every disaster that leaves many people homeless triggers renewed and often intense debates about what technologies are appropriate to rebuild homes so that they are 'safe' or 'disaster-resistant'. Shelter relief and reconstruction programmes absorb large amounts of international aid, yet we know very little about these programmes' long-term results.

Do reconstruction programmes succeed? In what ways are they successful? How effective are they in increasing livelihood security and reducing vulnerability to external shocks, such as natural hazards? What factors lie behind success and failure? What should be done to make reconstruction more effective?

We still do not know enough about the long-term impact of reconstruction initiatives to answer these questions adequately. All that this short discussion can do is point the way to the answers, but in doing so I want to stimulate debate by suggesting that current approaches to 'safe' housing reconstruction usually do little to increase poor people's livelihood resilience, and that the main reasons for this include:

- a narrowly technical approach to housing
- a perspective based on hazards rather than vulnerability
- the artificial boundaries that aid agencies place between relief and development programming

Safe housing and technology choice

There is a strongly technocratic bias in many reconstruction programmes: an emphasis on technically 'safe' housing without certainty that such housing is affordable or culturally acceptable. Large-scale programmes are particularly likely to be technology-driven, introduce new and expensive construction technologies, and bring in big contractors and outside workforces. The tradition of 'command-and-control' in disaster assistance is echoed in top-down decision-making and management in reconstruction. External technical consultants may exercise considerable influence over technology choice.

Indigenous building knowledge is often devalued by outsiders – and indeed by local people, who prize 'modern' building styles as symbols of development, and believe that they are more secure against natural hazards. Yet modern building methods do not automatically provide greater safety. In the recent earthquakes in Turkey (1999) and India (2001), newly built, middle-class apartment blocks collapsed and cracked: a large proportion of the fatalities in the Turkish earthquake were among people who lived in this kind of housing. In both cases, high modern design standards were undermined by a combination of shoddy building practices and lax enforcement of building regulations.

Some indigenous building technologies are well adapted to hazards. For example, certain kinds of timber and bamboo structure resist earthquakes well because they are flexible (see case study 3). A study of a rural community in the Philippines found that

traditional bamboo houses withstood the high winds of typhoons quite well, even though the methods used for building them were very different from those prescribed in text books.

Hybrid designs that graft modern technologies onto indigenous practices can be particularly lethal, since they rarely form coherently sound structures and are often erected by builders who lack the necessary technical skills.

Even apparently flimsy housing can sometimes make sense as a coping strategy against disasters: parts of it can be dismantled and moved at short notice so that they are saved to build with again. This happens sometimes in Bangladesh when monsoon floods threaten, and particularly if there is a risk of erosion by rivers. Researchers in the Indian city of Indore noticed that in slums vulnerable to flooding, some people held their corrugated metal roofs in place with rocks rather than bolts or nails, so that they could lift them off and take them to safety if there was a danger of the house being swept away. Lightweight materials cause less damage when they fall than more substantial construction – which means that in earthquake-prone cities, poor people living in shanty housing may sometimes be safer than wealthier citizens.

Housing reconstruction and income generation

Indigenous building technology is particularly valuable in terms of livelihoods because it uses local skills and labour: self-building (which is widely practised in the South), hiring local builders or a combination of the two.

Reconstruction does present an opportunity to create jobs. Many ‘safe’ housing initiatives in the aftermath of disaster follow a fairly standard pattern of training local builders in techniques for building more hazard-resistant structures and retrofitting others, providing them with employment on externally funded reconstruction programmes, building demonstration houses, and running public education campaigns to stimulate better understanding of safety features among local populations, who are potential clients for their services.

In many other cases, though, local builders and their traditional skills are displaced by imported construction technologies and the labour needed to use them. The marginalisation of local artisans in this way can actually increase vulnerability to hazards: once the reconstruction project is over and the imported labour has returned home, skills needed to extend, modify and repair houses using the new technologies are lacking, leading homeowners revert to traditional methods and hence to dangerous hybrid structures (mentioned above).

Where reconstruction does create local jobs, it is not clear how sustainable these new livelihood opportunities are once the programmes funded by aid agencies come to an end. Although appropriate masonry and carpentry skills for safe building may be retained within a community, it is unlikely that low-income groups can afford to hire builders, and so long-term opportunities for employment (and hence, building improvement) may be very limited. This argument is supported by evidence from some projects, although further research is needed.

Long-term development trends in a particular district are much more significant in creating or destroying livelihood opportunities than short-term reconstruction projects. Rising levels of poverty may lead local building craftsmen to turn to alternative occupations, and will probably discourage younger people from taking up the craft. Better employment opportunities in other places may cause skilled builders to migrate, as happened in mountain communities in Pakistan when the Karakoram highway was built to improve their links to the cities on the plains.

Costs and compromises

All housing improvement, including introducing safety features, carries an additional cost, especially if high levels of resistance are required.

Even minor modifications to make houses safer may be unaffordable by poor people. Research and project experience shows that such additional costs are a significant deterrent to building improvements, even where the modifications concerned can greatly improve resilience to hazards and durability.

It is also unrealistic to expect poor people to invest in more secure housing when they live in constant fear of eviction, which is a particular problem in many urban slums.

Economic pressures may lead to the degeneration of essentially sound construction practices. Poor people are inevitably tempted to use inferior materials and cut corners in meeting design specifications (e.g. nailing wooden beams together instead of more sophisticated joinery), and cannot afford to maintain buildings adequately.

Aid agencies too find it difficult to strike a balance between quality and quantity, especially where funds are in short supply. Low-cost structures can be put up in much larger numbers (as well as a shorter time) but they are less durable than more solid buildings and will not be as resilient to future disasters.

Product versus process

The household plays an important role in creating social, human and financial capital. However, in reconstruction programmes, the focus is on *houses* (physical structures/capital) rather than *housing* (the arena of social and economic life). Homes are seen merely as items of physical capital, not as places of work, learning, communication and relationship-building. The aim is confined to that of delivering tangible and quantifiable products, in the form of houses built, often without regard for how – or if – this will improve social and economic status.

Yet reconstruction can be an opportunity to address longer-term livelihood vulnerability within poor communities and households, and to empower the most vulnerable (see case studies 1 and 2).

Case Study 1: Floods, housing reconstruction and gender vulnerability

In the aftermath of severe flooding in Pakistan in 1992, a local NGO called PATTAN introduced a linked package of measures to reduce women's vulnerability of which housing was part.

First, it hired female relief workers to assess the needs of women during the floods and to involve them in planning and implementing relief and rehabilitation initiatives. To recruit the women, the organisation had to pay good salaries and offer decent transport, accommodation and security.

Second, local women were registered as heads of their households and put in charge of the distribution of relief food: this ensured that the distribution was fair and efficient. Third, village women's organisations were set up (in parallel to men's groups) to articulate women's needs and take responsibility for community development.

Fourth, in the villages of Bharat and Shamsabad, which had been completely destroyed by the flood and where housing was a high priority, PATTAN involved women in reconstruction. The women's groups were a forum for discussing women's views on the design and layout of new houses. Some women actually took part in construction (traditionally a male activity). Women were given the responsibility for collecting money to repay the loan instalments on the houses. Perhaps most significantly in livelihoods terms, PATTAN also introduced the concept of joint ownership of houses by married couples. Many meetings were held with both men and women before the concept was accepted. Then, a few couples drew up legal contracts of ownership that state that, in the case of divorce or separation, whoever wants to retain ownership of the house must pay the other half its value. Joint ownership made women feel more secure and proud, and it appeared to reduce the incidence of marital conflict and domestic violence as well as improving relationships between mothers-in-law and daughters-in-law.

Although provision of free or subsidised building materials is common after major disasters, this is to meet immediate shelter needs and is rarely stimulated by a long-term perspective of livelihood rehabilitation. Support to livelihoods in disaster response is still a relatively new approach, largely confined to support for agriculture and food security – for example, distribution of cash, seeds and tools as part of agricultural support packages – or to providing short-term assistance through food-for-work and cash-for-work projects. Many if not most of such initiatives are limited to meeting immediate needs rather than replenishing livelihood assets in general: the high cost and long-term programming required for the latter deter relief agencies from becoming involved.

Case study 2: Linking reconstruction to development

An earthquake in February 1976 was felt over nearly half of Guatemala. It killed 23,000 people and destroyed more than 250,000 houses. In the municipality of Joyabaj, in the northwest of the country, 600 people died, another 5,500 were injured and over 95% of the predominantly adobe buildings were wrecked.

A local NGO, ALIANZA, hitherto involved in public health work, became heavily involved in relief and subsequently in co-ordinating reconstruction efforts that promoted earthquake-resistant housing. The work followed a standard pattern of training builders, building demonstration houses, distributing materials and generally raising awareness, but projects were developed within the community. Local people were recruited as promoters. Local workers' teams provided design suggestions as well as labour. There was constant discussion of design issues which led to confidence in the project and a feeling of community ownership of the final results.

The initiative had a five-year timetable in which reconstruction was not seen as an end in itself: rather, emphasis was to be gradually shifted towards a more comprehensive development programme with projects to improve health and nutrition, education, productivity and infrastructure, and to support the development of local organisational capacity. The five-year planning framework was a crucial element in long-term success.

Rebuilding itself is often not an immediate priority for local people, whose first need is likely to be to resume income-generating activities. In normal times, building is often fitted around the local economic calendar: annual farming cycles or seasonal migration. Planting or harvesting will have first call on many rural families' time and labour. Disaster victims may choose to stay in makeshift shelters in the short term, hoping to have more time, money or materials for rebuilding later.

Participatory processes involving vulnerable people and disaster victims ought to identify livelihood needs and economic factors affecting rebuilding and technology choice, and so ought to be leading to approaches that are based more on livelihoods and less on technological 'fixes'.

Where disaster victims are given a voice in rehousing plans, they do highlight livelihood-related features that are invisible to agency planners. In a village of 110 households in Maharashtra, India, that was scheduled for relocation after the 1993 earthquake, a participatory planning exercise allowed inhabitants to point out that new house designs did not provide space for agricultural implements or for tying up cattle, and that it was difficult to turn a bullock cart round the right-angled street corners of grid layouts; women noted the failure of plans to consider domestic water supplies.

Community participation also allows for the choice of building technologies that are appropriate to local needs, resources and cultures (see case study 3).

Case study 3: Participatory technology development

In May 1990 an earthquake destroyed over 3,000 houses in north-east Peru. Most damage was done to buildings of rammed earth. The earthquake highlighted the vulnerability of such houses, particularly those of poor-quality construction and maintenance.

ITDG was already working in the district and so was well placed to assist in the reconstruction efforts. Participation in technology development was central to its approach. During the initial six months after the earthquake, ITDG undertook a process of consultation with the 5,000 inhabitants of the town of Soritor. This led to the decision to focus on a technology known as 'improved *quincha*'.

Quincha has been used in Peru for many centuries. Traditional *quincha* houses have round pole frames set into the ground, infilled with smaller wooden poles and interwoven to form a matrix which is then plastered with one or more layers of earth. The improved *quincha* developed in this project incorporated concrete foundations and wall bases, stronger connections between different elements of the structure, and cement rendering of the walls. These improvements strengthened the structural links while retaining the inherent flexibility of the traditional method, thereby making the technology more earthquake-resistant. The local availability of timber poles, bamboo and earth also meant that improved *quincha* was suited to a self-help building programme.

A community building and several houses were constructed to demonstrate the technology and train local artisans and residents. A core housing design was agreed which could be adapted to specific household requirements, reflecting income, available building materials, land features and so forth. Individual designs were then drawn up in consultation with beneficiary families and construction was begun, with groups of 20-25 people working in turn on each other's plots, normally at weekends.

The project targeted the poorest victims of the earthquake. ITDG relied heavily on a local community-based organisation and a church organisation to undertake the selection of project beneficiaries, in order to ensure that this process was considered both objective and fair.

When a second earthquake hit the region almost a year later, 70 *quincha* houses had been constructed. Each of these withstood the earthquake although 17,000 other local homes were damaged. This dramatically demonstrated the benefits of improved *quincha*, significantly improving its popularity and acceptance.

ITDG was directly involved in the reconstruction of 700-800 improved *quincha* houses but some 4,000 additional ones, or variations thereof, were also built in the project area. An independent evaluation undertaken in 1996, two years after the project's completion, concluded that the technology was filling an important gap in the local housing production system, providing cheap, secure and durable buildings.

Nowadays, the managers of most reconstruction projects *claim* that their projects are participatory, but there is usually an element of agency propaganda in this, and the extent and nature of such participation are often hotly disputed. Post-disaster circumstances do not favour the lengthy participatory processes considered desirable in development programmes, and, to be fair, some compromises may well be necessary.

Livelihoods and unsafe conditions

Purely technical approaches to reconstruction can be criticised on more fundamental grounds. Programmes that look only at housing *construction* are addressing just one element of the vulnerability context in which poor people shape their livelihoods.

In February 1976 an earthquake killed 1,900 people and made 90,000 homeless in Guatemala City. The victims were almost exclusively from squatter and slum settlements, many of which were located on unstable hillsides, and in ravines and gorges around the city. The earthquake left the middle and upper classes almost unscathed, and was soon widely referred to as a 'class-quake'. This disproportionate impact of natural hazards on poor people living in flimsy houses in unsafe locations has been observed in many other cases.

In response, relocation of vulnerable households to physically safer places is often seen as the best way to defend them against disasters. For example, after the Maharashtra earthquake of 1993, which killed over 8,000 people, the state government moved the inhabitants of 52 completely devastated villages (some 28,000 households) to new sites, while many NGO responses to Hurricane Mitch in Central America in 1998 involved moving vulnerable communities from the hillsides where their homes had been washed away by the torrential rains.

From a purely hazards point of view, relocation makes sense. Some locations – floodplains, unstable hillsides, soils likely to liquefy as a result of seismic tremors – are inherently unsafe. It is impossible, or at least extremely costly, to make communities that live in such places more secure. After a major disaster, such as an earthquake, survivors may be so traumatised and afraid of future shocks that they are very keen to move.

However, from a livelihoods perspective, there are two fundamental objections to post-disaster relocation. First, the location of housing is only part of the problem of vulnerability to external shocks. We have to understand why people live in unsafe conditions in the first place, which could be the product of poverty (itself the result of local, national or even global economic forces), demographic processes such as population growth or migration to towns and cities, legal-political issues such as land rights, and other political features such as the weakness of government and civil society institutions in protecting citizens. The root causes of vulnerability are very deep.

Second, the poor often resent relocation because of its impact on their livelihoods. Poor people live in a hazardous location because that is where they can earn a living.

For instance, a study in northern Pakistan in the 1980s found that houses tended to be sited in dangerous locations, against mountainsides and in the line of landslides and floods. Householders were aware of this risk but chose to build there rather than use up precious agricultural land, of which little was available in this mountainous area. When asked about the risk of disasters, people said they had more pressing problems to face such as the lack of education and health, and the difficulty of selling crops at a decent price. In Indore, many poor people live in the riverside and floodplain slums because of their proximity to markets and job opportunities in the centre of the city, the cheapness of the land, and the better chance of getting funds for improvement because of the slums' visibility to policy makers. They also see social benefits such as access to health services, schools, water and electricity, the presence of well-established social support networks, and access to entertainment.

Linking relief to development

In recent years academics and policy makers have talked of linking relief to development, even of a 'relief-development continuum'. This does not mean much at operational level, where the old institutional, financial and attitudinal boundaries between the two spheres of development and relief remain as firmly drawn as ever.

Donor agencies are largely to blame for this. After a few months, when the donors' emergency aid timetables expire, the relief workers go home and 'normal' development is expected to resume. In other words, development agencies are expected to pick up the bill. This has important implications for shelter and livelihoods. Provision of emergency shelter such as tents and plastic sheeting is relatively straightforward in relief operations, as this is basically a matter of distribution. Reconstruction is beyond the capacity of relief workers, for it requires a much longer-term commitment, especially where damage to housing is extensive.

In practice, rehabilitation, including house-building, is often undertaken with money from donors' relief budgets but such funding is explicitly short-term: typically, it has to be spent within 3-9 months. This time restriction means that extensive reconstruction programmes cannot get off the ground without further funds being sought, but additional funding for reconstruction usually arrives late (if it arrives at all).

With a focus on short-term, quantifiable targets for the purposes of donor reporting, there is an irresistible temptation for agencies to build houses for people rather than supporting people in house-building. Organisations responsible for reconstruction programmes may compromise on quality in order to meet their targets.

Donor conditionality can lead to absurdity. For example, an international NGO working in the Dominican Republic proposed to use wood from trees that had been knocked down by Hurricane Georges in 1998 to build temporary shelters for people made homeless by the hurricane. A donor refused to sanction a grant for this out of its emergency relief budget because fallen wood was not considered an appropriate material for temporary shelter – tents or plastic sheeting had to be used, even if this meant importing them. After Hurricane Mitch hit Central America, also in 1998, an

NGO's proposal to use relief funds to repair tools that a local carpentry workshop could use for reconstruction was also vetoed by a donor because the tools had been damaged before the hurricane.

Looking ahead: a livelihoods approach to reconstruction?

Evidence from recent disasters suggests that the top-down, technology-driven, house-as-product approach remains dominant in post-disaster reconstruction, with the exception of a few isolated and relatively small-scale NGO projects.

However, recent disasters give a few indications of shifts in thinking. Take the case of Bangladesh, badly affected by severe monsoon flooding in 1988 and 1998. In the aftermath of the 1988 floods, which destroyed over five million houses, many aid agencies introduced supposedly 'flood-resistant' designs, but the outreach of such programmes was limited, many of the designs were untested, and in any case strengthened housing was far too expensive for poor people to afford. Official and NGO interest in the subject gradually cooled over the following years as the difficulties of implementing large-scale, sustainable shelter programmes became apparent. By the time of the 1998 floods, 'flood-resistant' housing had all but disappeared from the agenda, and there was a new emphasis on micro-credit and other non-structural forms of livelihood support.

Official responses to the Gujarat earthquake of January 2001 also appear to have recognised the limitations of earlier, conventional approaches to housing reconstruction. Here a more owner-driven approach has been encouraged, with government providing resources (financial compensation and subsidised building materials) but leaving householders to undertake their own rebuilding, with the help of NGOs who give technical support in safe construction practices. This is arguably the first example of an owner-driven approach on a large scale, although it does not overcome the age-old problem of wealthier groups' capture of aid resources, and in practice it has not ensured that rebuilt houses are more earthquake-resistant than those that collapsed.

Mindful of the fact that rural Gujarat was already suffering badly from long-term drought and subsequent poverty, a local NGO, the Disaster Mitigation Institute, has introduced an approach in 30 villages that places post-earthquake reconstruction within a broader package of measures to restore livelihood and water security. Based on community action planning for vulnerability reduction, the project emphasised local capacity building (through provision of technical advice and training in building, agricultural practices and rainwater harvesting, and dissemination of information). Communities also received financial support through a specially created livelihood relief fund. Levels of participation and satisfaction were high in the short term, but inevitably have created greater demand for follow-up work to address the district's major water and livelihood security problems.

All of these approaches appear valuable. All merit further development and evaluation. However, we should not forget that housing provision is a complex and difficult problem, particularly in the chaos and suffering that follow disasters.

All approaches present challenges as well as opportunities. Has any agency met the challenge of creating a *sustainable, self-replicable* approach that enables the large numbers of poor and vulnerable people who need safe, affordable housing to obtain it? How realistic is such an ideal? Might it not be more honest and realistic to admit that safe housing projects cannot do without significant technical, material and financial inputs from external agencies (see case study 4)?

Case study 4: Replication versus pragmatism

In the aftermath of floods in November 1998 that destroyed over 11,000 houses, the Vietnamese Red Cross and the International Federation of Red Cross and Red Crescent Societies developed a new design for flood- and typhoon-resistant homes that included concrete bases, galvanised steel frames and other safety features.

The new design is intended to achieve three results: saving lives (roofs as refuge), saving the family's greatest material possession (the house itself), and protecting livelihoods (a first floor platform to store seeds, tools and other assets). Villagers called the houses 'little mountains'. When floods struck again in 1999, only one of the 2,450 that had been built was destroyed. By August 2000, the programme had built 7,400 houses.

The beneficiaries are selected on the grounds of vulnerability, with priority given to the elderly, the handicapped and women-headed households. But, at a cost of roughly \$500 per unit, the houses are too much expensive for poor people to afford. They are therefore given away, in effect. The Red Cross pays for the main frame and although the beneficiaries are expected to build the walls out of light materials such as rice straw, even this is beyond the means of the poorest, and in practice local authorities and Red Cross branches often finance it.

This approach goes against the grain of current thinking about good practice in helping the poor and vulnerable obtain shelter, which favours approaches based on local skills, material and financial limitations, that can be replicated. The Red Cross accepts that this is an important issue. Its choice of technology is based on two aims. First, it feels that relief funds should be used to make a prompt and significant difference to families that have suffered. Second, it wants to demonstrate to local and national authorities – which should play a major role in housing provision – what can be achieved. And there are some signs that this approach is having an impact: by mid-2001 the Red Cross and the Vietnamese government had built over 20,000 flood-resistant houses in 16 provinces between them, and the visibility of the 'little mountains' has ignited public debate about safe housing.

So much for the questions: let the debate begin!

Further reading

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Radix (Radical Interpretations of Disaster) website – www.radixonline.org