Chapter IV

POST-DISASTER HOUSING

4.1 RECONSTRUCTION: THE OPPORTUNITY FOR RISK REDUCTION AND REFORM

PRINCIPLE: A disaster offers opportunities to reduce the risk of future disasters by introducing improved land-use planning, building methods, and building regulations. These preventative measures should be based on hazard and vulnerability analyses, and should be extensively applied to all hazardous areas across the national territory.

Audience

• Private sector: Manufacturers/contractors
• Professionals: Architects/planners/engineers
• Policy-making administrators: National (tertiary) level
• Project managers of post-disaster shelter/housing projects: Regional/provincial (secondary) level

Time phases

• Pre-disaster phase—Overall mitigation/risk reduction
  ○ Phase 1—Immediate relief period (impact to day 5)
  ○ Phase 2—Rehabilitation period (day 5 to 3 months)
  ○ Phase 3—Reconstruction period (3 months onward)

HAZARD, VULNERABILITY AND RISK ANALYSES

In order to assess the disaster risk of an area, data are required on natural hazard, vulnerability and elements at risk.¹⁰

1. Natural hazard. Techniques for the assessment of natural hazards are reasonably adequate, but in some areas and in some scientific disciplines there may be deficiencies of basic data both in quantity and quality. For the natural phenomena of main interest—meteorological and hydrological phenomena, earthquakes and volcanoes—it is essential that data requirements for the assessment of natural hazard should be formulated and, where gaps are identified, urgent steps should be taken to close them. These steps are important since natural phenomena are complex, and for their complete description and future development a number of different parameters are required. (Thus, a tropical cyclone is described in terms of its direction, speed of movement, maximum wind strength, the value of the surface pressure at its centre, etc...).

The preparation of hazard maps presents no particular problems, given adequate data of reasonable quality. In order to establish risk, a planner would expect to be provided with hazard maps for each phenomenon which is known to occur in the area under consideration. For example, hazard maps might be prepared for the extent of flooding for one or more average return periods, for flooding due to river flows exceeding the bankfull discharge, and for flooding due to storm surges in coastal and estuarine areas. There might, in addition, be other hazards of a geological nature which would have to be mapped (for example, fault lines, loose unconsolidated soils, etc.) and overlaid.

2. Vulnerability. Information on vulnerability is less plentiful, less reliable and less clearly defined than the information usually available on natural hazards themselves. Various categories of data are required, relating not only to the details of possible material damage but also to the degree of social and economic disorganization that may take place. There is a pressing need to assemble and publish as much information as possible on the damage that has occurred in past disasters. It might be met by the co-ordination and extension of damage surveys which have already been undertaken in a number of developed and developing countries.

3. Elements at risk. Information on elements at risk, such as population, housing public utilities, industry, infrastructure, etc., is normally taken into account as standard planning and engineering practice, even when disaster prevention and mitigation are not specifically considered. The inclusion of a disaster prevention and mitigation perspective in land-use planning, building generally, and housing in particular, is a basic requirement of planning for reconstruction.

¹⁰Definitions of these terms are contained in Appendix C.
HOUSING, HAZARDS AND VULNERABILITY

In earthquake-prone areas the collapse of buildings is the primary source of death. Landslides and subsidence are also primary sources of structural collapse and death. Houses built on loose unconsolidated soils, soils prone to liquefaction, and unstable slopes are therefore particularly at risk. The vulnerability of buildings under these conditions of hazard is increased where there is a lack of structural timber and lightweight building materials—for example in the arid zones of Asia and the Middle East.

The least problematical are the warm, humid tropics where timber, bamboo and thatch will normally be available, and can form the basis of safe, rigid, lightweight housing. An added advantage is that exposure to the climate is not a major risk: the basic needs are for space, shade and screening off for privacy, and basic services (water supply, waste disposal).

The widespread failure of reinforced concrete buildings in the Indian Andhra Pradesh cyclone of 1977, and in the southern Italian and El Asnam (Algeria) earthquakes of 1980, is a reminder that not all modern, high-technology housing is safe. There is a very real need to improve the quality of structural design and building supervision in urban mass-housing projects.

Removing housing from fertile flood plains is practically impossible for economic reasons. Indeed, land-use control for the mitigation of flood disasters acknowledges that high waters will occasionally invade the land, on river floodplains and along the coast, in spite of man's increasing efforts to hold them back. The purpose of controls is to implement patterns of land use which reduce danger to life and property when the inevitable inundations occur. Relevant controls may take a number of different forms: directing people and economic activity away from the most hazardous places, insisting on designs and construction techniques that make buildings and other structures comparatively flood resistant, altering land-use patterns so that only those with low-damage potentials occupy the high-risk areas, and ensuring escape routes to higher buildings on higher ground for people in vulnerable low-lying areas.

BUILDING MODIFICATION

The preceding findings, which emphasize the importance of local building traditions, may have given the unqualified impression that local building methods, materials and traditions are always the best answer to Phases 2 and 3 (Rehabilitation and Reconstruction) of a disaster. But both historical evidence and case studies indicate that this is not always the case, the time intervals between certain types of hazard (particularly earthquakes) being too great to influence these traditions. Only if a disaster recurs relatively frequently (i.e. the last recurrence being within recent living memory and with a locally intolerable degree of intensity) will adaptation occur, bringing improvements to house siting and types of construction.
LOCAL CONSTRAINTS ON AND OPPORTUNITIES FOR MODIFICATION

Without support, such as subsidies and training programmes, it is unrealistic to expect low-income families to make changes in the siting, construction or form of their homes. The risk of unforeseen disaster appears to weigh lightly against everyday needs and established customs. Everyday needs, for families living at subsistence levels, pose continual "hazards" to their survival. For example, the short-term risks of crop failure, animal disease, or loss of income will be regarded as infinitely more important than the risks posed by infrequent hazards. However, while the modification of existing buildings may present difficulties, there will be greater opportunities for improvement in new housing, either during reconstruction or in the normal context.

Post-disaster housing programmes are different from normal low-income housing to the extent that:
In major disasters there is more money available for housing assistance;
The need to modify housing to achieve hazard resistance is generally accepted;
There are more agencies present than in normal conditions;
The provision of post-disaster shelter for the poorest sections of the community is of special international interest; and
The euphoric mood of the reconstruction period presents unusual opportunities for improvements.

THE RELEVANCE OF BYELAWS

Byelaws regulating land use and building construction, though they may be appropriate to middle-income housing, have been found to be ineffective in the low-income sector where mitigation measures must be introduced through the local community structure, rather than simply introduced by legal and regulatory process. Reasons for this ineffectiveness include a lack of public awareness among those at whom the byelaws are aimed, a lack of accompanying funds to achieve the higher standard of materials and construction stipulated, and difficulties of enforcement.

OPPORTUNITIES FOR WHOLESALE REFORM

Disasters will inevitably be regarded as ideal opportunities to introduce wholesale reforms in housing, building and planning. In reality, reforms are costly, technically difficult and politically complex. Progress in reform is generally slow, and an incremental approach is therefore easier to adopt.

PRE-CONDITIONS REQUIRED FOR CHANGE

Reforms in methods of housing reconstruction are dependent on a number of pre-conditions:
The capacity to keep the cost of construction and maintenance within the reach of the occupants;
The need to limit changes, respecting traditional values and housing forms;
The assurance of the long-term availability, at controlled costs, of materials required by new building methods;
The need for the confidence of survivors in those advocating change;
The capacity to teach new technology in a way that will be understood by the users;

In both the southern Italian and Algerian (El Asnam), earthquakes of 1980 there was widespread damaged to recently built, reinforced concrete buildings, despite the existence of aseismic building codes. This highlights the need for improved training of builders and the need for effective enforcement of building codes.
The willingness of groups providing technical assistance to remain active in a given area, with sustained support and encouragement to the surviving community beyond the relief period.

TECHNOLOGY TRANSFER

Following disasters where the structural failure of houses has been a major cause of death, assisting groups involved in housing reconstruction have attempted to introduce improved building methods. Many groups, however, do not have technical staff experienced in undertaking structural analyses of indigenous structures, from which to develop an appropriate reconstruction process. Therefore, they develop prototype designs of their own and attempt to provide enough units for those in need. These units are built as models for those who are not direct beneficiaries of the scheme. A second approach has been to develop intensive educational programmes and teach new building methods to the disaster-affected population.

The record of both approaches in transferring technology has been disappointing. The weakness of the first approach is cost of construction and maintenance, and the long-term scarcity of building materials (often imported)—factors rarely considered in programme planning. Secondly, the hastily designed techniques of crash programmes are not always the most readily understood or rational for those being trained.

Concerning the second approach, incentives have been required to get people to accept new building techniques. The best incentive has been the provision of building materials. However, the ability to transfer technology is dependent upon the continued availability of the selected materials: many techniques to improve structural performance in earthquakes, for example, require the use of lightweight, industrially manufactured materials. These materials, plus the improved building techniques, may be too costly for the majority of survivors.

In several instances, agencies involved in emergency shelter operations have attempted to introduce new technology in the hope that, when they re-entered the "normal" building process, the survivors would carry with them these improved techniques, and incorporate them into their new structures. But there is no evidence that this approach has worked, the primary obstacle being that the people do not equate their emergency shelters with permanent housing.

TRAINING FOR IMPROVED CONSTRUCTION

To date the best approach has proven to be combined programmes of building demonstration houses, and training in improved construction techniques. This work is still in its infancy, however, and much research and development are needed.
Training for the Management of Reconstruction Programmes

In addition to training needs at the grass-roots level, there remains the need for training in the management of post-disaster housing programmes.

There are two general classifications of assisting groups active in disaster relief and reconstruction: development organizations, working for long-term objectives; and relief organizations, working principally in emergency situations. The primary difference between the two is that the development organization will have on-going programmes in the country, and can reallocate the existing staff's time to meet emergency needs; whereas the relief agency will have only a skeleton staff in the country, bringing in personnel from outside to conduct their relief operation for a relatively short-term period.

A survey of both the development and relief organizations (conducted through the American Council of Voluntary Agencies and the International Council of Voluntary Agencies) reveals that among development organizations, little time is spent on training the staff in disaster preparedness or in managing post-disaster programmes. Few training aids exist within the organizations, other than their written standard operating procedures. Nevertheless, four of the largest development organizations have appointed officers at headquarters, responsible for preparing disaster operations guidelines, and maintaining liaison with other agencies/organizations. Training for field staff or volunteers on the planning and management of relief operations is virtually absent. As the majority of developing countries are disaster-prone, this lack of training represents a serious omission on the part of the development agencies, for there is the likelihood that their staff will be confronted with a disaster during their tour of duty.

In the relief organizations there is, of course, more emphasis on planning and managing disaster programmes. However, the nature of relief organizations tends to limit training to the higher, permanent echelons. In reviewing the training programmes of a sample of major relief organizations, it was found that few train their field staff on emergency shelter programmes, and especially on how to set objectives and choose options. Surveys of the libraries of two important relief organizations revealed little or no information on housing or emergency shelter, other than tent catalogues and several manuals on setting up tent encampments.

The apparent lack of staff training in the major development and relief organizations on emergency shelter and post-disaster housing must be remedied, for experience has shown that these areas constitute a substantial proportion of relief and reconstruction activities, both materially and financially.

Technical Improvements

1. The roofing problem

Most research on emergency shelter and post-disaster housing has concentrated on the development of either whole structural units, or improved materials for use in the walls (e.g. stabilized adobe). Field experience has shown, however, that the majority of the problems encountered relate to the roof and roofing materials.
Building research has shown that the performance of a structure in high winds or in an earthquake is in large measure dependent upon the weight and design of the roof, and how it is attached to the frame. Once these problems have been solved, it is almost inconsequential what type of infill is used in the walls. Normally, the local materials which were used before the disaster can be used again.

At present, the most common material used in post-disaster housing programmes is corrugated metal sheeting, available in a variety of forms and usually manufactured in the developing countries (corrugated galvanized iron, corrugated aluminium, etc.). A large market exists for the sale of these materials.

Only minimal efforts are being made to develop other types of light-weight materials from indigenous sources in the developing countries. Simultaneous and co-ordinated research is needed in two areas: development of new roofing materials using purely indigenous materials; and analysis of traditional structural types in order to determine how to improve their performance.

There is a major safety problem with heavy, flat earthen or tiled roofs, especially in earthquake areas. The need here is to try and devise a lightweight substitute that can retain the flat roof form and incorporate the insulation needed for extremes of climate.

2. The transfer of technical information

Currently, there is adequate technical information available for qualified architects and engineers to make decisions on design, the selection of materials, etc. However, this information is too technical for most relief or rehabilitation programme administrators. Therefore, simple technical information must be provided, in a form comprehensible to administrators, on:

Advice on the most appropriate type of shelter programme to select for the local situation;
How to use various types of indigenous materials;
Simple structural methods.

This information is needed at all levels of the relief system, to enable a greater number of people to become familiar with the options available. But, most importantly, it must be available at the field level, where the survivors’ points of view can be taken into consideration. It is necessary to prepare the information needed beforehand, and store it in the disaster-prone developing countries for use by the government and assisting groups, when needed. If one continues to rely on storing information in industrialized societies alone, third world access to it will continue to be limited, no matter how well established are the connections between the disaster-prone countries and the outside storage system. Recent research has indicated that the basic decisions in setting up post-disaster housing programmes are made within two weeks of the disaster’s occurrence. Thus, the information must be on hand, in usable form, as soon as the disaster has happened.

THE DEVELOPMENTAL CONTEXT

1. Development issues

Any assisting group involved in post-disaster assistance, whether for relief or reconstruction, is automatically concerned with long-term development. Thus, all the problems of development, such as the growth of “dependency relationships” through the inadvertent stifling of local initiative, are vital considerations. Relief and reconstruction programmes cannot be regarded or conducted as separate or distinct operations. They must be conducted in the context of development.

The development issues which are most overlooked by assisting groups when formulating post-disaster housing strategies and programmes are:

(a) Land tenure and land-use patterns. Few agencies initially realize the connection between their housing programmes and land tenure, and prevailing

---

land-use patterns: there is often the need for better quality, safer land equitably distributed at affordable cost.

(b) The need to upgrade self-help skills. Assisting groups consistently overlook the fact that a house provided to a disaster victim is of only limited value, and for the benefit of too few. With housing must come the development of skills.

(c) The need to facilitate co-operative actions. Agencies normally gear their housing programmes to help individuals; yet it has been consistently shown that, if a society is to develop socially or economically, residents must maintain a degree of sophistication in conducting co-operative activities. Many agencies overlook this opportunity.

Policy guidelines

Policies to avoid

1. Restoration of pre-disaster conditions. Merely to restore “normal” pre-disaster conditions will result in the loss of unique opportunities presented after a disaster to use the financial resources offered, as well as the political and social will for change to building and settlement patterns, which will improve general living conditions and reduce future risks.

2. Taking too narrow a view of risk-reduction policies. It is important to avoid regarding the provision of safe housing in isolation from other needs and priorities (land, utilities, employment, education, health, etc.). Communities vulnerable to natural hazards are normally aware of the risks they face, but their economic survival may be directly dependent on their particular location. In such circumstances, to propose relocation or modification of homes, without subsidies to cover the full costs, or technical assistance, is unrealistic.

3. Confusing the “normal” housing deficit with that created by a disaster. Experience indicates that authorities undertaking reconstruction are frequently asked to address chronic problems as part of the reconstruction process. Thus, pre-disaster housing deficits are added to disaster losses and reconstruction targets. Such a policy is probably inevitable but unrealistic, unless additional resources of cash, land, building skills and planning expertise are made available.

4. Regarding reconstruction as being limited to buildings or infrastructure. There is an urgent need following a disaster to strengthen all the components of reconstruction: institutions (administration and management), training, employment, community development, financing, the building materials industry, etc.

Policies to adopt

1. Risk reduction. It is important to introduce policies to modify the conditions which caused disaster. There are unique opportunities following a disaster to make substantial improvements to the infrastructure, building forms, building techniques and land-use patterns. The foundations of risk reduction are hazard mapping, vulnerability and risk analyses.

2. Varied policies. The need is not to place reliance on a single, technocrat risk-reduction policy, such as the introduction of structural regulations or land-use controls, but to develop a policy combining technical, social and economic measures.

3. Establish priorities for building improvements. It is axiomatic that all buildings must be made safe. However, pragmatism dictates that such a formidable task needs to be tackled according to a scale of priorities:

(a) Buildings for social groups such as children, the disabled and the elderly: schools, crèches, old people’s homes;

(b) Public buildings: community halls, churches, mosques, cinemas, markets;

(c) Buildings in regular rather than occasional use;

(d) Vital public buildings that cannot be damaged or destroyed without major, secondary adverse consequences: hospitals, dispensaries, fire stations, stockpiles of emergency goods, cyclone shelters, power stations;

(e) Buildings that are known to be in a dangerous condition.

It is proposed that priority lists of this nature should be drawn up in localities at risk. On the basis of the list, a system of regular structural checking and maintenance should be instituted as a standard preparedness measure.

4. Modification of existing housing. It is recognized that this poses considerable difficulties, particularly in a pre-disaster context, in view of potential social upheaval and the cost of such modifications. However, in some situations—most notably houses in arid, seismic zones where there is an absence of timber and other spanning materials—the risks are such as to make it imperative to modify the design of existing structures, as well as offer guidance on improved building methods. More research is required into vulnerable types of indigenous construction. Safe alternatives need to be developed which satisfy the demands of culture, local economics, climate, available materials, skills and risks. In any given area, research priorities need to be formulated and communicated to appropriate national or international bodies providing assistance for upgrading projects.

5. Training for management of relief and reconstruction. There are gaps in training at all levels of relief and reconstruction management. Lack of formal expertise is evident in both administration and technical understanding. It must be emphasized that the provision of shelter and post-disaster housing is as specialized an activity as, for example, the organization of medical or nutritional programmes. The need for properly trained personnel is therefore vital, and applies to both governmental and external agency staff.

6. Training of local builders. The collapse of, or damage to, a structure in a disaster may result either from ignorance of how or where to build in order to resist extreme forces, or from basically inferior building construction. But normally, a combination of both factors provides the fundamental cause of failure. It is apparent that local builders or craftsmen often
TABLE 5
Constituents of a risk-reduction policy

<table>
<thead>
<tr>
<th>Hazard mapping, vulnerability analyses, risk</th>
<th>Middle/high-income housing and settlement</th>
<th>Low-income housing (conventional) housing</th>
<th>Commerce, industry</th>
<th>Public services, utilities, community facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural modification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land-use adjustments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building regulations and enforcement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compulsory reinforcement of buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land-use regulations and enforcement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training of small builders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Official control and supervision of work done by major building and public works contractors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community preparedness, warning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

require basic education in the rudimentary principles of building construction and safe building techniques. Training programmes should be devised and implemented by the secondary and primary levels (regional and local), but the allocation of resources requires a policy decision at the tertiary (national) level.

On the one hand, the process of urbanization has resulted in a migration to the town or city of skilled craftsmen who can often obtain higher wages working for contracting firms. This can seriously deplete rural skills. On the other hand, families migrating to towns from rural areas frequently include men with building skills. However, such skills may relate only to the handling of local materials found within the original village—mud, stone, timber, thatch, etc. Once in the town or city, these builders cannot gain access to such materials, and they have to switch to an improvised mode of construction, normally involving makeshift use of recycled materials salvaged from refuse dumps, etc. Inevitably, the resulting buildings are frequently unsafe. In both of these situations, training programmes are necessary. To be fully effective, they should be linked with:
(a) Financial assistance for those being trained;
(b) Incentives in cash or kind to build safer homes;
(c) The supply (possibly at subsidized prices) of key building materials such as timber and lightweight roofing;
(d) The provision of simple educational aids. 22

7. Mitigation policies as an element of upgrading programmes. Within large towns or cities, local authorities have frequently undertaken upgrading programmes for the improvement of areas of low-income housing and marginal settlements. Such programmes normally include:
(a) Official recognition of the existence of marginal or squatter settlements, i.e. they have been legalized;
(b) Provision of essential infrastructure, e.g. roads, bus services, electricity, water, sanitation, schools, dispensaries, etc.;
(c) Some form of assistance with local housing, e.g. supply of materials, provision of subsidies and loans;
(d) In disaster prone areas, upgrading programmes should also include hazard resistant building methods, and the safe siting of housing. These measures should be based on hazard, vulnerability and risk analyses. 23

Key references

CUNY, Frederick C., "Scenario for a Housing Improvement Program in Disaster-Prone Areas", Disasters and the Small Dwelling, Pergamon, Oxford, United Kingdom, 1981, pp. 117-121.


22 These will probably be needed for people with little reading ability. Techniques originally developed for medical or agricultural education may be adapted to the housing sector. For a detailed description of a major integrated training programme for builders in safe construction, see McKay, Mary, 1981 (Key references to this section).

23 See appendix C.
4.2 RELOCATION OF SETTLEMENTS

PRINCIPLE: Despite frequent intentions to move vulnerable villages, towns and cities at risk to safe locations, such plans are rarely feasible. However, at the local level, a disaster will reveal the most hazardous sites (e.g. earthquake faults, areas subject to flooding etc.). Partial relocation within the same town or city may therefore be essential.

Audience
- Private sector: Manufacturers/contractors
- Professionals: Architects/planners/engineers
- Policy-making administrators: national (tertiary) level
- Project managers of post-disaster shelter/housing projects: Regional/provincial (secondary) level

Time phases
- Pre-disaster phase—Mitigation/risk reduction
- Phase 1—Immediate relief period (impact to day 5)
- Phase 2—Rehabilitation period (day 5 to 3 months)
- Phase 3—Reconstruction period (3 months onward)

GENERAL CHARACTERISTICS OF RELOCATION POLICIES

Experience indicates that governments frequently consider the relocation of entire settlements as part of their reconstruction policy. Relocation usually reflects the will to vacate land that is excessively hazardous. It can also be an attempt to remove people from illegally occupied land (such as squatter settlements), or it can express a political will for change and reform.

THE ROLE OF ASSISTING GROUPS

Assisting groups often purchase plots of land outside the immediate disaster area and erect large numbers of housing units for survivors. Families are given the opportunity to purchase houses and parcels of land, provided they can afford loan reimbursements.

PROBLEMS OF RELOCATION

1. Relocation away from urban centres is largely motivated by the availability of cheap (and often undesirable) land.
2. Distances from jobs and the costs of commuting are a cause of either a reduction of income, or missed opportunities for employment.
3. Urban services are frequently missing (schools, hospitals, shops, markets, etc.).
4. Utility systems such as water, sewerage, electricity, etc., will have to be extended. The demand for new services will compete with the need for repairs and reconstruction inside the devastated area, at the cost of social and economic recovery.
5. Few assisting groups are equipped to master-plan this type of development as part of relief management. The situation is worsened when the local authorities also lack planners, architects, administrators and capital resources.
6. If the economic and environmental situation worsens beyond endurance, people migrate back towards their original sites and jobs, leaving a vacuum behind them, quickly filled by rural-to-urban migrants, thus compounding problems of uncontrolled urbanization.
7. There are problems of default and difficulty to pay instalments on time, creating, for example, problems of overcrowding in order to obtain additional rent, with the environmental and social degradation that ensue.
8. If the new settlements are within the administrative boundaries of the disaster-stricken town, utilities (water, sewerage, electricity, etc.), will have to be extended. The demand for new services will compete with the need for repairs and reconstruction inside the devastated area, at the cost of social and economic recovery.
9. Settlements created outside municipal boundaries subsist in a kind of limbo, with neither the local nor the regional authorities willing to bear the costs of development and maintenance.
10. In developing countries, urban infrastructure costs are extremely high, the per capita costs far exceeding the per capita capacity to amortize such costs. The price of serviced land has risen out of all proportion to the costs of other resources and services, and especially in relation to wages.

A frequent response of governments is the promise to move survivors into new, less hazard-prone areas. But the evidence is clear that in practice this is rarely feasible, for the following reasons:
1. Reconstruction, especially of housing, normally starts very rapidly after a disaster.
2. People are unwilling to abandon well-established patterns of land ownership.
3. Even in a major catastrophe, it is likely that a relatively small proportion of the total urban fabric will
have been destroyed. The costs of relocation heavily outweigh the costs of repair and reconstruction.

4. Vested interests usually apply pressure to rebuild rather than move.

5. Despite the effects of a disaster, people naturally resist moving from their familiar surroundings.

**Policy guideline**

An alternative to wholesale relocation is the selective relocation of segments of the community away from the most hazardous sites, but remaining within the same general area. Even this alternative can be prohibitively expensive for the public and the local authorities. In any case, it is more than likely that vacated land will be rapidly re-occupied by others who will in turn live at risk, because of the extreme scarcity of serviced urban land, and especially land that is within reach of jobs. In many developing countries there is no formal way out of the dilemma: perhaps the only approach is to persuade communities to reduce their own vulnerability, through public education on the effects of severe natural hazards, and the gains to be derived from partial relocation.

There are five pre-conditions for successful, partial relocation:

- The consent of the affected community;
- The availability of safe land at a cost the community can bear;
- Proximity to employment and social services;
- The provision of utilities at the community level (if not for every family);
- Facilities for home building as described in this study.

### 4.3 LAND TENURE AND LAND USE

**PRINCIPLE:** Success in reconstruction is closely linked to the question of land tenure, government land policy, and all aspects of land-use and infrastructure planning.

**Audience**

- Private sector: Manufacturers/contractors
- Professionals: Architects/planners/engineers
- Policy-making administrators: National (tertiary) level
- Project managers of post-disaster shelter/housing projects: Regional/provincial (secondary) level

**Time phases**

- **Pre-disaster phase**—Mitigation/risk reduction
  - *Phase 1*—Immediate relief period (impact to day 5)
  - *Phase 2*—Rehabilitation period (day 5 to 3 months)
  - *Phase 3*—Reconstruction period (3 months onward)

**Land and Population**

The major regions of the world exposed to violent natural phenomena (especially earthquakes, tsunamis and tropical cyclones) stretch across the tropical and sub-tropical portions of Africa, Asia and Latin America. These areas coincide with areas of rapid population growth and urbanization, and are extremely disaster-prone. In addition, virtually no country is entirely safe from floods.

Indeed, the rapid growth and spread of population in hazardous areas is a matter of increasing concern, and is rapidly contributing to mounting costs of disasters in terms of lives lost, and damage to property and investments. Most developing countries are doubling their population every 20 to 25 years (assuming national population growth rates of 2 per cent to 3 per cent), while the urban population in these countries is doubling every 12 to 15 years (assuming urban growth rates of 4 to 7 per cent). Equally significant, and of critical importance in areas subject to natural phenomena likely to cause disasters, is the growth rate of low-income slum and squatter settlements around major urban agglomerations.

Slum and squatter populations grow at about twice the average urban rate. In settlements such as these there is a doubling of population every 5 to 7 years, and the density is usually very high. In many cases, entire families may occupy a single room. Urban population densities per square kilometre, as measured in slums and squatter settlements, are even more revealing. In squatter areas, densities may be as high as 100,000 persons per km² (Morocco) and rise to 148,000 (India).
Even the average densities for urban areas as a whole are high enough to cause concern in areas exposed to earthquakes, floods or landslides. The older sections of some cities may contain as many as 20,000 to 60,000 persons per km², although the average densities for such cities may be less than 10,000 persons per km². Densities such as these are all the more critical in hazardous areas.

The problem of exposure to disaster risk among rural populations, however, should not be underestimated. Although the population growth rate in rural areas is usually lower than the national average due to rural-urban migration, the scarcity of arable or developed land in many developing countries, combined with the fact that on the average more than 70 per cent of total national populations are still rural, can create significant risks in areas exposed to natural phenomena. Rural population densities can surpass 1,000 persons per km² in areas where rainfall and tropical soil conditions limit the amount of arable land. Wherever rural populations are sedentary (as opposed to being nomadic and pastoral) and engaged in agriculture on hazardous land, the risk of substantial disaster cannot be ignored.

Dramatic increases in population size, distribution and density increase disaster risk: natural hazards such as floods, earthquakes or tropical cyclones do not in themselves constitute disasters until they strike at human lives and property.

The earthquake in Guatemala of February 1976 serves to illustrate how global and unselective disasters can be, affecting rural and urban populations with equal intensity. More than 3.4 million people out of a total of 5 million (64 per cent) were affected by the earthquake. More than 1 million persons were left homeless, and more than 222,000 dwelling units were partially or totally destroyed. Of the 1.2 million people left homeless, 350,000 were in the country’s largest urban area, Guatemala City. The remainder were largely rural populations living in small towns or villages, scattered throughout the earthquake zone. The single largest damage impact was on housing. The loss to the private sector (and particularly to low-income housing) was more than two-and-a-half times that incurred by the public sector.

There are two fundamental alternatives to disaster mitigation: the first aims at steering development away from hazardous areas towards safer locations; the second comprises structural measures aimed at resisting or deflecting the impact of natural phenomena. Comprehensive land-use planning is a discipline which began early in the twentieth century in industrialized countries with scarce land resources, such as the Netherlands, Denmark and Great Britain. It is a physical planning tool which has since gained widespread acceptance in most industrialized countries. The more centralized the system of government, the more effectively can land use be controlled, usually because private ownership of land is limited or strictly regulated. In free market economies, land-use controls are more complex and policies more difficult to implement, due to the high rate of private land ownership and the resultant tensions between public and private interests.

In disaster-prone developing countries, land-use planning and control for disaster mitigation may act as a spur to comprehensive land-use planning, especially where natural disasters have become a permanent development problem owing the the intensity and frequency.

Land-use planning and control are key factors for the orderly and safe growth of human settlements. Although there is no immediate shortage of raw (undeveloped) land for urban expansion in most developing countries, land is ultimately a finite resource and is extremely costly to develop.

Alternative methods have been explored, seeking to expand urban infrastructure and housing in planned and progressive stages with heavy reliance on purely local resources, including self-help. In disaster-prone areas, orderly urban expansion becomes prohibitive unless investments in infrastructure, housing and other services are protected from damage at all stages of their development. Land-use control measures establish not only static norms, such as function, density, and location, but also dynamic norms, such as the rate of development and growth.

The major elements of land-use may be summarized as follows:

1. Land-use policies and plans setting out the social, economic and environmental goals of comprehensive land development, and their stages of development;

2. Land ownership and land tenure patterns, identifying the legal, social and economic basis of ownership and tenure;

3. Land values and prices, reflecting the forces of supply and demand for land with respect to free market economies;

4. Land-use controls which may be subdivided into three broad categories: legal, fiscal and directive (by direct government intervention).

LAND AND POST-DISASTER HOUSING

1. A policy of homeowners only. Many assisting groups are apprehensive of the problems related to land acquisition. Their programmes offer housing preferably to families who have title to land. However, few low-income families are landowners. Thus, programmes such as these only help those who are better off to begin with, and who would in any case be eligible for financial assistance. In the aftermath of a disaster this built in discrimination against the majority of survivors (who, as we have seen, are mostly poor and landless) can be the source of social and political tensions.

2. Provision of housing for those who do not own the land. Many agencies offer to provide emergency shelter and/or temporary housing to families on the site of their former house. These units usually evolve into formal structures over a period of years, and become permanent dwellings. If the family has paid for a house, built on land which it does not own, a legal question arises as
A consequence of land-tenure problems can be seen in these photographs of devastation after the Guatemalan earthquake of 1976. Within the city area, poor families had illegally occupied unstable, sloping “Barrancos” (ravines in the city with very steep slopes subject to landslides). The earthquake resulted in the progressive collapse of houses. Assisting agencies were faced with the dilemma of whether or not to provide assistance to rebuild in such dangerous locations. The ultimate solution is a change in the pattern of land tenure, with the government making safe land available for low-income families.
to who owns the structure, the landlord or the occupant.  

3. Reconstruction on unsafe sites. To head off demands for land reform some governments will turn tracts of land over for low income housing reconstruction. Usually, however, this land is of little economic value, and is likely to continue exposing its occupant to risk.  

4. State ownership. In general, countries enjoying state ownership of land have been more successful with resettlement than those in which private land ownership prevails, even though the latter frequently possess emergency powers of compulsory land purchase, such powers, however, being rarely used. One example of the use of emergency powers occurred after the 1963 earthquake in Skopje, Yugoslavia. Safe land on the outskirts of the city was scheduled by the government for housing. The ability to requisition land was the reason why 14,000 housing units were erected within eight months of the earthquake.  

Policy guidelines

1. The land issue must be recognised as an integral part of post-disaster housing programmes. The political and economic nature of the issue may present difficulties, but nevertheless there may be opportunities for land reform, and safe land for resettlement must be made available after a disaster.  

2. The release of safe land for building, designated for low-income families, must be supplied with basic infrastructure—at least water, waste disposal and all weather roads—and must be within reach of employment. It is recognized that this may appear unduly idealistic, since safe land near urban centres will inevitably be very valuable. However, it is essential to recognize that poor families have to live close to centres, since their livelihood may depend on it. They are unlikely to have the time or money for travelling long distances to work.  

3. The costs of land development cannot be overlooked. It is necessary therefore to incorporate land purchase and development costs within the financing system established for housing reconstruction. Financing systems are described in section 4.4.  

4. For low-income groups, security of land tenure must be assured in order to encourage the entire grass-roots system of self-help and popular participation in development. The evidence clearly indicates that families will put their resources (skills, energy, money) into housing only if they can see some personal return from such investment. Safe house construction by local families requires security of tenure at the outset of building (not at the completion of the loan repayment period). In many countries such provision will require land reforms.  

Key references


4.4 HOUSING FINANCE

PRINCIPLE: One of the most important components of a post-disaster shelter programme is its financing system. Outright cash grants are effective in the short term only, and can create a dependency relationship between survivor and assisting groups. It is far more advantageous for both the individual and the community to participate in the financing of their own shelter programmes, especially permanent reconstruction.

Audience

- Private sectors: Manufacturers, contractors, banks, co-operatives,
- Professionals: Architects/planners/economists
- Policy-making administrators: National (tertiary) level
- Project managers of post-disaster shelter/housing projects: Regional/provincial (secondary) level.

Time phases

- Pre-disaster phase — Risk reduction, preparedness
- Phase 1 — Immediate relief period (impact to day 5)
- Phase 2 — Rehabilitation period (day 5 to 3 months)
- Phase 3 — Reconstruction period (3 months onward)

The need for housing finance

One of the most important components of a post-disaster shelter programme is its financing system, i.e. the means by which the survivor ultimately pays for shelter aid. Unfortunately, it has been one of the components whose importance has been least understood. Some assisting groups, as long as a year after the completion of their project, have not even finalized the financing system. The recipients of aid have often been unaware of their financial obligations, leaving a cloud of uncertainty and anxiety hanging over them. On the other hand, financing programmes that have been well planned have had the positive effects of reinforcing the recipients' self-esteem, furthering local development and contributing towards economic recovery.

The following is an overview and critical evaluation of the most common financing systems or arrangements that have been used for post-disaster shelter and housing programmes:

1. Outright gift. Some shelter programmes solve the question of financing by simply eliminating its attendant charges. The assisting group gives the aid to the recipient who has fulfilled certain, more or less formal, conditions of entitlement, such as proof of being a genuine disaster victim, proof of ownership of the land on which the shelter is to be built, evidence of low income level, etc. Once the aid has been given, the recipient has no further obligation to repay part, or all of the cost of the shelter. This may seem justifiable when the shelter is clearly temporary and erected on land not ultimately destined for housing.²⁸

Advantages

It eliminates the need to recuperate the money; it may be difficult for an assisting group to do this, especially if it only operates in the disaster area for a short time, or has no staff qualified to direct a financing programme;

It may conform to the charter or mandate of certain assisting groups who are required to give their aid;

It allows the recipient to spend what money he may have on other necessities;

Disadvantages

The money may be used inappropriately, thus compromising the reconstruction process;

It may undermine the vital resource of the survivors' own "coping" mechanisms, including traditional, community self-help;

It may result in the imposition of housing solutions which do not respond to people's needs and preferences;

It may weaken local co-operatives, and other institutions, by bypassing them;

It deprives the donor from recuperating funds for new projects;

Because construction materials are expensive, and because agencies have limited funds, it limits the number of people it can serve.

2. Straightforward purchase. This is virtually the opposite of the outright gift, and is seldom the financing mechanism used by assisting groups, especially those which are charities. It is employed by profit-making businesses that see the demand created by the disaster as a marketing opportunity. Its advantage is that it maintains the freedom of the open market, though this could obviously become a disadvantage if the

²⁸ Such was the case of shelters built by the government after the 1970 earthquake in Peru.
seller is in a position to exploit survivors with few options. In practice the numbers of survivors who can afford full market prices will probably be very limited.

3. No-cost self-help. Several assisting groups have instituted programmes where they give building materials, and usually furnish supervisory and administrative personnel to an organized group of families who build their own houses. As with the outright gift of a house, the recipients do not repay any money for the costs of materials. This method is viewed as a means of involving the recipient in the programme without straining his meagre or reduced economic resources.

Advantages
As with the outright gift, it eliminates the need for an organization and procedure to recuperate money;
It allows the recipient to spend what money he may have on other necessities;
By virtue of building the shelter, the recipient will have a greater commitment to the programme than if he had been a passive spectator.

Disadvantages
To a lesser extent, the disadvantages of the outright gift will tend also to hold true with the no-cost self-help approach;
The assisting group may feel it has a right to influence the organization and timing of the self-help because it is giving the materials and technical assistance, to the possible detriment of the recipient community.
The time spent on the construction of the shelter is valuable to the recipient. He may have difficulty in choosing between building a house and providing the family with economic support.
The successful implementation of a no-cost self-help programme can only be achieved with great care. The design of the programme must correspond to traditional patterns of building, to the time available, and to the economic priorities of the victims.

4. Loan programmes. Loan programmes may take a variety of forms, and be either a part, or the whole, of an assisting group’s shelter programme. Specific loan conditions vary considerably, but they generally require that the recipient be a genuine disaster victim, living in a given locality; that his income falls within a prescribed range; that his employment is secure; that he has prior experience of credit repayment, and that he agrees to the terms of the loan. The lender may also make the additional condition that the new building must conform to minimum standards of safety, or that it be built away from hazardous areas. The non-profit lender is often capable of providing advantageous terms of repayment. Various programmes have allowed subsidies in the form of low interest, no interest, repayment of only a percentage of the principal, long term repayment, or repayment at an affordable proportion of the family’s income.

(a) Long-term straight loan. The long-term straight loan is perhaps the most commonly conceived form of loan financing. It is typically extended by a bank or lending institution at prevailing or subsidized bank rates. After many major disasters, the World Bank and the Regional Development Banks in Asia and Latin America have made large scale loans to financing institutions within national governments. These institutions in turn offer loans to survivors (individuals or communities) for reconstruction, but may not always offer the complementary assistance of building materials or technical support, which the lowest incomes require as well.

Advantages
It accommodates survivors who typically do not have cash to spend on building materials right after a disaster, but who can pay the full costs of the materials, plus interest and administrative charges in the long-term;
It removes the stigma and problems of free aid;
It introduces the discipline of credit, becoming an experience that may facilitate future credit for economic development;
The lending institution is likely to expand its own experience and capabilities, and perhaps extend its services to the lowest income groups;
The amount of the loan can be tailored to the need and capability of the recipient;
The recipient has the freedom to rebuild a house of his own choosing or design, and not be tied to a uniform housing programme;
The lending institution, will in its own interest, be concerned with the economic well-being of the recipients for at least the life of the loan.

Disadvantages
The lender may place unduly restrictive conditions on the loan. In rural areas, it is unlikely that credit loan administration facilities will exist.
The recipient may not have been adequately prepared for the economic burden of repayment. This could occur if he has no experience of credit, does not understand its concept, or is not adequately motivated to make repayments.
Some people are reluctant to take out loans because they believe that their property will be placed in jeopardy if they do not repay installments on time.
The costs of loan administration are high and add to the burden of repayment. 29
Conservative financing institutions tend to make loans exclusively to middle class, relatively high-income groups, i.e. to people who are a low risk.

(b) Loan for loan. Many lending institutions require a substantial down-payment, for example, 20 per cent of the loan they make. For those without the cash, a loan is therefore an inaccessible form of aid. Assisting groups, particularly voluntary agencies, have therefore made additional loans to cover the down payment, hence the concept “a loan for a loan”.

(c) Guaranteed loan. As previously noted, a disadvantage of many loan programmes is the tendency for lending institutions to make loans

---

29 In Guatemala, the staff of the OXFAM/World Neighbours housing programme estimated that the loans would cost about 30 per cent to administer in the first year alone. In the end, the costs of administration would have to be added to the original cost of the programme.
available only to the most credit-worthy individuals. Lending institutions have also been reluctant to venture out of familiar territory, i.e. into marginal, low-income settlements and rural areas. Assisting groups addressing the problem have made guarantees to these lending institutions, enabling them to extend loans to previously disadvantaged populations. This is a particularly effective form of assistance from agencies involved in development programmes continuing beyond the emergency phase of a disaster. The advantage of the guaranteed loan is its cost effectiveness, for it reaches a proportionately large number of people, thus introducing economies of scale.

(d) Revolving loan. A revolving loan system allows money brought into a disaster-affected community to be used many times over. As the original recipients begin to repay the loan, a new fund is created which can in turn be used to lend to other survivors. This form of aid is most appropriate when the assisting group provides assistance in the form of a grant that does not have to be recovered, as with the traditional loan. The financing system has the multiple advantage of extending the use of the original money to many times the number of the original loan recipients. This money also has the side effect of creating additional employment in the community. It may further assist in the creation of new credit institutions, providing them with a sound base of experience, the funds and financial expertise carrying far into the reconstruction period.

(c) Material price subsidy and money refl ow. This financing system is actually a hybrid of material supply and community economic development, combining the advantages of both, at a period when the disaster-stricken community is most in need of these kinds of external support. Although they are actually two separate financing mechanisms, material price subsidy and money reflow have been successfully linked in several shelter programmes, the money recovered from the initial sale being used to pay disaster survivors for their labour on public works projects.⁴⁰

Advantages
Subsidized prices, as opposed to full prices, make materials available to poorer, and more numerous families;
The programme’s benefits are threefold: the survivors receive materials; community projects are built; personal income is generated;
The poorest families, initially unable to purchase materials, can do so later by participating in public works or community projects.

The managerial experience acquired, especially if the executing agency is governmental, may contribute significantly to the long-term recovery and development of the affected region in general.

A materials purchase programme allows the recipient the freedom to use the materials when he chooses.

Disadvantages
The only major disadvantage with this approach is that it must inevitably be carried out on a large scale, and therefore requires an extensive administration which may be difficult to staff with enough, and adequately trained, people.

Conclusion
Where there are a number of assisting groups providing shelter programmes, there is likely to be a wide range of financing systems in operation. This variety can itself lead to problems, irrespective of the merits or otherwise of the individual systems being used.¹¹ The issue of financing is closely interrelated with the total cost, value and desirability of the project. It should also relate to survivors’ incomes and ability to pay. As obvious as that may seem, it has not often been the case.

Policy Guidelines
It is necessary to create a common approach to financing systems among all assisting groups. Some authoritative body, such as the disaster coordinating agency of the national government, should establish a policy to achieve this objective. The policy could take the form of a set of criteria which all shelter programme financing systems must meet. Because of the great diversity of cultural traditions and economic bases, it is not possible here to set forth a model set of criteria. Rather, a set of principles can act as a guide for each country to develop its own criteria:

1. All recipients of aid should be required to repay a substantial proportion of the cost of that aid. A nominal repayment of only 5 or 10 per cent may be perceived as a gift. On the other hand, 100 per cent repayment of costs may be too great a burden for families that may have suffered economic losses from the disaster.

2. The cost of a shelter should approximate the cost of pre-disaster housing. There may be extenuating factors justifying a somewhat higher cost that may include, for example, structural modifications using additional building materials. The form of the repay-

⁴⁰ After the 1976 earthquake in Guatemala, USAID implemented a programme utilizing this approach. Corrugated galvanised iron roofing sheets were bought in large quantities and shipped to Guatemala. USAID made agency agreements with local cooperatives for the distribution of the material which was then sold directly to survivors at approximately half the cost, with a limit of 20 sheets per family. The community was asked to identify community projects that needed attention. The money received from the material sales was used to finance these projects, the survivors who formed the labour being paid a daily wage. This, of course, increased the purchasing power of the survivors and accelerated their economic recovery.

¹¹ These problems are clearly illustrated by the experience at Choloma, Honduras, after Hurricane Fifi in 1974. They were exacerbated by the fact that there was also a great range in the quality and user desirability of the housing projects. The cost of the agency built housing ranged from USA$400 to $2,150. Some families received highly desirable concrete block houses which cost $1,000, and did not have to pay anything. Others received less desirable $600 wooden houses and had to pay a portion of the cost, whilst others received $450 wooden houses, and were required to repay the entire cost. Such inconsistencies led to frustration, confusion and anger on the part of the beneficiaries. For many, there was the uncertainty and insecurity created by an unknown status of payment, many months or even years after occupancy. These feelings sometimes leave a bitterness which upsets social patterns in a community for years to come.
ment should be as similar to traditional debt repayment practices as possible, allowing repayment to reflect income, capacity, and taking place at a familiar location.

3. Preparedness plans should identify lending institutions which would co-operate with special post-disaster loan programmes, such as the guaranteed loan or loan-for-loan. These same institutions might also agree to act as loan recuperating agencies in contract with assisting groups who choose not to set up their own loan recovery administration. This would effectively eliminate the chief argument such groups have for giving away their assistance. Where a reflow programme is anticipated, the mechanism and institution to operate it could also be anticipated.

4. It is the responsibility of all assisting groups, and their target communities, to identify the financing systems that serve the best interests of the survivors. Financing and loan mechanisms, in the last analysis, are better than outright gifts: human dignity is preserved; more people benefit from the resource made available; and the ends of development are served.