

# Chapter 16

## Preparing for disasters and emergencies

### 16.1 Introduction: what is disaster preparedness?

Many standard risk reduction terms are used loosely and inconsistently. ‘Disaster preparedness’ is one. Basically, it has three main elements:

1. Forecasting events and issuing warnings.
2. Taking precautionary measures in response to warnings.
3. Improving response by organising and strengthening capacity to deliver timely and effective rescue, relief and assistance.

Disaster preparedness therefore has two main aims: to help people to avoid impending disaster threats; and to put plans, resources and mechanisms in place to ensure that those who are affected receive adequate assistance. It is assumed that some people and property will be vulnerable to disasters, despite mitigation measures, and that agencies will have to deal with the disaster’s impact.

This chapter highlights aspects of preparedness that do not fit easily into the other thematic sections of this Good Practice Review, with an emphasis on planning and systems. It is not a comprehensive review of emergency management practices. The chapter has two parts:

1. An overview of the main components of disaster preparedness.
2. Forecasting and warning systems.

### 16.2 Components of disaster preparedness

#### 16.2.1 Overview

The main components of disaster preparedness are set out in the following framework (Table 16.1). Detailed guidance can be found in readily available expert publications, which have been used in preparing this chapter.<sup>1</sup>

The framework’s nine general categories should not be seen as a fixed sequence. In most cases, activities in different categories will be carried out at the same time. Nevertheless, there is a logical sequence of sorts: planning must be preceded by understanding of vulnerability and leads on to the

**Table 16.1 Disaster preparedness framework**

<p><b>1. Vulnerability assessment</b></p> <p>Starting point for planning and preparation, linked to longer-term mitigation and development interventions as well as disaster preparedness.</p>	<p><b>2. Planning</b></p> <p>Disaster preparedness plans agreed and in place, which are achievable and for which commitment and resources are relatively assured.</p>	<p><b>3. Institutional framework</b></p> <p>Well co-ordinated disaster preparedness and response system at all levels, with commitment from relevant stakeholders. Roles and responsibilities clearly defined.</p>
<p><b>4. Information systems</b></p> <p>Efficient and reliable systems for gathering and sharing information (e.g. forecasts and warnings, information on relevant capacities, role allocation and resources) between stakeholders.</p>	<p><b>5. Resource base</b></p> <p>Goods (e.g. stockpiles of food, emergency shelter and other materials), services (e.g. search and rescue, medical, engineering, nutrition specialists) and disaster relief funding (e.g. for items not easily stockpiled or not anticipated) available and accessible.</p>	<p><b>6. Warning systems</b></p> <p>Robust communications systems (technologies, infrastructure, people) capable of transmitting warnings effectively to people at risk.</p>
<p><b>7. Response mechanisms</b></p> <p>Established and familiar to disaster response agencies and disaster victims (may include: evacuation procedures and shelters, search and rescue teams, needs assessment teams, activation of emergency lifeline facilities, reception centres and shelters for displaced people).</p>	<p><b>8. Education and training</b></p> <p>Training courses, workshops and extension programmes for at-risk groups and disaster responders. Knowledge of risk and appropriate response shared through public information and education systems.</p>	<p><b>9. Rehearsals</b></p> <p>Evacuation and response procedures practised, evaluated and improved.</p>

R. Kent, *Disaster Preparedness* (New York/Geneva: UNDP/DHA Disaster Training Programme, 1994), [http://undmtp.org/english/disaster\\_preparedness/disaster\\_preparedness.pdf](http://undmtp.org/english/disaster_preparedness/disaster_preparedness.pdf).

establishment of an institutional framework; the framework is a foundation for setting up information and warning systems, assembling resources, putting resource mechanisms in place and testing them, and providing public education and training. In reality, one never starts with no elements of the disaster preparedness system in place, so that the task is to make improvements in all areas.

### 16.2.2 Planning

A disaster preparedness ‘plan’ can take several forms, ranging from a broad mitigation and preparedness strategy to a detailed contingency plan for responding to a particular hazard. In most plans, the operational priorities will be to save human life, meet people’s emergency needs (principally medical care, food, shelter and clothing) and restore facilities that are essential for health, safety and welfare (e.g. hospitals, water and sanitation, power and transport). Rehabilitation and reconstruction are likely to be included in more strategic plans, although in practice they tend to be poorly integrated with emergency response (see Chapter 17).<sup>2</sup>

Whatever the contents of the plan, it should have the following characteristics:

1. The objectives and activities must be set out clearly, logically and systematically.
2. It should be realistic, based on existing structures and systems and recognising their strengths and weaknesses. A high level of adaptability will be required during disasters. Plan for likely problems within response organisations as well as on the ground. Creating a preparedness/response system that can deal with the full range of disasters a society is likely to face will take a long time, depending on the resources available. Planning should reflect this.
3. Many preparedness plans include mitigation and recovery, but this may be only for form’s sake. In practice, emergency systems’ capacity to undertake these complex, long-term tasks is usually lacking (though it is essential to integrate preparedness plans with those for longer-term development and disaster management). Where there are weaknesses, strengthen existing structures rather than create new ones. The latter approach adds to the bureaucracy and will create confusion between organisations with similar mandates (see point 4 below and Case Study 16.1). The arrival of international relief teams after a major disaster often leads to creation of ad hoc parallel structures that confuse the situation even further, overwhelming local agencies and their systems.

4. Roles and responsibilities must be defined clearly. This is often done through provisions in the legislation setting up disaster management structures, or through administrative order. But as official mandates may be too generalised, there is usually a need for separate agreements between agencies. Existing arrangements can soon become outdated, so partners will need to monitor them regularly and adapt them if required. For organisations working at local level, it is particularly important to establish the extent of decentralisation in the plan and the corresponding extent to which they will be allowed to make operational decisions on their own.
5. The plan must be well informed – based upon reliable and comprehensive information covering all relevant aspects: hazards, risks, vulnerabilities and capacities. Analysis of past events and how they were managed will form a central part of this information base, but it is also important to anticipate the kinds of event that are likely to happen in the future, which may be different from those that have occurred in the past.
6. It must prepare for extreme events and chaotic situations. These will require a different scale and type of response from routine emergencies. In the conventional definition, a disaster is an event that overwhelms a society's capacity to cope. Although smaller events may well be disastrous at local level, major disasters are quite different in their scale and often in the nature of their impact.
7. It must reflect the needs of the community, especially the most vulnerable. This means that some kind of socio-economic vulnerability analysis is essential in advance. Preparedness plans are usually much more aware of the vulnerability of critical facilities and infrastructure (e.g. emergency command centres, hospitals, power and water supplies, roads and bridges) than of the vulnerability of the human beings who live within their remit. When a disaster strikes, needs assessments need to be as quick and accurate as possible, and should take the most vulnerable into account (see Chapter 6).
8. The aim should be to provide *effective and timely* response. This is a question not just of speed, but also of providing what is most needed, when it is needed. In the aftermath of a disaster, the affected communities' needs and priorities may change rapidly. Disaster managers must be able to identify and react to this.
9. Governments usually take the lead in disaster preparedness planning, but as in any other aspect of risk reduction the plan should integrate the skills and capacities of a wide variety of agencies – official and non-governmental, including community groups (see Chapter 5). This is likely to include many groups and organisations not normally involved in disaster management. In implementation, the plan should be flexible enough to

incorporate the variety of ‘emergent groups’ that are likely to spring into action after disasters (see Chapter 8.3.1, page 119). Local people are the main responders in the immediate post-disaster period, and disaster workers should support their efforts, not duplicate or undermine them.

10. Good coordination is vital – vertical (between local and higher authorities) and horizontal (between different agencies operating at the same level). Disaster preparedness planning does not have to be centralised. There will have to be some centre to coordinate emergency operations, but disasters cannot be controlled in a ‘top-down’ manner from a single point, and decision-making should be delegated where possible. Decentralisation of responsibilities is generally desirable because it allows disaster responses that are more rapid and better informed about local needs. Organisations operating locally may need to develop their own preparedness plans, especially in places where there is little chance of support from government or external agencies: this might be because government is ineffective or the area is very remote. But in most cases, some degree of coordination with official agencies is vital to make the most of what may be limited capacities, as well as to avoid duplication of effort. In many cases, plans (or parts of them) will have to be translated into local languages in order to engage local people and their organisations.
11. It should be ‘owned’ by all parties involved. For the plan to work, people must believe in it and be committed to it. At government level, enabling legislation and adequate resources (especially funding) are key indicators of commitment; so too is support from a senior figure such as a president or prime minister. Some of the indicators set out in Chapter 3 may be helpful in assessing the commitment of other agencies.
12. Regular review and updating is essential.

Above all, one should focus on the planning *process*, rather than the production of plans. A written disaster preparedness plan must not be seen as an end in itself. It is ‘a product, but not the main goal, of the planning process’.<sup>3</sup> Its purpose is to stimulate action and make that action effective. Constant review and dialogue between partners will be required.

Case Study 16.2 describes some of the harm that results from inadequate preparedness planning.

### 16.2.3 Resources

When a disaster strikes, a variety of goods and services are needed to deal with the crisis.

## Case Study 16.1

### Organisational duplication in disaster response

The politicisation of disaster management institutions became a burning question in Peru, Bolivia and Ecuador during the El Niño crisis of 1997–98, when the response to the crisis was heavily influenced by party and presidential politics.

In Ecuador, the major parties and candidates were preparing for a presidential election. In Peru, the next presidential election was more distant but the country's autocratic president, Alberto Fujimori, was anxious to boost his popularity. In Bolivia, responses were influenced by a transition between administrations and political manoeuvring within a four-party coalition government.

In each country, the conventional emergency management organisations (civil defence) were marginalised by new, temporary government organisations that took over management of the El Niño

event. The result was duplication of roles and attendant confusion, together with a serious loss of credibility and morale in the civil defence organisations.

Although in each case the official justification for the changes was the lack of capacity in the civil defence agencies and their response-focused attitudes, a prime motive was to put allies of the president in charge of dealing with the El Niño event, as it rapidly became a national political crisis in all three countries. In other words, a short-term, politically expedient, approach was preferred to the strategic development of disaster management capacity.

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R. S. Olson et al., *The Marginalisation of Disaster Response Institutions: the 1997–1998 El Niño Experience in Peru, Bolivia, and Ecuador* (Boulder, CO: Natural Hazards Research Center, Special Publication 36, 2000), [www.colorado.edu/hazards/sp/sp36/SP36.pdf](http://www.colorado.edu/hazards/sp/sp36/SP36.pdf).

The material resources required include search and rescue equipment, boats and vehicles (and fuel to run them), stockpiles of relief goods such as food, medicines, water purification and oral rehydration tablets, emergency shelter materials, blankets and cooking utensils. The range of potentially useful materials is very wide, and careful thought must be given to likely needs and how to supply them. There must be systems in place that ensure adequate funding will be on hand to pay for emergency response operations.

## Case Study 16.2

### Failure to plan

Cyclone Geralda struck Madagascar in February 1994. It was probably the strongest cyclone in the country's history, and caused widespread damage to crops, housing and infrastructure. The immediate emergency response was limited because the structures for dealing with such an event were not in place. The failure to develop adequate preparedness plans had the following consequences:

- Important roads and bridges had not been maintained, which hindered relief operations.
- Lack of functioning local committees led to delays in emergency response and relief. Responsibilities were not defined, which encouraged competition between members of parliament and town mayors over who should take the leading role.
- In one case, owing to the lack of response plans and the strict application of official rules, bulldozers stationed in one administrative district could not be used to clear a major landslide just 20 metres outside the district's boundary.
- In the absence of plans or criteria, it was impossible for the government to target distributions of emergency supplies.
- Much of the collection of baseline information about the affected population had to take place *after* the cyclone. This task and the post-disaster damage assessments were greatly handicapped by the destruction of roads and bridges. There were no protocols for damage assessment.
- Lack of emergency food and fuel stocks resulted in immediate shortages, hoarding and price escalation (rice prices went up by 300% overnight). The impact was felt particularly by the urban poor. Destruction of infrastructure added to the supply problem.
- Capacity to respond had to be built up after the disaster: this included logistics, communications and human resources, as well as material and financial capacity. Much essential equipment had to be imported, since it could not be purchased locally, and in some cases it took months for equipment to arrive.

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R. Vonk, 'Emergency Preparedness in Cyclone Prone Areas in Madagascar', in J. Scobie (ed), *Mitigating the Millennium: Community Participation and Impact Measurement in Disaster Preparedness and Mitigation Programmes* (Rugby: ITDG, 1997), pp. 52–59.

The necessary human resources include trained emergency management staff and volunteers able to disseminate warnings, assist evacuation, carry out emergency response activities such as search and rescue and first aid, make needs assessments and manage the distribution of relief aid. The skills of medical personnel, the police, fire-fighters, engineers, architects, scientists, media professionals and many others will also be needed. Training courses should reach beyond emergency managers, staff and volunteers to include all professional groups that are likely to be involved in disaster response.<sup>4</sup>

Good preparedness includes having these resources in place, or having established mechanisms that can put them in place rapidly when needed.

### Material resources

The history of disaster response is full of examples of inappropriate materials being sent for the relief of victims. This inappropriateness takes two main forms.

1. Items that are not needed, are unsuited to local cultures and practices, or are simply inferior. In this category are:
  - Foodstuffs that disaster-hit communities do not use or like, such as wheat for people who normally cook with rice; or items that they have already (such as the rice transported into a rural district in Peru after an earthquake in 1990; the district had a rice surplus, and so had no need of further supplies).<sup>5</sup>
  - Out-of-date or inessential medicines, which are frequently dumped on disaster-affected communities.
  - Faulty equipment such as the motor boats minus propellers for the outboard motors that arrived in Madagascar after Cyclone Geralda in 1994.<sup>6</sup>
2. Items that are needed but are brought in from far away when they are readily available locally (such as blankets, tents, cooking utensils and foodstuffs). Off-the-shelf prefabricated emergency shelters, designed by foreigners with little or no understanding of the diversity of local conventions and needs, have been heavily criticised since the 1970s, but still appear on occasion.<sup>7</sup>

Wherever possible, supplies and stockpiles of relief materials should be bought locally. They will be relatively cheap and appropriate. Local purchases also stimulate the local economy, but large-scale purchases of foodstuffs or other items in local markets for stockpiling are likely to push up prices, which may harm poor households.

All of these problems can be overcome, but this needs careful logistical planning and management, for which systems should be set up well in advance. New information technology has helped considerably here, and a great deal of work has been done to develop robust supply management systems (see Case Study 16.3). However, the capacity to use such systems needs to be built up through acquisition of technical resources and training.

## Human resources

A standard component of most community-level preparedness programmes is the establishment of a cadre of volunteers. The effectiveness of such teams depends on the number of volunteers, how widely they are distributed across an area at risk, the level of skills and commitment they possess, and the extent of equipment and material resources at their disposal.

The number of volunteers will have to be built up over time, and developing their skills will also be a long-term process. Avoid short-term perspectives and over-ambitious targets. However, the task of setting up a single volunteer group, giving basic training and providing equipment, can be carried out within a short period.<sup>8</sup>

Volunteer-based programmes can be effective on both small and large scales. The Bangladesh Red Crescent's Cyclone Preparedness Programme (Case Study 16.5) deploys over 30,000 volunteers across hundreds of kilometres of exposed coastline, supported by an extensive infrastructure of radio warning systems and cyclone shelters. In the Philippines, the community organisation Buklod Tao (Case Study 7.2, page 107), working at village level, has a handful of trained disaster management volunteers, three boats and a few items of basic equipment such as ropes, first aid kits, megaphones and flashlights.

Whatever the scale of the programme, its organisational structure must be robust and lasting. There is an understandable temptation among disaster management agencies to create new structures for disaster preparedness/response, but unless the agency concerned is prepared to remain in the area and offer long-term support these may not be sustainable. In many, if not most, cases it is better to use established community structures as the foundation for disaster preparedness activities, because these will have a solid base of organisational skills, motivation and group solidarity. Many kinds of community structure can form a foundation for disaster preparedness work, including village development committees, peasants' federations, savings and credit groups, slum dwellers' associations and youth clubs.

## Case Study 16.3

### Managing humanitarian supplies

The flood of donations after major disasters causes major logistical and management problems. Much is neither requested nor appropriate. To overcome this, PAHO began developing a computerised supply management system called SUMA in the early 1990s. Initially focusing on health-related supplies, it has since been extended to cover all forms of relief goods.

SUMA identifies and sorts incoming aid, prioritises supplies according to the affected population's needs, indicates the flow of donations and identifies gaps. It can be used for large and small disasters. It is also used in normal times for inventory control of warehouses and health centres. The software, which can be run on most modern PCs, is updated periodically and, with operating manuals, can be downloaded from the Internet. SUMA is also used as an information and reporting system, making aid more transparent and accountable.

In a disaster, teams of trained staff and volunteers from government and other organisations run the system. PAHO has held courses for such teams and developed training materials (available free on the

Internet), and SUMA is included in the curricula of other training institutions. An estimated 2,500 people have been trained around the world. All the national emergency organisations of Central America and the Caribbean have agreed to adopt SUMA methodologies in their official manuals and guidelines.

An independent evaluation of SUMA after two earthquakes in El Salvador in 2001 found that it had registered 16,000 tons of humanitarian assistance sourced from 41 countries via 880 flights or border crossings. Although the system was outpaced by the rapid arrival of assistance in the first 2–3 days, and there was a shortage of trained personnel, SUMA operators recorded an estimated 90% of humanitarian supplies flown into the country, and 60–70% of those brought in overland.

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*The WHO/PAHO Supply Management System* (Washington DC: PAHO, 2001), [www.paho.org/english/ped/suma.pdf](http://www.paho.org/english/ped/suma.pdf); N. A. Nicolás and R. S. Olson, 'Final Report. "SUMA" and the 2001 El Salvador Earthquakes: An Independent External Evaluation', 2001, [www.disaster-info.net/SUMA/pdf/suma\\_els2001.pdf](http://www.disaster-info.net/SUMA/pdf/suma_els2001.pdf). The SUMA website is at: [www.disaster-info.net/SUMA](http://www.disaster-info.net/SUMA).

The capacities of the local structure and its members, including their enthusiasm for the task, are the key criteria in identifying those most suitable for disaster preparedness. Many of the volunteers and organisers will probably come from those already involved in community work. Selection of team members should always involve consultation with the community and can be left to local groups in many instances. However, it is important not to overload groups and individuals with new responsibilities, and in most cases additional volunteers and organisers will have to be found.

Training of professionals and volunteers is essential. Refresher courses are also essential, although under-resourcing of preparedness means that these happen less frequently than they should. Disaster preparedness manuals emphasise the importance of rehearsals or simulations of disasters. No simulation can fully prepare disaster management teams for a real event, but rehearsals enable them to practise procedures and test their effectiveness. They often reveal weaknesses in the system that can be corrected. Such exercises must be taken seriously.

Case Study 16.4 is an unusual example showing that community-level training and preparedness can bring almost instant benefits, although normally a longer period of training, organisation and mobilisation will be needed to prepare a community for all eventualities.

#### 16.2.4 Protection of assets

Short-term measures to protect household assets will be needed in sudden-onset disasters. The most obvious step is to move them out of harm's way. Communities vulnerable to frequently occurring hazards such as seasonal floods tend to have well-established systems for moving livestock, food, household utensils and other items (see for example Case Study 9.3, page 138). Where this is not possible, possessions can be secured within the home by putting them onto high shelves and platforms, hanging them from the ceiling, or even placing them on the roof.

If the house itself is vulnerable – for example, to the high winds and sea surge of a cyclone – some goods can be made safe by burying them in the ground in tins or pots. This is common practice in parts of Bangladesh, where it is also increasingly common to build mounds of earth that give shelter to animals above floodwater levels.

The need to protect livelihood assets has an influence on poor people's readiness to respond to warnings of disasters (see section 16.3, below).

## Case Study 16.4

### Mobilising a community for disaster response

One of the consequences of the eruption of the Mount Pinatubo volcano in the Philippines in 1991 was that communities in the vicinity faced an increased long-term threat from volcanic debris. The volcano emitted some 6.6 cubic kilometres of volcanic ash that settled on slopes and in river basins. In the following years, rainfall turned this into huge mudflows (lahars) which destroyed agricultural land, bridges, roads and homes over a wide area.

In 1994–95, a local NGO, CONCERN, began a project to train and mobilise people in Manibaug-Libutad, a community of 771 households in one of the areas at greatest risk from lahars. Twenty-five people volunteered for training in capacity and vulnerability analysis, hazard monitoring and mapping, disaster response management (including evacuation), damage and needs assessment, and other aspects of disaster management.

During the two-day training course, the community was able to identify safe places for evacuation, and resources such as people and organisations with cars, trucks and communications facilities. The participants immediately set up a community disaster response organisation, which in turn

established committees for warning, evacuation, health, information and education, and relief and rehabilitation. Each committee recruited and trained volunteers.

Only three days after the initial training was over, rain began in the late afternoon and the warning committee posted men along a nearby lahar-retaining dyke to monitor rising mudflows and stream water. Barely two hours later, the committee gave the order to evacuate when the dyke began to collapse. Volunteers blew whistles and mobilised foot patrols, which went from house to house telling villagers to gather at the designated pick-up points for evacuation, from where they were taken by vehicles to safe areas.

Within another hour, one kilometre of the dyke had collapsed and a lahar was moving through the village, but by this time all the residents had been evacuated. An hour after that, the entire village was covered by the lahar to a depth of up to two metres.

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Z. G. Delica, 'Community Mobilisation for Early Warning in the Philippines', in J Zschau and A. N. Küppers (eds), *Early Warning Systems for Natural Disaster Reduction* (Heidelberg: Springer Verlag, 2003), pp. 37–47.

Protection of household assets is largely a matter for individual households at present. Disaster preparedness and response agencies have not given much thought to it, being concerned with saving lives and relieving human suffering. Some shelters and safe places are designed to take animals and people will often take their most precious possessions to shelters. Community stores have been built to protect grain and seeds against flooding. The idea of providing secure buildings for storing other items is occasionally discussed but has not been tested on any scale.

The assets of the disaster preparedness system itself also need protecting. Control centres, communications systems, warehouses, search and rescue equipment and relief goods are all vulnerable. Agencies need to protect their own buildings, equipment – and files: preserving records of beneficiary groups, resources, methods and experiences is important (just as it is important for local government agencies to preserve land, legal and medical records).

### 16.3 Forecasting and warning

The literature on forecasting and early-warning systems is extensive; this section sets out only a few general principles of good practice, and discusses some of the most important issues in making warnings effective at local level. Much of the literature looks at forecasts rather than warnings, and tends to focus on scientific and technical features. There is some sociological writing on warning systems, but most is based on research in developed countries. Local systems also tend to be less well covered in the literature than national ones.

Looked at simply, the early warning process has three inter-related stages:<sup>9</sup>

1. Evaluation/forecasting (observation and prediction) based on scientific expertise and advanced technologies (e.g. mathematical modelling, remote sensing). A great deal of effort and resources have gone into this stage, resulting in significant advances in accuracy and timeliness in some areas of forecasting, notably tropical cyclone forecasts. This is the scientific and technical dimension of early warning.
2. Warning/dissemination, where forecasts are turned into messages and transmitted by appropriate agencies as recommendations for action. There has been considerable investment in this stage as well. In particular, rapid advances in communications technology have greatly improved the speed with which warnings are transmitted. At this stage, early warning acquires institutional and political characteristics.

3. Response, whereby warnings are turned into actions, such as evacuation. The actors in this process are more numerous and diverse. They include officials at national and local levels, NGOs, communities and individuals. In this third stage, the institutional and political aspects of early warning broaden out, and the early-warning process acquires an essentially social dimension, where the human factors of risk perception and decision-making play a crucial part. It has not received as much investment as the first two stages.

There are three key elements in the success of an early-warning system, at any level:

1. Forecasts must be accurate in predicting the location, time and severity of a hazard event.
2. Warnings must be disseminated in time for populations at risk to make themselves safe.
3. Warnings must be communicated to decision-makers and communities in appropriate ways, based on understanding of their perceptions and needs.

There have been significant advances in both of the first two areas. However, insufficient attention has been paid to the third.

### 16.3.1 General principles

The UN's International Decade for Natural Disaster Reduction in the 1990s highlighted early warning as a topic for analysis and development. International expert groups were convened to look at different aspects of the topic and make recommendations. These were summarised in a set of 'guiding principles' for effective early warning (a) at national and local levels and (b) at international and regional levels. Those relating to national and local levels are reproduced in Box 16.1.

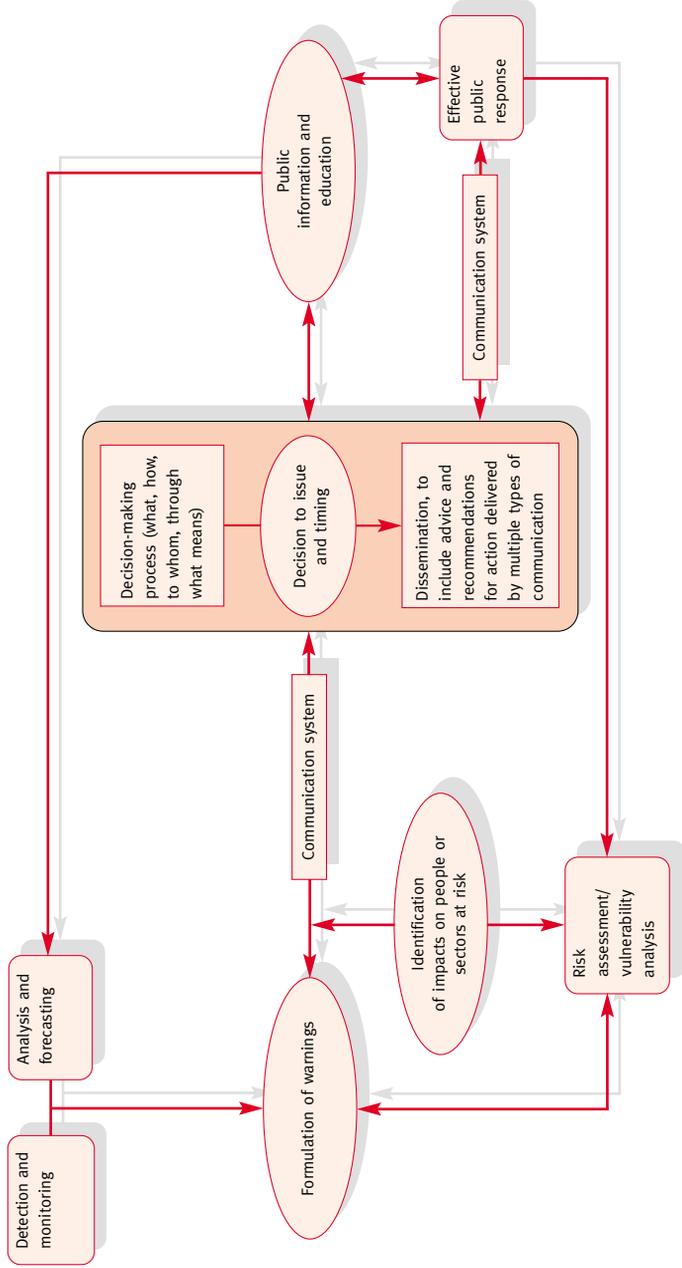
### 16.3.2 Issues in early warning

Warning systems vary greatly in size, structure, management and technological sophistication, according to the extent of their coverage, the nature of the hazard(s) they are warning of and the human and material resources available. But there are many issues common to all systems.

#### Management and resources

Large-scale early-warning systems require considerable resources: people, infrastructure, technology, data and funding. They are also complex to

**Figure 16.1**  
Generic forecasting/warning system



Source: Carmen Schlosser, unpublished

### Box 16.1

## Ten guiding principles for the application of early warning at national and local levels

1. Early warning practices need to be a coherent set of *linked operational responsibilities established at national and local levels of public administration and authority*. To be effective, these early warning systems should themselves be components of a broader program of natural hazard mitigation and vulnerability reduction.
2. Within each country, the *sole responsibility for the issuance of early warnings for natural and similar disasters should rest with an agency, or agencies, designated by the government*.
3. The *decision to act upon receipt of warning information is political in character*. Authoritative decision-makers should be identified and have locally-recognised political responsibility for their decisions. Normally, action resulting from warnings should be based on previously-established disaster management procedures of organisations at national and local level.
4. In the chain of political responsibility, initial hazard information is often technically specialised or specific to a single type of hazard authority. To be applied effectively, *warnings need to be clearly understood and operationally relevant to local agencies* which are more frequently oriented toward non-specific hazard functions.
5. Early-warning systems must be *based upon risk analysis* which includes the assessment of the occurrence of hazards, the nature of their effects and prevailing types of vulnerability, at national and local levels of responsibility. The warning process must *lead to demonstrated practices that can communicate warning and advisory information to vulnerable groups* of people so that they may take appropriate actions to mitigate loss and damage.
6. *Locally predominant hazard types and patterns*, including small-scale or localised hydro-meteorological hazards related to patterns of human economic or environmental exploitation, must be incorporated if early warning is to be *relevant to risk reduction practices*.
7. There is a continuing *need to monitor and forecast changes in vulnerability patterns, particularly at local levels*, such as sudden increases in vulnerability arising from social developments. These may include conditions of rapid

(continued)

**Box 16.1** (continued)

urbanisation, abrupt migration, economic changes, nearby civil conflict or similar elements which alter the social, economic or environmental conditions of an area.

8. The *primary responsibilities must rest at local levels of involvement* for producing detailed information on risks, acting on the basis of warnings, communicating warnings to those individuals at risk and, ultimately, for facilitating appropriate community actions to prevent loss and damage. A high resolution of local knowledge and developed experiences of local risks, decision-making procedures, definitive authorities concerned, means of public communication and established coping strategies are essential for functions to be relevant.
9. Groups of people that exhibit different types of vulnerability will have different perceptions of risk and various coping strategies. *Locally appropriate warning systems will provide a range of communication methods and should provoke multiple strategies* for protection and risk reduction.
10. To be sustainable, all aspects of the design and implementation of early-warning systems require the substantive involvement of *stakeholders* at the local and national levels. This includes production and verification of information about perceived risks, agreement on the decision-making processes involved, and standard operational protocols. Equally important abilities involve the selection of appropriate communication media and dissemination strategies which can assure an effective level of participation in acting upon receipt of warning information.

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*IDNDR Early Warning Programme: Reports on Early Warning* (Geneva: UN International Decade for Natural Disaster Reduction, 1999), pp. ii–iv.

manage. They have to integrate multiple actors and different levels (international, regional, national, local), and must be linked not only to disaster preparedness but also to wider mitigation programmes. It is relatively easy to design a system on paper, but its implementation can take many years, depending on the scale, and should always be undergoing review and refinement.

## Case Study 16.5

### The Bangladesh Cyclone Preparedness Programme

Following the 1970 cyclone, which killed 500,000 people, the government and the Bangladesh Red Crescent Society began working together to improve coastal warnings and evacuation. The Cyclone Preparedness Programme currently covers 11 districts containing 3,500 villages. Its activities include issuing warnings, building and operating shelters (there are 1,350 along the coast, some built by other agencies), assisting with evacuation, search and rescue, first aid, relief and rehabilitation, and building up community preparedness capacity.

The backbone of the project is a cadre of 32,000 village volunteers, men and women, organised into local teams of 12. They are equipped with radios to monitor weather bulletins, megaphones and hand-operated sirens, first aid kits, rescue equipment and protective clothing. They are not paid, but receive travel costs and daily allowances for attending training sessions.

In the periods between cyclones, volunteers are trained by permanent Red Crescent staff. They receive a three-day basic training in cyclone preparedness, with refresher courses every five years. Specialist training in

subjects such as radio use, first aid and leadership is provided separately.

The volunteers organise regular rehearsals and demonstrations in villages: the project aims to hold at least 260 mass community awareness demonstrations each year. Plays have been written for the programme to disseminate information about storing emergency rations, safe shelter and basic hygiene. More than 200,000 people have seen these. Folk songs, wall paintings, video shows and posters are among the other methods used to raise awareness.

The village volunteer groups are linked to each other and to Red Crescent offices at field and higher levels through a network of radio stations. This network is maintained throughout the year, and runs 24 hours a day during a warning or emergency period.

The system is costly and requires ongoing funding from the government and the international Red Cross/Red Crescent movement. Extending its coverage and improving its operational effectiveness are continuing challenges. However, it is widely acknowledged to be highly effective. Hundreds of thousands of

**Case Study 16.5** (continued)

IVS Bangladesh

A page from a community training manual, showing actions to take in preparing for a cyclone

people can now routinely be evacuated from the path of cyclones. In May 1994, three quarters of a million people were safely evacuated; only 127 died.

A review in 2000 found that, as a result of the programme, 'Cyclone warning and the response to it have become part of people's daily lives.'

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*Cyclone Preparedness Programme* (London: British Red Cross Society, NGO Initiatives in Risk Reduction, Case Study 4, 2000), [www.redcross.org.uk/riskreduction](http://www.redcross.org.uk/riskreduction); M. H. Akhand, 'Disaster Management and Cyclone Warning System in Bangladesh', in J. Zschau and A. N. Küppers (eds), *Early Warning Systems for Natural Disaster Reduction* (Heidelberg: Springer Verlag, 2003), pp. 49–64.

It is certainly not the case that only rich societies can have effective forecasting and warning systems: one of the most notable successes in recent years is the Cyclone Preparedness Programme in Bangladesh (Case Study 16.5).

Well-integrated systems like the cyclone preparedness programme in Bangladesh cover a wide geographical area and reach down to community level. It is not clear how common this is. Centralised forecasting and warning systems tend to achieve broad geographical coverage, but can 'fade out' as they get closer to vulnerable communities.

In most systems, the bulk of effort and expense is put into transmitting detailed, clearly presented information to decision-makers and government emergency management services. Far less effort and funding go into disseminating this information right down to individual communities or households through accessible messages that will warn them and help them to make sensible decisions about how to respond. In Delhi, for example, a sophisticated forecasting and warning system for floods in the Yamuna River was found to break down at the point of informing poor people living in slums in the riverbed. A cryptic one-line statement ('the water level is expected to rise, make your own arrangements') was all these communities received to warn of floods in September 1995, delivered by local policemen touring the settlement.<sup>10</sup>

### Local and community-based systems

There is a role for small-scale early-warning systems. These can be based on local capacities and technologies to a greater extent than larger systems. They can deal with the local incidence of hazards, which larger systems cannot usually manage. Communities can be more closely involved in running them – and are more likely to respond to their warnings.

The effectiveness of such systems is particularly evident in community-based monitoring of drought/famine (see Chapter 15.4, page 274), but they can also be effective with other hazards, notably flood warnings (see Case Study 16.6). Local warning systems can sometimes be free-standing, but for comprehensive, integrated outreach it is better if they form 'sub-systems' of larger-scale programmes.

Technological sophistication is not necessarily a barrier to small-scale warning systems or community involvement. In Jamaica, volunteer rainfall gauge readers in the upper watershed of the Cave River respond to heavy rainfall and general alerts by the National Meteorological Services by monitoring the amount and duration of the rainfall. They transmit information down to the village of Aenon Town, which the river also runs through, using citizen band radio. The radio operator at Aenon Town interprets the data and, using a prediction table, estimates how long it will be until the river floods there and how high the floodwaters will be. A complex computer-based flood forecasting model developed by scientists was used to draw up the prediction table, but the local radio operator only has to use the table itself and does not have to make any other calculations. When the estimated time to flooding gets down to three hours, an emergency operations centre is activated.<sup>11</sup>

## Case Study 16.6

### A community-operated early-warning system

The Coyolate River Basin covers 900 square kilometres of highlands and coastal plains in Guatemala. It is subject to recurrent floods. In 1997, the government established a community-operated disaster management programme with funding from the Swedish International Development Agency (SIDA).

Local emergency committees and volunteers were trained in hazard mapping and elements of emergency planning and response, including early warning. A technologically simple early-warning system was established, at about a quarter of the cost of conventional automated (telemetric) systems which use more sophisticated instruments. Community volunteers use plastic rain gauges to monitor rainfall, and simple electronic instrumentation to measure river levels, feeding information to a local forecasting centre via solar-powered radios. The centre, which is staffed by members of the local emergency committee,

can forecast floods two to three hours in advance and begin emergency preparations if required.

Hurricane Mitch in October 1998 was the system's first test. While almost 300 people died in Mitch-induced floods on other rivers in Guatemala, no lives were lost along the Coyolate River system thanks to successful evacuation. In its first five years, the early-warning system benefited over 5,000 people in about 100 communities.

The project's success has led to similar systems being developed elsewhere in Guatemala and Central America. There are believed to be more than 20 community-operated early-warning systems in watersheds in the region, most of which have been set up since Mitch.

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*World Disasters Report 2002: Focus on Reducing Risk* (Geneva: International Federation of Red Cross and Red Crescent Societies, 2002), pp. 52–53.

In any case, vulnerable communities will probably monitor impending events themselves. Communities living close to flood-prone rivers often have people watching water levels at times of severe or prolonged rainfall, and simple gauges – e.g. marks on a tree or a bridge – are used to measure this.

## Influences on official response

Institutional response to forecasts and warnings of impending disasters is influenced by external factors – political, attitudinal, legal, economic, logistical, ideological and institutional – that are unrelated to the scientific data (for a discussion of this in famine/food security early-warning systems, see Chapter 15.4, page 274).

Where events are seasonal or frequent, such as cyclones or monsoon floods, institutions are relatively familiar with them and it is easier to develop and run effective warning systems. But in the case of infrequent events, officials may not understand the hazard, and establishing a warning system is less likely to have been a political priority.

Volcanic eruptions are a prime example. Many potentially dangerous volcanoes have not erupted in living memory, there is still a lot of scientific uncertainty when it comes to predicting the timing of individual eruptions, and as complex natural phenomena volcanoes are not easily explained to non-scientists – yet scientists still need to explain matters to decision-makers, the media and the public.<sup>12</sup> Successful evacuations, such as that of 60,000 people ahead of the eruption of Mount Pinatubo in 1991, owe their success to the effort and ingenuity that went into communicating with non-specialists (see Chapter 11.3.5).

Case Study 16.7 outlines a famous, tragic example of political and institutional weaknesses contributing to a disaster that could have been avoided.

## Influences on community response

As previous chapters have shown, people at risk do make rational choices about protecting themselves from disaster.<sup>13</sup> Within communities, there are many different perspectives of risk which vary according to socio-economic differences in wealth, social standing, level of education, age, religion, ethnic group and gender. Personal and collective experience plays a significant part here. Risk perceptions are likely to vary considerably between different communities, and even within the same community. This diversity presents a particular challenge to those who have to transmit early-warning messages over wide areas.

One of the principal socio-economic factors affecting response to disaster warnings in many developing countries is, surely, the vital need to protect assets and maintain livelihoods. The poorer and more marginalised a house-

## Case Study 16.7

### Early-warning failure

Shortly after 9pm on the evening of 13 November 1985, the Nevado del Ruiz volcano in Colombia erupted. It threw out clouds of hot ash that scoured and melted part of the summit's snow and ice cap, sending torrents of meltwater, slush, ice and volcanic debris down the slopes, where they picked up water, vegetation and other debris to form lahars that raced along the valleys of streams and rivers normally fed by the volcano's melting snow and ice. Shortly before midnight, the lahars reached the town of Armero: more than 21,000 people were killed.

The eruption was not a surprise. The volcano had been noticeably active for about a year. Early in 1985, government scientists and civil defence authorities were alerted. The Civil Defence prepared a disaster plan, but this was done without an up-to-date hazard/risk map. This was the responsibility of the government geology and mines bureau, INGEOMINAS, but it showed little sense of urgency when it came to mapping or monitoring the volcano and in any case did not have sufficient expertise. Equipment and experts had to be brought in from other countries to help monitor seismic activity, but the monitoring system was not in place until the end of August, and

even then there were two parallel monitoring sets in operation, one run by INGEOMINAS and the other by an officially sanctioned local Volcanic Risk Committee that had been set up by local government, universities and businesses. Central government officials were offered more expert volcanologists, equipment, training and information by UNESCO, but did not act on the offer for nearly two months.

Nevado del Ruiz increased its volcanic activity markedly in September, and this speeded up preparedness activity. The Volcanic Risk Committee issued a public warning of serious risk of an eruption and avalanches of rock and ice. A national-level emergency committee was formed, the Civil Defence developed its emergency management plan and the Colombian Red Cross assumed responsibilities for emergency communication and disaster response. The Civil Defence was active in identifying populations at most risk along the river systems fed by the volcano, initiating awareness programmes in schools, improving radio communications facilities and providing other emergency equipment, and meeting national and local officials. Provincial emergency committees contacted villages to

*(continued)*

### Case Study 16.7 (continued)

highlight the need for preparedness and encourage the development of local evacuation plans.

Yet the disaster management arrangements remained incomplete. A preliminary hazard map was presented in early October, showing that extensive areas were threatened and some towns would need to evacuate rapidly; but only ten copies were made and distributed. The four provinces likely to be affected were developing separate plans, with little coordination. The seismic monitoring programme was still inadequate and data were not being shared fully. It was felt that national government was hesitant about action, and some government officials in the capital criticised the hazard map as being too alarming. In an attempt to calm the population, a national newspaper stated that the volcano was not dangerous, as did the Director of the Geophysical Institute of the Andes. The Chamber of Commerce in Manizales, a large town near the volcano, expressed concern that irresponsible reporting would cause economic losses. An archbishop criticised the media for spreading 'volcanic terrorism'. The Mayor of Armero stated that many people were confused by the information they received: they did not know whether to stay or leave.

Improvements to the scientific monitoring system and public presentation of a revised hazard map were delayed by a national political crisis early in November, when guerrillas took over the Palace of Justice in Bogota and the government sent in troops to recapture it. When Nevado del Ruiz began to erupt in mid-afternoon on 13 November, regional and local emergency structures were alerted but no immediate decision to evacuate was made, although it was known that the lahar flows might be rapid, leaving little time to escape: the people of Armero would have at most two hours' warning to evacuate to higher ground. In Armero, residents were reassured by a local radio station and the church public address system that there was no immediate danger.

After a new and more serious phase of the eruption began at 9pm, the Governor of Caldas Province called local radio stations to issue red alerts to communities living along the rivers. Officials in the capital of Tolima Province attempted to order the evacuation of Armero from 9.45, but there were power and communications difficulties owing to a torrential rainstorm filled with volcanic ash. Shortly afterwards, the lahar broke through a natural dam

*(continued)*

**Case Study 16.7** (continued)

created by a landslide 12km upstream. The dam had been holding back 250,000 cubic metres of water, which were now released in a 40-metre-high wave. The Mayor of Armero had stated his concern about the dam on 17 September and government geologists had recommended draining it, but the work had not begun.

Survivors' accounts suggest that there was no official, systematic order to evacuate, although in some cases representatives of relevant

agencies took action as individuals. Many people were reluctant to move having heard the earlier reassurances from the local priest and radio station. Even the Mayor and his family remained. In Armero, most people fled, on foot and in the darkness, only after hearing the first flood waves hit the town.

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B. Voight, 'The 1985 Nevado del Ruiz Volcano Catastrophe: Anatomy and Retrospection', *Journal of Volcanology and Geothermal Research*, vol. 44, 1990, pp. 349–86.

hold is, the more important it becomes to hold on to assets and property (such as livestock and household goods) and income (for a day labourer, every day's wages are vital in feeding the family or paying off debts to money-lenders). A household may perceive the risk of evacuation, in terms of losing control of its assets and resources, as more devastating than the risk of the hazard, especially where warnings are frequent but do not necessarily lead to disaster.

There are many indications that poor people delay evacuation because of this, often with fatal consequences. It is believed, for example, that many of the 700 people who died in Mozambique in the 2000 floods were family members left behind to tend cattle and goats.<sup>14</sup> Anecdotal evidence suggests that Bangladeshis respond to flood and cyclone warnings more readily when they know that there is a place of safety for their livestock. The remark of a woman inhabitant of a *char* island on the Jamuna River in Bangladesh is revealing: 'During the '88 floods I remained alone here. Someone obviously had to look after the farm'.<sup>15</sup>

Gaining a better understanding of the contextual factors and constraints that generate people's diverse perceptions of risk and hence their diverse

responses to warnings should enable early-warning systems to be more effective. However, warning specialists are often not well-equipped to understand how communities perceive and react to hazards and risks. There are several reasons for this.

The first is that specialists and communities look at a potential disaster from different starting points. Early-warning systems start centrally, at international and national levels, and then move outwards and downwards through the administrative system towards districts, sub-districts and villages or neighbourhoods. In this perspective, individual villages or neighbourhoods are on the periphery. But for the individual at risk, their home and immediate locality are at the centre of the picture. This means that factors that are of primary importance to the villager or householder at risk are likely to be invisible to system managers, who work on a much larger scale. Conversely, the manager's national or regional perspective appears irrelevant to the individual at risk.

The second reason is that the two groups measure and describe risk in quite different ways. Technical specialists draw upon scientific and engineering methods of analysis to quantify risk, principally in mathematical terms of probability. This esoteric language is not understood outside the scientific community. It may not even be understood by officials and NGO staff responsible for disaster preparedness and response. It is not easy to translate such mathematical calculations into everyday language (such as 'high', 'medium' or 'low' risk) for operational use; indeed, this may only add to the confusion. Disaster victims and potential victims measure and describe risk in more varied, qualitative terms.

A third reason is the assumption among some disaster professionals that they alone understand and assess risk objectively (i.e. scientifically), whereas the disaster victims' understanding and assessment is merely subjective, even irrational, perception. There are a number of problems with this attitude. One is methodological: it is not possible to maintain a clear distinction between 'objective statistical' and 'subjective perceived' risk because 'objective' risk estimation itself involves value judgements, such as the definition of hazard events and the time/space sampling frame chosen for the events. Second, such a perspective undervalues the knowledge of those who actually experience hazards on the ground. It also overlooks the social and economic forces that make some people more vulnerable to natural hazards than others.

A better understanding of such matters will require different approaches to communicating with communities at risk based on dialogue with communities and community participation (see Chapter 11.2). Participatory methods

## Case Study 16.8

### Communicating community response

Simulation exercises can enable communities to explain themselves fully and clearly on their own terms, without mediation. In one such exercise, in the Philippines in 1996, villagers re-enacted what they had done before and during a major cyclone, Typhoon Ruping.

Villagers were divided into three groups with, as far as possible, a similar social and occupational mix. Each group was given one hour to discuss a different stage of the typhoon (before, during and after) and prepare its presentation, which took the form of a short drama

involving all group members, followed by a more detailed explanation by the groups' rapporteurs.

The simulation provided valuable insights into how the villagers had learnt about the impending typhoon, their actions to protect property and assets, and their evacuation plans. It also revealed the impact of the typhoon on different groups in the community.

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R. Bellers, 'Simulation Exercise Notes: Igbalangao's Experience of a Typhoon', mimeo (Oxford: Oxford Centre for Disaster Studies, 1996).

have considerable potential in helping outsiders to understand local contexts and actions in response to warnings (see Case Study 16.8).

Many communities draw on their own indicators of impending hazard when deciding how to respond to warnings. A survey on the offshore islands of Bangladesh has identified a wide range of local indicators of impending cyclones based on observation of weather patterns, action of the sea and rivers, and animal behaviour.<sup>16</sup> In the 1970s, China claimed success in predicting earthquakes by mobilising the masses to watch for signs in nature, such as chickens roosting in trees, fish leaping out of the water, horses refusing to enter stalls, dogs howling and other animals acting nervously. The Chinese believe that the bat is the animal most sensitive to approaching tremors; for the Japanese, it is the pheasant. Well water is also thought to rise before an earthquake.<sup>17</sup>

Indigenous knowledge of this kind has been shown to be reliable on occasion – as in the case of methods used by villagers along the Jamuna River in

Bangladesh to plot and predict flooding and erosion.<sup>18</sup> But in general there has been little attempt to validate indigenous forecasting scientifically. More work should be done in this area. It would help to dispel potentially dangerous errors in understanding, but it might also enable warning systems to incorporate reliable indigenous indicators, with a potentially higher chance of community response. Famine early-warning systems certainly benefit from community participation, as local people are sensitive to socio-economic as well as agricultural indicators of food insecurity.

### Information command and control

Emergency planning manuals highlight the importance of officially validated forecasting and warning information issued from a central point. Experts are often concerned about the growing diversity of unofficial sources of information, especially radio, satellite and cable television stations and the Internet. Information from multiple sources, with varying degrees of reliability, is generally reckoned to be dangerous, leading to incorrect responses or even panic.

There is some justification for this. In Nepal in 1997, statements were made in the media and by politicians about the risk that the natural dam holding back the Tsho Rolpa glacial lake could burst during the imminent monsoon season, causing a sudden, massive and highly destructive flood that would hit some 4,000 people in the river valleys below. Alarm spread quickly among government officials, NGOs and communities. Officials advised thousands of people to evacuate, prices shot up and down in local markets, traders and large numbers of villagers moved to higher ground, and flights to the local airport were suspended. There was general confusion, but it was not in response to an official warning, because none was issued. There was not even an early-warning system in place on the lake at the beginning of the alarm. Scientific studies of the lake and the potential threat were carried out, but the response of officials, NGOs and communities alike was triggered by media stories and politicians' public statements. The media and politicians were not technical experts, but jumped to their own conclusions from the scientific data. There was no flood.<sup>19</sup>

But in the modern age command and control of information is unrealistic. The public are increasingly *consumers* of information from different sources, choosing what information to use and where to obtain it (see Chapter 11.3.4, page 177).

It will be extremely difficult to strike a balance between the need for warning systems that disseminate authoritative information and the public's desire to make its own choices. Disaster managers will have to acquire extensive skills

in media management, but the central issue is arguably one of public trust in disaster professionals. It has been suggested that one of the reasons for the Cuban authorities' success in evacuating 700,000 people from the path of Hurricane Michelle in November 2001 was the population's trust in officials and in their warnings. There were many other reasons – the warning and evacuation appear to have been models of good planning and implementation – but their effect would have been weakened without a sufficiently high level of public trust.<sup>20</sup>

## Science and technology

Recent decades have seen rapid advances in the scientific understanding of natural hazards and in the development of technologies to monitor them. This has greatly enhanced scientists' ability to forecast the location, timing and severity of many events.

All forecasting and warning systems, other than a few free-standing local ones, rely at some point on such scientific knowledge, but scientists' capacity to predict varies with the hazard studied. For example, in the case of geological hazards (earthquakes, volcanic eruptions, landslides, tsunamis), it is possible to identify where events may take place, but very difficult to indicate when. Short-term predictions or forecasts (over days and hours) are generally much more successful in the cases of landslides, volcanoes and tsunamis than they are for earthquakes. Meteorologists have become very skilled at making short-term forecasts of hurricanes, predicting their timing and movement, and their seasonal forecasting is also becoming more reliable. Scientists' improved understanding of the El Niño phenomenon over the past 20 years has made their predictions of its timing relatively accurate.

The scientific and technical resource base is the result of many years of investment throughout the world. Knowledge is widely shared among the various scientific communities. Data from technical devices (such as remote-sensing satellites and buoys monitoring sea-surface temperatures) are routinely transmitted to forecasters and disaster planners through established global networks. The World Meteorological Organization, for example, has played a significant role in coordinating monitoring and forecasting of hydro-meteorological hazards.

## Evacuation and shelter

In most cases, evacuation will be the primary response to warnings. Creation of escape routes and shelters is therefore essential.

## Case Study 16.9

### No escape route

In January 1981, 104 people were killed by floods in the small town of Laingsburg in South Africa. The lack of a flood warning system was a major factor in the disaster. The town is in a floodplain and there had been heavy rainfall.

The highest loss of life was due to residents staying in their houses, close to the river, until the depth and speed of the flood waters prevented them from leaving. Sixteen people were killed on the road bridge across the Buffels River. When the river overflowed its banks and spread into the town, vehicles approaching from

the direction of Cape Town could go no further and traffic built up on the bridge. Unaware of the danger they were facing, drivers, passengers and onlookers remained on the bridge. The river continued to rise and crossed the road on the other side of the bridge, cutting off their escape route. The flood then covered the bridge itself.

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W. J. R. Alexander, 'Early Warning Systems for the Detection and Response to Severe Floods', in J. Zschau and A. N. Küppers (eds), *Early Warning Systems for Natural Disaster Reduction* (Heidelberg: Springer Verlag, 2003), pp. 311–16.

People at risk need to know which routes are safe to use for escape and where to go in case of a hazard event. They must be confident that the escape routes will not be blocked by those fleeing the disaster, or be cut off by the hazard itself (e.g. by flood waters). Where routes are cut off people should be aware of alternative routes. Many lives are lost in disasters because people remain in their homes for too long, until they cannot escape, or because places they believed to be safe were not (see Case Study 16.9).

Particular attention should be given to helping vulnerable people to escape. Older people, the disabled, and pregnant women or women with young children cannot move very quickly and easily. They may need assistance, as in the example from India cited in Chapter 6.3.1 (page 89), in which young people helped their elders to safety before a cyclone struck.

People must also have confidence that emergency shelters are in safe locations and can withstand the hazards concerned. In some places, women have been particularly reluctant to go to shelters, because of the lack of privacy or

fear of abuse there. Many specially-constructed disaster shelters are used during normal times as community buildings, such as meeting halls, schools and stores. There is concern that local elites may use such facilities for their own purposes, and may deny access to others at times of crisis. Certainly, there is plenty of anecdotal evidence of this. It is also not unknown for local elites to influence the siting of shelters. It is unclear how widespread this is and how best to prevent it. More systematic study of how shelters are managed during and between disasters would be helpful.

Shelters do not always need to be specially constructed, since existing community buildings such as schools, churches, temples and mosques may be adequate. Planning should include compiling inventories of such facilities and strengthening or protecting them where necessary.

## 16.4 Chapter summary

- Disaster preparedness comprises several elements: forecasting and warning, taking precautionary measures and organising effective rescue and relief. Establishing a disaster preparedness system involves addressing a range of technical and institutional issues.
- Good disaster preparedness planning is crucial to success. Plans should be based on thorough and realistic analysis, should ensure coordination by all groups concerned and should be 'owned' by them.
- Above all, planning should be seen as a continuing process of improvement, not merely as the production of a plan.
- When disaster strikes, a variety of material and human resources will be needed. These should be built up (e.g. through stockpiling and training) well in advance.
- Relief materials should be genuinely appropriate to local needs, cultures and practices, and should be bought locally wherever possible.
- Volunteer-based programmes can be effective on both small and large scales. They should be based on existing community institutions, if possible. Thorough training and refresher courses are essential.
- Protection of livelihood assets is seen largely as a matter for individual households at present, but it deserves more attention.
- Disaster preparedness systems themselves need protecting.
- There have been great advances in hazard forecasting in recent years, but insufficient attention has been paid to communicating warnings to decision-makers and communities in appropriate ways.
- Small-scale, community-based warning systems can be very effective.
- The need to protect livelihood assets is a powerful influence on the way poor people respond to disaster warnings, but this is poorly understood

by most disaster managers. More dialogue with communities about their priorities and perceptions of risk is needed.

## Notes

- 1 See R. Kent, *Disaster Preparedness* (New York/Geneva: UNDP/DHA Disaster Training Programme, 1994), [http://undmtp.org/english/disaster\\_preparedness/disaster\\_preparedness.pdf](http://undmtp.org/english/disaster_preparedness/disaster_preparedness.pdf); E. L. Quarantelli, *Major Criteria for Judging Disaster Planning and Managing and Their Applicability in Developing Societies* (Newark, DE: University of Delaware Disaster Research Center (Preliminary Paper 268), 1998), [www.udel.edu/DRC/preliminary/268.pdf](http://www.udel.edu/DRC/preliminary/268.pdf); D. Alexander, *Principles of Emergency Planning and Management* (Harpندن: Terra Publishing, 2002).
- 2 Examples of the structure and content of typical disaster plans are given in Kent, *Disaster Preparedness*, p. 15; Alexander, *Principles of Emergency Planning and Management*, pp. 96–97.
- 3 Kent, *Disaster Preparedness*, p. 14.
- 4 On emergency management training, see Alexander, *Principles of Emergency Planning and Management*, pp. 287–300; A. von Kotze and A. Holloway, *Reducing Risk: Participatory Learning Activities for Disaster Mitigation in Southern Africa*, International Federation of Red Cross and Red Crescent Societies/Oxfam/University of Natal, 1996, pp. 187–232.
- 5 T. Schilderman, 'Disasters and Development: A Case Study from Peru', *Journal of International Development*, vol. 5, no. 4, 1993, pp. 415–23.
- 6 R. Vonk, 'Emergency Preparedness in Cyclone Prone Areas in Madagascar', in J. Scobie (ed) *Mitigating the Millennium: Community participation and impact measurement in disaster preparedness and mitigation programmes* (Rugby: ITDG, 1997), p. 54.
- 7 I. Davis, *Shelter after Disaster* (Oxford: Oxford Polytechnic Press, 1978).
- 8 For example, A. Heijmans and L. P. Victoria, *Citizenry-Based & Development-Oriented Disaster Response: Experiences and Practices in Disaster Management of the Citizens' Disaster Response Network in the Philippines* (Quezon City: Center for Disaster Preparedness, 2001), pp. 45–80.
- 9 K. Smith, *Environmental Hazards. Assessing Risk and Reducing Disaster* (London: Routledge, 1996), pp. 110–12.
- 10 A. Sharma, 'Early Warning: Community Interpretations and Perceptions – A Case of Recurrent Floods and their Warnings in Delhi (India)', in J. Zschau and A. N. Küppers (eds), *Early Warning Systems for Natural Disaster Reduction* (Heidelberg: Springer Verlag, 2003), pp. 77–80.
- 11 B. E. Carby, 'Transferring Flood Warning Technology to Vulnerable Communities in Jamaica', in *ibid.*, pp. 811–13.
- 12 For guidance on this, see *Communication During Volcanic Emergencies* (London: Benfield Hazard Research Centre, 2002), [www.benfieldhrc.org/DMU/Carib/Carib.2003.pdf](http://www.benfieldhrc.org/DMU/Carib/Carib.2003.pdf).
- 13 The following paragraphs are based on J. Twigg, 'The Human Factor in Early Warnings: Risk Perception and Appropriate Communications', in Zschau and Küppers, *Early Warning Systems for Natural Disaster Reduction*, pp. 19–26.

- 14 *World Disasters Report 2002: Focus on Reducing Risk* (Geneva: International Federation of Red Cross and Red Crescent Societies, 2002), p. 65.
- 15 H. Schmuck-Widmann, *Living with the Floods: Survival Strategies of Char-Dwellers in Bangladesh* (Berlin: ASA-Programm of the Carl-Duisberg-Gesellschaft, 1996), p. 30.
- 16 P. Howell, *Indigenous Early Warning Indicators of Cyclones: Potential Application in Coastal Bangladesh* (London: Benfield Hazard Research Centre (Disaster Studies Working Paper 6), 2003), [www.benfieldhrc.org/DMU/WorkingPapers/workingpaper6.pdf](http://www.benfieldhrc.org/DMU/WorkingPapers/workingpaper6.pdf).
- 17 A. Wijkman and L. Timberlake, *Natural Disasters: Acts of God or Acts of Man?* (London: Earthscan, 1984), pp. 93–94.
- 18 Schmuck-Widmann, *Living with the Floods*; H. Schmuck-Widmann, *Facing the Jamuna River: Indigenous and Engineering Knowledge in Bangladesh* (Dhaka: Bangladesh Resource Centre for Indigenous Knowledge, 2001).
- 19 D. Gyawali and A. Dixit, 'How Distant Is Nepali Science from Nepali Society? Lessons from the 1997 Tsho Rolpa GLOF Panic', *Water Nepal*, vol. 5, no. 2, 1997, pp. 5–43.
- 20 B. Wisner, 'Lessons from Cuba? Hurricane Michelle, November, 2001', Radix website, 2001, [http://online.northumbria.ac.uk/geography\\_research/radix/resources/lessons-from-cuba.doc](http://online.northumbria.ac.uk/geography_research/radix/resources/lessons-from-cuba.doc).

# Chapter 17

## Risk reduction after disaster

### 17.1 Introduction

This chapter looks at the operational challenges of introducing risk reduction measures during post-disaster work. First, it looks at the broad challenge of integrating relief, recovery and development. Next, it surveys some of the main ways in which mitigation and preparedness are introduced after disasters (though the basic principles of good practice outlined in earlier chapters also apply to post-disaster conditions).

### 17.2 Relief, rehabilitation and development

Underdevelopment and ineffective or inappropriate development programmes increase vulnerability to hazards, and hence lead to more disasters, great and small. In turn, emergencies make subsequent development more difficult for disaster-affected communities that have lost their livelihood assets – and therefore for the institutions that are trying to help them.

There is widespread agreement on the need for closer integration of relief, rehabilitation and development, which implies a longer-term perspective behind post-disaster action. In essence, it means that relief and rehabilitation should contribute to long-term development and the reduction of vulnerability, where they can – they should not simply reconstruct the existing risk. At one time, the phrase ‘relief–development continuum’ was used to refer to this integration. Nowadays, it is usual to speak of ‘developmental relief’, a concept first articulated by the Red Cross in the mid-1990s. This expresses a broad-based and sustainable approach to post-disaster work (see Box 17.1). ActionAid uses the notion of ‘recovery plus’, meaning an intervention ‘whereby people are in some way better off than before the emergency’.<sup>1</sup>

There is plenty of scope for academics to debate the merits or drawbacks of such terms and concepts. Operationally, it is helpful to look for the similarities in their basic principles, which can be summed up as follows:

- intervene at the earliest possible stage in the disaster cycle to protect livelihoods and reduce vulnerability;
- incorporate development principles into disaster relief operations (e.g. build up local capacities, adopt participatory approaches);

**Box 17.1****Nine features of 'developmental relief'**

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| <ol style="list-style-type: none"> <li>1. Participation.</li> <li>2. Accountability.</li> <li>3. Decentralised control.</li> <li>4. Demonstrating concern for sustaining livelihoods.</li> <li>5. Basing strategies on the reality of a disaster.</li> <li>6. Identifying the needs and capacities of diverse disaster survivors.</li> </ol> | <ol style="list-style-type: none"> <li>7. Building on survivors' capacities.</li> <li>8. Building on local institutions.</li> <li>9. Setting sustainable standards for services.</li> </ol> |
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*World Disasters Report 1996* (Oxford: Oxford University Press/IFRC, 1996), pp. 50–51.

- use disaster relief not just to meet immediate needs but also to restore livelihood assets and rebuild livelihoods;
- use disaster relief to develop infrastructure that will be of value after the emergency is over; and
- take the opportunity to induce positive socio-economic change and not merely a return to the status quo.

This shift puts more emphasis on what is normally called rehabilitation. Originally seen as a distinct linking phase between relief and development, it is now seen more as a continuing process that may take place alongside both disaster relief and development, and ideally is integrated with them.

It is clearly unrealistic to expect 'normal' development to resume soon after the crisis period. People affected by disasters are left more vulnerable than they were before. Relief and development programmes need to adjust to take account of this. For example, the Centre for Sustainable Agriculture and Appropriate Technology, which works with peasant farmers in the Dominican Republic, had to redirect much of its efforts away from long-term rural development and towards short-term agricultural rehabilitation for two years after Hurricane Georges in 1998.<sup>2</sup>

Although interest in monitoring and evaluating relief programmes has grown enormously over the past few years, rehabilitation has not been studied as

much. Evidence of the long-term impact of rehabilitation is in particularly short supply. Where this is investigated, it is usually to demonstrate underachievement, as in the *Times of India's* assessment of the Orissa state government's work after the two cyclones in 1999, which found that only 11 out of 100 planned cyclone shelters had been built, only 392 out of 3,779 secondary schools had been rebuilt, and government departments had not spent funds allocated for rehabilitation.<sup>3</sup>

Many post-disaster assistance projects come to an end too soon and too suddenly. Disaster response organisations talk a lot about 'exit strategies', but what an external agency describes as a phase-out may be seen by the affected community as a cop-out, in which the agency concerned walks away rather than seeing the job through to the end. Reflecting on the experiences of Afro-Honduran communities after Hurricane Mitch, a local NGO complained of a disaster training programme established by a major international NGO that 'existed here for a few months, but made no provision for follow up, provided no ongoing funds for replication to expand the number of people trained beyond the initial group, and left no materials or resources for implementation of what people had learned'.<sup>4</sup>

Organisations that are only working in the short to medium terms in a disaster-affected area should plan their withdrawal carefully, recognising that there will be plenty of work left unfinished, and community expectations may not have been fulfilled. Phased withdrawal is preferable to sudden departure. There must be a coherent handover to locally-based organisations and communities. The process should be planned early, it should be transparent and it should be agreed with partners. Relief and rehabilitation agencies bear some of the responsibility for ensuring that activities are sustained, and that local agents have the capacity and resources to manage this.<sup>5</sup>

Some relief and rehabilitation initiatives lead to longer-term risk reduction projects, especially where the same agencies are involved in both relief and development work in the area concerned. It is impossible to say how widespread this is: again, it is probably not common, but it may have become slightly more so since the spate of major natural disasters in the late 1990s.

Relief and post-relief initiatives tend to operate on different scales, with mass coverage being more easily achieved in relief operations. In the Red Sea Province of Sudan during the 1985–86 famine, a major food aid programme supported more than 400,000 people, but a parallel rehabilitation initiative including locust control and improvements to village wells could only reach a few thousand.<sup>6</sup> There is a dilemma for relief agencies in deciding how to

balance the need to give relief to as many people as possible with the need to provide for future emergencies.

The shortage of funds for rehabilitation is another obstacle. Relief funding covers only short-term, often fixed periods (typically six to nine months) and so cannot be used to support many longer-lasting activities that would improve resilience. This makes no sense logically. It results from the distinction between ‘relief’ and ‘development’ in donor budget lines. It leads to effort and resources going into activities that are not sustained, and to strict limitations on activities deemed too ‘developmental’ by relief donors. UK-based international NGOs interviewed in a recent study were frustrated by the inflexibility of donor regulations in this regard.<sup>7</sup> Funding from development budget lines is not a realistic alternative owing to the length of time taken for major funding schemes to reach decisions.

Staff in a development NGO once told the author of problems it had had with a humanitarian aid donor after a hurricane in the Caribbean. With the trees grown by its community forestry project flattened, it sought to make the best of the situation by using the wood to build shelter for people living in shanty towns, who were hurricane victims. The donor approached turned the proposal down because shelters made of wood were considered too permanent to be emergency response – but the donor was prepared to pay for bringing in plywood boards and plastic sheeting from outside the island for emergency shelter.

## 17.3 Approaches to risk reduction after disasters

### 17.3.1 Rebuilding livelihoods

Preservation of livelihoods is vitally important to poor and vulnerable people, and vulnerability is closely linked to livelihood security. After a disaster, earning a living will soon be a priority for the victims. Take, for example, the village of Rampur in Nepal and its farmlands, hit by a landslide in July 1993 that claimed the lives of 18 people and more than 70 animals. The disaster occurred during a peak period for harvesting, mending terraces and planting, and so from the third day after the disaster most villagers divided their time between rehabilitating canals and farmland and managing the chaos in their homes.<sup>8</sup>

In the past, relief agencies often failed to appreciate how important this is. For example, in the case of drought, interventions are often launched only after communities have begun to dispose of essential livelihood assets as the last resort in their coping strategy (see Chapter 15). Research by HelpAge International found a major discrepancy between the perspectives of older

people affected by emergencies and those of aid agencies. The aid agencies did not think that earning income would be a concern for older people, but in fact it was one of their top priorities.<sup>9</sup> Relief efforts also risk undermining local markets and incomes by flooding them with goods (e.g. food aid, shelter materials) or outside labour (e.g. in housing reconstruction programmes). Given that many relief/rehabilitation programmes are characterised by a lack of beneficiary participation in assessment and planning, there is a danger that livelihood support activities will be inappropriate. It is difficult for outside agencies to identify key livelihood issues in the chaotic and stressful conditions after a disaster, but even rapid participatory approaches can give insights into the complexity of livelihoods.

However, disaster response programmes nowadays usually recognise the need for some livelihood support. Relief/rehabilitation aid commonly includes food- or cash-for-work schemes (see below). It is also common to provide seeds and tools for agriculture, livestock, household utensils and shelter materials. The appropriateness of such goods (e.g. are seeds suitable for local conditions and farmers?) is much debated in the literature of humanitarian relief, but the principle of helping livelihoods and not just saving lives is generally accepted.

Interest in financial assistance measures is growing. Cash-based responses to emergencies may have potential in empowering local communities economically.<sup>10</sup> In the field, micro-finance institutions establish emergency loan funds to help their clients replace or repair assets (Chapter 13.2.2, page 222). The Disaster Mitigation Institute's livelihood relief fund finances the purchase of tools, seeds and raw materials for victims of natural hazards and riots in India. The fund has supported 9,500 people since 1998.<sup>11</sup>

Agencies are also looking more creatively at ways of supporting jobs. After the 2000 floods in Mozambique, initiatives by the International Labour Organisation (ILO) included rehabilitation of the central market in Chokwe and construction of three other markets, in order to help small-scale traders resume business and make goods more easily available locally.<sup>12</sup> In India, NGOs have helped artisans to continue to earn money by such measures as organising credit and supplies of raw materials, purchasing their products, and creating temporary exhibitions to help market products.<sup>13</sup>

There are encouraging signs of such livelihood support initiatives making a significant difference to poor people in the months after disasters.<sup>14</sup> However, little is known about their long-term impact. This is a significant gap, since it can take a very long time for livelihoods to recover fully, and in many cases they never do.

## Case Study 17.1

### Rebuilding livelihoods after disaster

After the October 1999 cyclone in the Indian state of Orissa, two Indian NGOs – Voluntary Health Association of India (VHAI) and Orissa Voluntary Health Association (OVHA) – established a community-based disaster management initiative in which livelihood support played a central part.

The initiative supported a wide range of income-generating groups: women's groups involved in dry fish processing, mat-weaving and broom-making; artisans, including bamboo-basket makers, masons, carpenters, blacksmiths, makers of fishing nets, toy makers and weavers; small traders; and women-headed households (through poultry and animal husbandry). It also supplied fertilisers and seeds, renovated wells, ponds, latrines and salt pans, and built water-harvesting structures. Village volunteers were trained in disaster preparedness and health care.

The type of support varied according to the activity. For example,

fishermen were offered equipment under a long-term repayment scheme. Each newly formed cooperative group of five received a boat, net and radio worth Rs16,000 (\$350) and agreed to pay back half of the value within 18 months. Members shared the money received from selling their catch: one group interviewed some months later reckoned each member was earning about Rs150 (\$3) a day on average.

Two women's groups were trained in literacy and small enterprise management, enabling them each to secure a loan of Rs20,000 (\$440) to fund fruit processing: in their first three months of operation, each enterprise earned a profit of over Rs7,000 (\$155).

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J. Keve and P. K. Mohanty, 'From Disaster to Development: How People Can Help Themselves', in T. Palakudiyil and M. Todd (eds), *Facing Up To the Storm. How Local Communities Can Cope with Disaster: Lessons from Orissa and Gujarat* (New Delhi/London: Christian Aid, 2003), pp. 53–61.

Establishing sustainable small enterprises or more secure livelihoods usually takes much longer than the limited timetables of relief programmes. Potentially valuable initiatives may not be followed through. Road repairs by humanitarian agencies in Mozambique after the 2000 floods helped the local

economy as well as the relief effort, but maintenance stopped when the relief phase ended.<sup>15</sup>

Post-disaster conditions are special, and it is not clear how well conventional income-generating activities can work in these circumstances. Moreover, as livelihood strategies vary greatly between and within communities, livelihood-supporting programmes need to be equally varied and based on very thorough knowledge of local conditions. Local NGOs and CBOs are best placed to undertake such work – and because they are locally based, to follow up. Participatory approaches are clearly valuable here for identifying needs, setting priorities and targeting beneficiaries. They may lead to unexpected results, such as a community workshop to design a response to drought in Ethiopia that came out firmly in support of providing food, seed, fertiliser and blankets on credit instead of as hand-outs.<sup>16</sup> More project evaluation and comparative research on such issues would be helpful.

### 17.3.2 Public works

Cash- and food-for-work programmes are a standard device in an emergency, intended to give temporary help to disaster victims and to provide more permanent community facilities for the longer term. By supplying food or creating paid jobs they can prevent livelihood collapse. One of the most famous examples is the 1972–73 drought in Maharashtra, India, where at one point nearly five million labourers were employed on public works by the state. The income they received under the programme enabled them to buy food in the market, and by doing so helped to prevent famine.<sup>17</sup>

Public works activities tend to focus on construction or repair of physical structures such as roads and schools. They are often used to improve resilience to future shocks by building mitigation infrastructure such as irrigation channels, dams and other water harvesting structures, embankments, flood shelters, and measures to stabilise hillsides (terraces, gabions and afforestation). Rehabilitation after the 1998 Bangladesh floods, for example, saw a number of cash-for-work projects building flood shelters of raised earth on common land such as school grounds and market places.<sup>18</sup>

Although food- and cash-for-work initiatives can help to protect livelihoods and reduce risk, success depends on good management. Threats to success include:

- Lack of clarity about objectives. Most schemes aim to provide income and public facilities, but in practice these two aims can be difficult to reconcile. The need to create work quickly may lead to projects of limited value,

## Case Study 17.2

### Cash-for-work and food insecurity

Koisha is a *woreda* (administrative unit) covering 700 square kilometres in southern Ethiopia, with a population of over 150,000. Since the 1970s, a number of factors including plant and animal disease, shortage of adult labour and small farm size, as well as low rainfall, have contributed to food shortages there. The region was badly affected by the 1984 famine, from which it has not recovered. Vulnerable households need food relief every year and almost all households need it in bad seasons.

The development NGO SOS Sahel began working in Koisha in 1991 on an agricultural development programme, but soon realised that chronic seasonal food insecurity made it necessary to develop an integrated strategy of relief and development. This included a cash-for-work project to rehabilitate the main road through Koisha, an earth road built in the 1970s that had deteriorated badly. Road improvement was expected to improve marketing opportunities for local farmers.

A review of the initiative two years after it had begun identified a number of benefits:

- Nearly 700 households took part in the first year of the project (a

good year agriculturally) and over 1,300 in the second year (a bad year). Even so, the project could not provide for many in need. Nor did it make provision for those unable to work (an estimated 15% of families could not participate because they did not have the necessary labour).

- The targeting method used, which involved community participation in selecting beneficiaries, was relatively effective, but support and training are required to make such processes sustainable.
- Most work was carried out during the slack period in the farming season, and in the mornings, allowing the labourers to attend to their farms and other activities.
- Cash-for-work improved food security: nearly half the money earned from the road repair in the first year was spent on food, and it appeared that the increase in money supply did not affect grain prices in local markets. Most labourers would nonetheless have preferred food for several reasons, including fear of losing out when cash was converted into food and the likelihood of creditors becoming more insistent when cash was available.

(continued)

### Case Study 17.2 (continued)

- Over 40km of road through the *woreda* were rehabilitated, leading to increased commercial and relief traffic, a fall of 50% in transport costs and improved access to markets and services.

The review also found that, if such employment schemes are to make a real difference to local food security, they must be longer-term investments, managed as far as possible by communities and directed to public works identified as a priority by communities themselves.

Government and non-government institutions would have to be involved, and shared responsibilities negotiated. A range of projects would be required, together with a high degree of flexibility that would allow initiatives to close down during peak periods of demand for agricultural labour, and to scale up or down during good and bad years.

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P. Jenden, *Cash-for-Work and Food Insecurity in Koisha, Southern Ethiopia* (London: Humanitarian Practice Network, Network Paper 11, 1995).

whereas it takes a long time to set up more substantial, complex initiatives because of the level of technical, managerial and other inputs required.

- Poor targeting that fails to support those most in need or creates divisions within communities by selecting some individuals and not others. There is still some debate about the best methods of selecting beneficiaries.<sup>19</sup>
- Inadequate planning and consultation, leading to effort being wasted on mitigation structures that are not a priority for the community, or will not work.
- Lack of commitment by beneficiaries, usually because they are not participants in the project, but are treated merely as employees. This can result in poor quality of construction. It also makes it less likely that the community will continue to maintain the newly-built facilities once the food or cash payments come to an end.

#### 17.3.3 Changing attitudes: windows of opportunity

Disasters are generally believed to present a 'window of opportunity' for promoting and implementing risk reduction measures, because the consequences of failing to act are so strongly implanted in the minds of those who

are affected by disasters, the operational agencies that have to respond to them, and the public policy-makers who have to manage their effects. This reasonable assumption is well-demonstrated by the number and variety of mitigation initiatives introduced at all levels after major disasters in particular. For example:

- Disasters can be an opportunity to change socio-economic relationships that affect vulnerability (Case Studies 6.3 and 6.4).
- In Mozambique, ActionAid undertook an HIV/AIDS awareness campaign in camps for people displaced by the floods in 2000. The people then dispersed to their home areas, with key contact people in each place with whom the programme could work. Such coverage would not have been possible in normal conditions, where people cannot spare the time to sit together for several hours to discuss such issues.<sup>20</sup>
- In Central America, Hurricane Mitch prompted vigorous debate about vulnerability and how to reduce it, leading to the creation of new pressure groups such as the Foro Permanente de Ciudadanas in El Salvador that sought new laws and policies for disaster prevention.<sup>21</sup>
- Disasters can stimulate renewed thinking about the problem, which is leading to shifts in policy in some organisations.<sup>22</sup>
- In the UK, a series of technological disasters in the 1980s led to the creation in 1991 of Disaster Action, a mutual support group and pressure group for improved disaster management.<sup>23</sup>

Characteristics of the ‘window of opportunity’ are said to include:<sup>24</sup>

- residents and local officials are thinking about the problem of risk, when they do not normally do so;
- the disaster may already have forced some changes (for example by destroying unsafe buildings and infrastructure);
- the community has to make decisions about recovery; and
- technical and expert advice and resources become available from government and non-government sources.

It is hard to tell how long the window will remain open, or what conditions must be met to take advantage of the opportunity. Chances of success at community level may be improved by:<sup>25</sup>

- acting quickly before the fear or enthusiasm for change created by the disaster have lessened;
- basing interventions on familiar technologies and local resources as far as possible;

- concentrating on a small number of important actions, not introducing a whole portfolio of changes that dissipate efforts;
- focusing on what is achievable – communities already hit by a disaster have many urgent problems to attend to, and they will not respond if they believe the proposed mitigation measures are beyond their reach; and
- encouraging, supporting and involving communities as participants in change.

The principles of being realistic and setting priorities apply equally at organisational level, for here too momentum can easily be lost and lessons learned are soon forgotten. A further problem among organisations is that disasters may be caught up and lost in discussion of other development issues that are currently a policy priority for the organisation concerned. This happened in Nicaragua after Hurricane Mitch, when evidence of the disaster's impact was used to support arguments over alternative economic development models more than to debate measures that addressed risk reduction more directly.<sup>26</sup>

The psychological impact of disaster must also be taken into account. Post-traumatic stress can be a significant influence on the way survivors, the bereaved and responders behave after disasters, yet there is scope for discussion about the nature and consequences of such stress.<sup>27</sup> Over-emphasis on negative responses such as post-traumatic stress disorder and unresolved grief can lead to the assumption that people affected by disasters are passive victims, whereas in fact disaster-affected communities are the main actors in disaster response. The reluctance of some practitioners and researchers to take post-traumatic stress disorder seriously may be due in part to the fear that it will reinforce stereotypes of passivity. The experience of disasters can even stimulate survivors and the bereaved to work vigorously for better risk reduction efforts in the long term.<sup>28</sup>

This issue is neglected in relief and rehabilitation work in the South. This may be because psychological recovery is assumed to be 'a community function', not a task for outside agencies.<sup>29</sup> Or it may simply be overlooked.

It has been suggested that severe traumatic events sometimes undermine the individual and collective will to respond. It is conceivable that what aid agencies perceive as dependency syndrome (passivity brought about by the abundance of relief supplies) among disaster victims or lack of community spirit in undertaking post-disaster recovery is – at least in part – an expression of post-traumatic stress disorder. But this is complex and contested territory, and much more investigation is needed.

### Case Study 17.3

## Community strengthening through disaster recovery

In September 1989, Hurricane Hugo struck the small Caribbean island of Montserrat. Only 11 people were killed, but the physical damage was extensive: 98% of homes were damaged and 3,000 people (a quarter of the population) made homeless; 80% of hotel rooms (on which Montserrat's tourist industry depended) were destroyed; all government buildings and schools were damaged, and some destroyed.

Eight months later, an international development NGO (Canadian University Students Organization – CUSO), an intermediary NGO from the eastern Caribbean (Caribbean Conference of Churches – CCC) and a community action group began a rebuilding programme in the poor village of Streatham, where almost all the houses had been severely damaged or destroyed.

The initiative was community-based, using local people in a housing assistance team that held training workshops on rebuilding and structural strengthening techniques, built 22 homes and repaired the severely damaged community centre. The long-term developmental achievements were more significant. The housing team members took

great pride in their work and the importance of the Streatham Community Action Group was enhanced as a result of its involvement in the programme. The participation of local people in volunteer group activities was greater than before the disaster. The action group's coordinator observed: 'We used to have just one or two people show up to help out. Sometimes nobody came. Now we often get ten coming, sometimes 20 who show up to pitch in'.

On this basis, CUSO decided to put additional funding into local development projects: introducing new agricultural production practices and improving water distribution. These had been planned before the hurricane, but over a longer time-scale; they were now brought forward. Two years after Hugo, the community group appeared to have established an economically-viable agricultural production and marketing cooperative.

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P. R. Berke and T. Beatley, *After the Hurricane: Linking Recovery to Sustainable Development in the Caribbean* (Baltimore, MD and London: Johns Hopkins University Press, 1997), pp. 82–116.

### 17.3.4 Safer housing and locations

Every disaster that leaves many people homeless triggers renewed interest in rebuilding homes so that they are 'safe' or 'disaster-resistant'. Shelter relief and reconstruction programmes absorb large amounts of international aid, yet very little is known about their long-term impact in making vulnerable people more secure. It is likely that such programmes have little impact, for the following reasons:<sup>30</sup>

- 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 and introduce new and expensive construction technologies.
- Although reconstruction programmes can provide jobs for local builders, in many cases the builders and their traditional skills are displaced by imported technologies and labour. Communities do not acquire the skills needed to extend, modify and repair the new houses.
- 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.
- The focus is on *houses* (physical structures) rather than *housing* (the arena of social and economic life). Homes are not seen as places of work, learning, communication and relationship-building. Houses are built without regard for how – or if – this will improve social and economic status or reduce vulnerability in its widest sense.
- Lack of community participation. Most reconstruction projects claim that they 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.

In general, participatory approaches, based on local skills and appropriate technologies, offer the best chance of long-lasting success in post- and pre-disaster situations alike.

A common response to the destruction of housing in disasters is to resettle their occupants in safer locations as the best way to defend them against future hazard events. One of the most striking examples of this came after the Maharashtra earthquake of 1993, when the state government moved 28,000 inhabitants of 52 devastated villages to new sites.<sup>31</sup> Governments are probably best placed to undertake resettlement because of the major practical challenges, but NGOs are sometimes involved. Several NGOs' responses

to Hurricane Mitch in Central America in 1998 included relocation of vulnerable communities from the hillsides where their homes had been washed away by the torrential rains.<sup>32</sup>

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. Provision of land can also improve livelihoods where it is used to grow crops or products used in building or craft work: there are instances of this in Central America after Mitch.<sup>33</sup>

However, relocation presents considerable practical challenges, notably the cost of purchasing land and providing infrastructure, and the difficulty of securing legal title. There are examples of planned relocation projects failing because the community could not obtain public land or buy private land.<sup>34</sup> NGOs need to work very closely with local authorities and beneficiaries to resolve these problems. More fundamentally, the policy of resettlement overlooks the economic and other reasons that make people settle in unsafe areas in the first place.<sup>35</sup>

There is sometimes a degree of compulsion in resettlement; even after disasters, people are usually reluctant to move. In Mozambique in 2000, government policy was to move communities away from areas at risk of flooding, even though their economy was based on the fertile farmland of the flood plains. Aid agencies were forbidden to give shelter materials to anyone who was not at a government-approved site, and these were often some distance from people's lands. This led to many farmers living in grass shelters on their old lands, and only returning to their new houses from time to time.<sup>36</sup>

## 17.4 Chapter summary

- Lack of integration between relief, rehabilitation and development hinders a sustained attack on vulnerability.
- Relief and rehabilitation should contribute to vulnerability reduction – they should not simply reconstruct the existing risk. This requires earlier intervention, more emphasis on rebuilding livelihoods and encouraging positive socio-economic change.
- Rehabilitation has not been studied a great deal, and there is little evidence of programmes' long-term impact.

- Many post-disaster assistance projects come to an end too soon and too suddenly (partly due to restrictions imposed by donors). More careful, phased withdrawal is needed.
- Livelihood recovery is a priority for disasters' victims but influxes of relief goods and outside labour can undermine local markets and income-earning opportunities.
- Cash- and food-for-work programmes are a standard device in emergencies, to give temporary help to disaster victims and provide more permanent community facilities (including mitigation structures) in the longer term. These can be very successful, but success depends on good management, clarity about objectives, careful targeting and community participation.
- Disasters can present 'windows of opportunity' for promoting risk reduction because the consequences of failing to act are so strongly implanted in the minds of all involved. But it is hard to tell how long the window will remain open, or what conditions must be met to take advantage of the opportunity.
- The psychological impact of disasters is much debated but must be taken into account in post-disaster recovery.
- Many 'safe housing' programmes after disasters may have little impact because they do not take sufficient account of communities' needs, preferences and capacities. Participatory approaches based on local skills and appropriate technologies offer the best chances of long-lasting success.
- Relocation is often advocated and practised after disasters, but presents considerable practical challenges and overlooks the economic and other reasons that make people live in unsafe conditions in the first place.

## Notes

- 1 *Emergencies Impact Review* (London: ActionAid, 2002), pp. 12–13.
- 2 M. Mowforth, *Storm Warnings: Hurricanes Georges and Mitch and the Lessons for Development* (London: Catholic Institute for International Relations, 2001), pp. 32–35.
- 3 A. Sharma and T. Palakudiyil, 'The Orissa Supercyclone: Lessons from a Calamity', in T. Palakudiyil and M. Todd (eds), *Facing Up To the Storm: How Local Communities Can Cope with Disaster: Lessons from Orissa and Gujarat* (New Delhi/London: Christian Aid, 2003), p. 48.
- 4 Comité de Emergencia Garifuna de Honduras, 'Lessons and Experiences from the Garifuna Coast after Mitch', contribution to the ISDR email conference for Earth Summit 2002, 11 May 2002, <http://earthsummit2002.dyndns.org/pages>.
- 5 S. Packwood, 'Exit Strategy: How To Withdraw Respectably', Aid Workers Exchange website, 2002, [www.aidworkers.net/exchange/20021127.html](http://www.aidworkers.net/exchange/20021127.html).
- 6 P. Walker, 'Famine Relief Amongst Pastoralists in Sudan: A Report of Oxfam's Experience', *Disasters*, vol. 12, no. 3, 1998, pp. 196–202.

- 7 J. Twigg et al., *NGO Natural Disaster Mitigation and Preparedness Projects: A Study of International Development and Relief NGOs Based in the UK* (London: British Red Cross Society, 2000), pp. 103–104.
- 8 N. Dahal, 'Coping with Climatic Disasters in Isolated Hill Communities of Nepal: The Case of Rampur Village in Okhaldunga', in J. Twigg and M. R. Bhatt (eds), *Understanding Vulnerability: South Asian Perspectives* (London: IT Publications/Duryog Nivaran), pp. 47–67.
- 9 *Older People in Disasters and Humanitarian Crises: Guidelines for Best Practice* (London: HelpAge International, 2000), [www.helpage.org/images/pdfs/bpg.pdf](http://www.helpage.org/images/pdfs/bpg.pdf), p.18.
- 10 D. Peppiatt et al., *Cash Transfers in Emergencies: Evaluating Benefits and Assessing Risks*, Network Paper 35 (London: ODI, 2001).
- 11 *Action Learning for Disaster Mitigation: Disaster Mitigation Institute's Annual Report (2002–2003)* (Ahmedabad: Disaster Mitigation Institute, 2003), pp. 26–30.
- 12 'Support to the Job Recovery Process in the Flood Affected Areas in Chokwe: Progress Report March 2001', mimeo (Geneva: ILO InFocus Programme Crisis Response and Reconstruction, 2001).
- 13 L. Tyabji, *Craft in the Aftermath of Disaster: Generating Independence As Well As Incomes* (Ahmedabad: Disaster Mitigation Institute/Duryog Nivaran, 1997); T. Vaux, *Disaster and Vulnerability: SEWA's Response to the Earthquake in Gujarat* (Ahmedabad: Disaster Mitigation Institute/Self-Employed Women's Association, 2002), p. 15.
- 14 For example, Palakudiyil and Todd (eds), *Facing Up To the Storm*.
- 15 *Independent Evaluation of Expenditure of DEC Mozambique Floods Appeal Funds, March 2000–December 2000* (London: DEC, 2001), [www.dec.org.uk](http://www.dec.org.uk), pp. 25–26.
- 16 P. Howell, 'Crop Failure in Dalocha, Ethiopia: A Participatory Emergency Response', *Disasters*, vol. 22, no. 1, 1998, pp. 57–75.
- 17 J. Drèze and A. Sen, *Hunger and Public Action* (Oxford: Clarendon Press, 1989), pp. 129–33.
- 18 *DEC Bangladesh: 1998 Flood Appeal. An Independent Evaluation* (London: DEC, 2000), [www.dec.org.uk](http://www.dec.org.uk), p. 26.
- 19 For example, K. Sharp, *Between Relief and Development: Targeting Food Aid for Disaster Prevention in Ethiopia* (London: Humanitarian Practice Network, Network Paper 27, 1998).
- 20 P. Howell, 'Fighting Poverty: The Humanitarian Connection', unpublished paper (London: ActionAid, 2000).
- 21 Mowforth, *Storm Warnings*, pp. 60–64.
- 22 C. Benson et al., 'NGO Initiatives in Risk Reduction: An Overview', *Disasters*, vol. 25, no. 3, pp. 199–215.
- 23 A. Eyre, 'More than PTSD: Proactive Responses among Disaster Survivors', *The Australasian Journal of Disaster and Trauma Studies*, 1998-2, [www.massey.ac.nz/~trauma/issues/1998-2/eyre.htm](http://www.massey.ac.nz/~trauma/issues/1998-2/eyre.htm).
- 24 *Holistic Disaster Recovery: Ideas for Building Local Sustainability after a Natural Disaster* (Boulder, CO: University of Colorado Natural Hazards Research and Applications Information Center, 2001), [www.colorado.edu/hazards/holistic\\_recovery](http://www.colorado.edu/hazards/holistic_recovery), pp. 1–7.
- 25 R. S. Parker, 'Single-Family Housing: The Window of Opportunity for Mitigation Following Natural Disaster', in A. Kreimer and M. Arnold (eds), *Managing Disaster Risk in Emerging Economies* (Washington DC: World Bank, 2000), pp. 80–84.

- 26 J. L. Rocha and I. Christoplos, 'Disaster Mitigation and Preparedness on the Nicaraguan Post-Mitch Agenda', *Disasters*, vol. 25, no. 3, 2001, pp. 240–250.
- 27 See, for example, K. J. Tierney, *Controversy and Consensus in Disaster Mental Health Research* (Newark, DE: University of Delaware Disaster Research Center (Preliminary Paper 305), 2000), [www.udel.edu/DRC/preliminary/pp305.pdf](http://www.udel.edu/DRC/preliminary/pp305.pdf).
- 28 Eyre, 'More than PTSD'.
- 29 Y. Aysan and I. Davis, *Rehabilitation and Reconstruction* (Geneva: UNDP/DHA Disaster Management Training Programme, 1993), <http://undmtp.org/english/rehabilitation/rehabilitation.pdf>, p. 11.
- 30 J. Twigg, *Technology, Post-Disaster Housing Reconstruction and Livelihood Security*, T4SL (Technology for Sustainable Livelihoods) website, 2002, [www.livelihoodtechnology.org/home.asp?id=disIntro1](http://www.livelihoodtechnology.org/home.asp?id=disIntro1).
- 31 *Community Participation in Postdisaster Reconstruction. Lessons Learned from the Maharashtra Emergency Earthquake Rehabilitation Program* (Washington DC: World Bank Disaster Management Facility, undated), [www.worldbank.org/html/fpd/dmf/best\\_practices2.htm](http://www.worldbank.org/html/fpd/dmf/best_practices2.htm).
- 32 F. Grunewald, V. de Geoffroy and S. Lister, *NGO Responses to Hurricane Mitch: Evaluations for Accountability and Learning* (London: Humanitarian Practice Network, Network Paper 34, 2000).
- 33 Mowforth, *Storm Warnings*, pp. 70–71.
- 34 A. Maskrey, *Disaster Mitigation: A Community Based Approach* (Oxford: Oxfam, 1989), p. 51.
- 35 Aysan and Davis, *Rehabilitation and Reconstruction*, pp. 38–39.
- 36 *Independent Evaluation of Expenditure of DEC Mozambique Floods Appeal Funds*, pp. 30–31.

# Chapter 18

## Monitoring and evaluation

### 18.1 Introduction

This chapter offers a brief general survey of monitoring and evaluation (M&E). Owing to the shortage of good-quality evidence, its conclusions are particularly tentative. Work on methods of assessing the benefits of risk reduction measures now being planned by the ProVention Consortium should improve our understanding of this complex subject. Some of the evidence referred to here is not attributed because of agencies' sensitivity about confidentiality.

The chapter contains a short account of approaches to monitoring and evaluation in general, drawing on recent writing on its application in development and humanitarian work.<sup>1</sup> The focus is on evaluation – as this presents specific difficulties where risk reduction is concerned – and field projects. Approaches to project monitoring in general are covered in standard manuals and should be part of all agencies' systems and training.

Monitoring and evaluation are important because they:

1. Make operational agencies more accountable to those they seek to help, as well as those who support them.
2. Demonstrate to donors, policy-makers and practitioners that risk reduction works, and thereby make a case for greater effort in this area.
3. Improve understanding of how risk reduction works in practice – including identifying problems and mistakes.

The range of M&E approaches and methods in development and relief has grown considerably over the years, as has the level of interest in the subject, but mostly since the early 1990s. This is most noticeable in the NGO sector, partly driven by criticism and donor pressure but also by the desire to prove success and improve performance.

A growing body of work is providing NGOs and other actors with better-informed guidance on M&E methods for development and emergencies. Several networks have appeared during the past decade to support such efforts. They include the Active Learning Network on Accountability and Performance in Humanitarian Assistance (ALNAP), whose members come

from bilateral and multilateral donors, UN agencies and NGOs (see [www.alnap.org](http://www.alnap.org)); and the electronic MandE information forum ([www.mande.co.uk](http://www.mande.co.uk)).

By comparison, organisations addressing risk reduction have given low priority to M&E, even though professionals working in the field recognise a weakness here. Most technical manuals ignore it, or mention it in passing without giving guidance. There may well be a similar neglect in training courses. M&E rarely features in the wider literature on disasters and risk. As in development and relief work, very few of the evaluations that are carried out are made public. The findings of a recent study of international NGOs (described in Case Study 18.1) may be typical of many other types of institution. However, some in the UN system are starting to think about how to develop national-level disaster risk reduction baselines, targets and indicators.<sup>2</sup>

## 18.2 Definitions

It is important to be clear about what is being monitored or evaluated. Assessment of a project or programme can focus on quite different aspects:

- Inputs. These are the human, financial and technical resources deployed. Their effectiveness, cost-effectiveness and appropriateness can be assessed.
- Activities and processes. This covers the performance of tasks and factors affecting this.
- Outputs. These are the immediate results the project achieves (sometimes called 'deliverables').
- Impact (or outcomes). Impact has been described as 'significant or lasting changes in people's lives, brought about by a given action or series of actions'.<sup>3</sup>

Similarly, the main distinctions between monitoring and evaluation can be identified:

- Monitoring usually addresses inputs, activities and outputs. Most monitoring systems are designed meet the ongoing information needs of project managers and provide information for donor reports. Evaluations focus on outputs and especially impact, and are intended for a wider audience within and outside the organisation.
- Monitoring is mainly descriptive. Evaluation is more analytical. Impact assessment is mainly analytical, and concerned with longer-term outcomes.

## Case Study 18.1

### Much monitoring, but little evaluation

A recent research project managed by the British Red Cross studied 22 international relief and development NGOs based in the UK, analysing 75 mitigation and preparedness projects of different kinds.

The researchers found that assessment or evaluation of impact had taken place in only 12 of the 75 projects, managed by eight of the 22 NGOs. That is to say, 12 had reports and evaluations that had *addressed* the question of impact: their quality varied, and with it the extent to which impact could be proved, although all demonstrated some beneficial impact. The projects were of very different kinds: drought/food security, networking/advocacy, housing, training, disaster preparedness and post-disaster rehabilitation.

Other features of the 14 evaluations (two projects were evaluated twice) were:

- Only one was a long-term, post-project evaluation; the rest were of ongoing work, sometimes at the end of a project phase.
- Seven were carried out within two years of the project's start, which is arguably too soon to demonstrate much impact; four were carried out within four years; one after five years and two after six years.
- Only two were internal evaluations; one used internal and external evaluators; the others were carried out by external evaluators.
- Four were donor evaluations; the rest were commissioned by the NGOs concerned.

In another 30 projects, M&E focused on activities only. Most projects for which evidence was available monitored activities. These implementation reports were often thorough. But eight projects had given little thought to indicators. In another 22 cases, there was simply not enough evidence to judge the quality of the M&E. The remaining three projects of the 75 were very new.

Although the documentation was limited, where mitigation or preparedness measures had been undertaken, they were generally believed by NGO staff to have been effective.

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J. Twigg et al., *NGO Natural Disaster Mitigation and Preparedness Projects: A Study of International Development and Relief NGOs Based in the UK* (London: British Red Cross Society, 2000), pp. 76–78.

- Monitoring should be frequent, throughout the project. Evaluation is infrequent. It can take place at any point in the project cycle. It is usual to carry out evaluations towards the end of a project, or the end of a phase in the project if it is a long one. Mid-term evaluations are valuable in identifying if projects are heading in the right direction. These are becoming more common. Retrospective evaluations some time after the conclusion of the project are less usual.

Other terms used in this context are:

- Review. This comes somewhere between monitoring and evaluation. Reviews supplement regular monitoring, taking place less frequently and focusing more on activities and outputs than on impact. Reviews usually form part of internal management systems, but reviews involving external stakeholders are not uncommon.
- Audit. This term is normally associated with financial accountability and honesty. It is sometimes used more broadly.

These definitions and distinctions are meant to guide; they should not be seen as complete explanations or rigid categories.

## 18.3 Issues in monitoring and evaluation

### 18.3.1 Planning and operation

M&E systems must be planned carefully, bearing in mind that no two projects are identical. The purpose and methods of any monitoring exercise, review or evaluation should be clearly defined – and agreed (see the discussion of accountability below). Since it is almost never possible to assess everything, there must be some focus to the assessment, and its objectives must be realistic in relation to the resources that go into it. Thought should be given to such issues as:

- Indicators (see below) – this is very important.
- Units of assessment. M&E can take place at individual, household, group, community or institutional levels. Even in a large-scale project, it is important to get as close to the grass roots as possible; data can be collated subsequently.
- Sampling: sample size and sampling methods.
- Geographical coverage. This is conditioned by the coverage of the project in terms of geographical area, hazards and risks addressed, and the number and types of vulnerable people assisted.

- Existing information sources. Most evaluations will draw on external sources (e.g. government and other agencies' data sets and surveys) and internal sources (e.g. project documents) as well as field surveys. The low standard of information management in many agencies can make it difficult to identify and obtain these.
- Who should be involved in collecting, providing and discussing evidence (see the section on accountability below). The size, composition and skills of evaluation teams are important considerations.
- Scheduling. Evaluators must be given sufficient time to do their task properly. In many cases, they are forced to do it in a hurry because there is not enough money to keep them on the job for longer. Reviews and evaluations should be scheduled at an appropriate phase in the project's lifetime and at times of the year that best suit the beneficiaries. When in the field, researchers must find appropriate times of the week or day for talking to beneficiaries.
- Tools and methods to be used. These may comprise formal surveys, structured or semi-structured individual and group interviews, group discussions such as focus groups and workshops, direct observation, other PRA methods and case studies. Each method brings its own advantages and drawbacks. Project evaluations often use several methods. The methods adopted must be appropriate to what is being assessed and the resources available.
- Matching inputs and outputs. The evaluators must have enough time and resources to carry out the proposed activities and achieve the outputs required. In many cases, agencies' expectations are unrealistic and the time and resources insufficient.
- How the findings will be reported back to all the stakeholders concerned, and how they will be acted upon. Both of these actions are often neglected.

Terms of reference should reflect the main decisions that have been made on these issues. Clear terms of reference are vital. Many problems with evaluations stem from failure to achieve this clarity and to reach agreement with the relevant stakeholders on the contents of the terms of reference. Sufficient time should be set aside to achieve this.

Even the best plans can break down when confronted with reality in the field, so flexibility is essential. Good planning should allow for this.

As already noted, many evaluators are not given the time or resources to do their work thoroughly. Overcrowded schedules are common. This limits time in the field, forcing evaluators to place too much reliance on what may be

very selective field evidence, on agency documents that may be incomplete or unavailable, and on interviews in head offices. In consequence, many evaluations are little better than snapshots of an initiative, coloured by chance encounters and personal views. Experienced evaluators can compensate for this to some extent by drawing on their skills in identifying and gathering key data and their knowledge of similar initiatives elsewhere, but if they rely too much on their general knowledge they may miss features that are distinctive to the work in question.

However, snapshots can be useful. Small-scale or rapid assessments provide valuable insights in some cases, especially when focused on a distinct aspect of risk reduction, as in Case Study 18.2.

### 18.3.2 Accountability and participation

It is best to approach M&E as a mutual learning process for all involved, not merely as an information-gathering exercise. The principles of accountability to vulnerable people outlined in Chapter 12.2 (page 198) are very important here. Communities' views should be central to evaluation. However, many monitoring and evaluation systems are top-down, designed to provide information to headquarters staff and donors.

In a participatory project geared towards community action, it follows that the community must be involved in evaluation. This works very well in some disaster contexts, for instance in food insecurity and famine early warning, where a number of NGOs have established viable systems to alert communities and outside agencies to deteriorating food and livelihood security, and to generate appropriate responses (see Chapter 15.4, page 274). Sales of animals and other assets, changes in market prices, seasonal migration, school attendance, crop yields and failure to carry out funeral ceremonies are among the diverse indicators identified and applied by local people in such initiatives.

The participatory methods described in Chapter 8 can be useful in allowing beneficiaries to express their views. Standard PRA exercises can yield valuable information. Since it is never possible to involve everyone, careful thought must be given to ensuring that those who are consulted are representative of the range of vulnerable groups concerned, paying particular attention to the most vulnerable as well as people who may have dropped out of the project. Some evaluations pick up the views of similar people who were not involved in the project as a kind of 'control group'.

## Case Study 18.2

### Reporting on disaster response

On 11–12 November 2002, a cyclone warning was issued along the coast of the Bay of Bengal. A relatively weak cyclone struck, with high winds and heavy rain in several places. The Orissa State Branch of the Indian Red Cross used the event to assess the effectiveness of its disaster preparedness work.

The initial assessment was based on telephone calls from local voluntary coordinators and emergency team members in eight locations. These conversations focused on the following:

- When the cyclone warning was received, and from which source(s).
- Actions taken by local disaster preparedness teams.
- Actions taken by villagers.
- Details of the event (wind speed,

condition of the sea, rainfall) and its impact.

The phone calls provided plenty of local detail. Using this, it was possible to build up a picture of the situation on the ground and actions taken almost as they happened, the effectiveness of warning and response mechanisms and factors affecting them, as well as variations between the locations.

The phone call method was not a substitute for field surveys, but it did help to identify priority issues for fuller assessment subsequently.

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'Actions by 8 Red Cross Cyclone Shelter Communities in Orissa During Cyclone Warning (Nov. 11 to 12, 2002)', mimeo (Bhubaneswar: Orissa State Branch, Indian Red Cross Society, 2002).

Beneficiary participation in M&E can take different forms. In some projects, it may be no more than providing information to review or evaluation teams, but this is too limiting. Ideally, beneficiaries should be involved in planning the assessment (including selecting indicators), providing information on what was and was not achieved, and analysing and verifying the results. Findings should always be fed back to communities. The needs of communities in this regard may differ from those of outside agencies – especially their senior management – and donors, who expect more conventional indicators of success, often emphasising the quantitative at the expense of the qualitative.

Beneficiaries are only one group of stakeholders. Project staff are another. NGOs and other local institutions, local and national government officials, and where appropriate international agencies and other kinds of organisation (e.g. the private sector) should all be consulted if they have been involved in the project, are affected by it, or have some influence on its outcome. Note that it can be difficult to reconcile the views of diverse stakeholder groups. This makes it all the more important to be clear from the start about what M&E are designed to look at. Meetings should be held to discuss and explain this. Where stakeholders have different priorities and perspectives, this should be made explicit at the start to avoid misunderstandings later.

Evaluations are often funded by donors or in some way linked to ensuring continued donor support. In such circumstances, the ideal of M&E as mutual learning is hard to sustain. Many of those involved will be tempted to overstate the positive features of their project and downplay the negative ones. They may be defensive about their work, fearing that evaluation teams are searching for faults. Community members may only tell evaluators what they think they want to hear.

### 18.3.3 Assessment teams

Participation and accountability are therefore significant factors to bear in mind when assessment teams are formed. The balance between internal and external assessors is an important consideration. In development projects, evaluation may be carried out by external specialists, local staff or local people, working separately or in mixed teams. There are no fixed rules: the appropriate size and mix are selected to suit the specific project, and there is increasing emphasis on gender balance and local participation.

In contrast, external specialists – mostly men – continue to dominate teams evaluating risk reduction and humanitarian aid initiatives, and it is still common to have projects evaluated by a single external consultant. Whilst it is useful to have the added objectivity of an outsider's view and the experience of a well-travelled evaluator, there is a danger that somebody new to the project will not understand all its complexities – this danger is accentuated by the limited time usually allocated to evaluators.

The purpose of the evaluation offers some guidance to the balance of the evaluation team. If the main purpose is lesson-learning, it makes sense to involve more internal staff; if it is accountability, the independence of external evaluators becomes more crucial. In practice, however, most evaluations aim at lesson learning and accountability.

There is a lot of discussion in the literature about the appropriate skills mix in evaluation teams. Again, there are no fixed rules about this. Some people feel that a wide range of relevant technical skills is essential; others maintain that experience in evaluation methods is more important. In some kinds of risk reduction project, technical expertise may be valuable, be it in science, engineering/architecture, nutrition, economics or the social sciences. Evaluators need to be able to use quantitative and qualitative data and relevant data collection methods. Knowledge of local geography, society, cultures and institutions is also valuable.

Case Study 18.3, though it concerns a review of a humanitarian operation in response to a complex political emergency, highlights several issues with wider relevance.

### Case Study 18.3

#### Membership and functioning of an evaluation team

In 1996, the IFRC commissioned an external review of its programme in Tajikistan, where civil war had created major humanitarian problems. The review was wide-ranging. It covered health and nutrition programmes (including distribution of food and medical supplies), logistics, general relief programmes and developmental relief. The team was also asked to consider the broader and longer-term issues of disaster prevention and the development of the Tajikistan Red Crescent Society.

The programme's institutional stakeholders comprised the IFRC (Geneva Secretariat and Regional Delegation), the Tajikistan Red Crescent and national Red Cross

Societies in the North that had funded the work.

The composition of the core review team in terms of skills and experience reflected the interests of the principal donor Red Cross societies, the British and American Red Cross, who were also influential in the choice of individuals. There were four core team members: the team leader (an independent consultant identified and funded by the British Red Cross), a health and emergency medicine expert (from another institution, identified and funded by the American Red Cross), a public health and nutrition specialist (seconded by the American Red Cross) and a logistics expert (from the IFRC Secretariat).

*(continued)*

### Case Study 18.3 *(continued)*

All of the external evaluators were experienced, and though none had worked in Tajikistan, some had worked in other former Soviet states or in neighbouring Afghanistan. Two senior members of the Tajikistan Red Crescent were also seconded to the team. Only one of the team members was female, despite the review's terms of reference requiring efforts to be made to ensure a gender-balanced team.

The core team members were briefed by their sponsoring Red Cross societies and spent three days in Geneva being briefed, interviewing and studying documents, followed by briefings at the Federation's regional delegation in Kazakhstan and the headquarters of the Tajikistan Red Crescent. There was little opportunity to discuss the terms of reference and methodology before the interviews and document searches began, and fieldwork methods had to be discussed on the way to Tajikistan. Identifying and tracking down key documents during the preparation stage was difficult and time-consuming. On the other hand, sectoral responsibilities were clear, with the team leader covering areas not addressed by the technical specialists and the local staff acting as general advisers.

The 20-day fieldwork period mostly involved interviews with IFRC delegates, staff of the Tajikistan Red Crescent and key informants in the government and international agencies. A limited number of projects and Red Crescent local branches was visited. Beneficiary interviewing was limited and opportunistic. The schedule underestimated the time needed for interviews and meetings where translation was required.

There were three main issues relating to the way the team functioned:

1. The two members from Tajikistan were unable to attend the Geneva briefings (largely due to cost) and were not involved in writing the report. They participated as facilitators, informants and contributors to the review, but not as full members of the team.
2. Some of the team members brought their employer's agendas to the work: one was piloting a health assessment format for the American Red Cross; another wanted to carry out an internal review of IFRC logistics procedures in the region.

*(continued)*

**Case Study 18.3** (continued)

3. Because of other work priorities, two of the four core team members could not participate for the full period of the fieldwork.

This left considerable responsibility for the final report with the team leader and the remaining team member, although the team agreed on the main conclusions. Each member of the team wrote their own sectoral sections and the team leader drew these together, in the process overcoming the problems caused by different writing styles, the specialists' tendency to give too much technical detail and their preoccupation with general sectoral issues without grounding them in

the reality of the work being reviewed.

The timing of the review meant that the IFRC and Tajikistan Red Crescent had little time to study the report and act on its findings before operational and fundraising plans for the following year were finalised. However, many of the report's recommendations were subsequently implemented.

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P. Wiles, 'Review of the International Federation of Red Cross and Red Crescent Societies' Tajikistan Programme', in A. Wood, R. Apthorpe and J. Borton (eds), *Evaluating International Humanitarian Action: Reflections from Practitioners* (London: Zed Books/ALNAP, 2001).

**18.3.4 Baseline data**

Evaluation is easier if there are already good baseline data to measure progress against. Projects should be based on baseline studies, with their objectives and indicators of achievement set accordingly. This happens far less than it should in practice, leaving many project evaluators struggling to find adequate measures of success. However, few baseline studies can anticipate all the questions likely to be asked in subsequent reviews and evaluations.

In risk reduction, a risk or vulnerability/capacity analysis should provide good baseline data and guide interventions. Application of the same method of analysis during or after the project should make it possible to draw meaningful conclusions about impact. It would be interesting to know if this has been done. The *apparent* failure to do so may be due to the following factors.

- Vulnerability and capacity analysis is a new technique for most field agencies, and hence has been used mostly in pre-project assessments. To date, there has not been much opportunity to apply it as an evaluation tool.
- Agencies are finding it difficult to analyse data collected in such exercises, particularly to weigh up data on the many aspects of vulnerability that have been gathered in a variety of ways using different indicators. Until project staff acquire greater confidence in the techniques for risk and vulnerability analysis, they will be reluctant to use it in evaluations, especially where the findings will go before senior staff or funding agencies.
- Considerable resources are required for comprehensive risk or vulnerability analysis. Few project budgets would allocate the same level of resources for evaluation – evaluations are generally under-resourced anyway.

### 18.3.5 Indicators

Vulnerability and resilience are multi-dimensional. It is difficult for vulnerability and risk analysis to collect data on every single relevant aspect, and in any case collection of unnecessary data should be avoided. Monitoring and evaluation systems need to identify and focus on the most useful indicators of risk reduction. Remember that the indicators that are easiest to measure are not necessarily the most useful as far as analysis is concerned (there is more on this below).

Indicators will vary from one project to another, according to the work being undertaken and its specific context. But in general they should try to be both SMART (specific, measurable, attainable, relevant and time-bound) and SPICED (subjective, participatory, interpreted, cross-checked, empowering and diverse): see Box 18.1.

This sounds simple on paper, but in practice it can be complicated. Questions to be asked regarding the practicality of indicators include:<sup>4</sup>

- Measurability. Is the indicator measurable? Is it sufficiently sensitive to an improvement or deterioration in conditions?
- Ease and cost of collection. How easy is it to obtain the information required? How costly will this be? Can the community participate? Are some relevant data already collected?
- Credibility and validity. Are the indicators easy to understand, or will people end up arguing over what they mean? Do they measure something that is important to communities as well as implementing organisations?

**Box 18.1****Indicators: SMART and SPICED**

<b>SMART</b>	<b>SPICED</b>
<p><b>Specific:</b> Indicators should reflect those things the project intends to change, avoiding measures that are largely subject to external influences.</p> <p><b>Measurable:</b> Indicators must be defined precisely so that their measurement and interpretation are unambiguous. They should give objective data, independent of who is collecting the data. They should be comparable across groups and projects, allowing change to be compared and aggregated.</p> <p><b>Attainable:</b> Indicators should be achievable by the project and therefore sensitive to the changes the project wishes to make.</p> <p><b>Relevant:</b> It must be feasible to collect data on the chosen indicators within a reasonable time and at a reasonable cost. Indicators should be relevant to the project in question.</p> <p><b>Time-bound:</b> Indicators should describe by when a certain change is expected.</p>	<p><b>Subjective:</b> Informants have a special position or experience that gives them unique insights which may yield a very high return on the investigators' time. In this sense, what may be seen by others as anecdotal becomes critical data because of the source's value.</p> <p><b>Participatory:</b> Indicators should be developed together with those best placed to assess them. This means involving a project's ultimate beneficiaries, but it can also mean involving local staff and other stakeholders.</p> <p><b>Interpreted and communicable:</b> Locally defined indicators may not mean much to other stakeholders, so they often need to be explained.</p> <p><b>Cross-checked and compared:</b> The validity of assessment needs to be cross-checked, by comparing different indicators and progress, and by using different informants, methods and researchers.</p> <p><b>Empowering:</b> The process of setting and assessing indicators should be</p>

*(continued)*

**Box 18.1** (continued)

<b>SMART</b>	<b>SPICED</b>
	empowering in itself and allow groups and individuals to reflect critically on their changing situation.  Diverse and aggregated: There should be a deliberate effort to seek out different indicators from a range of groups, especially men and women. This information needs to be recorded in such a way that these differences can be assessed over time.

C. Roche, *Impact Assessment for Development Agencies: Learning to Value Change* (Oxford: Oxfam/Novib, 1999).

- Balance. Do the selected indicators provide a comprehensive view of the key issues?
- Potential for influencing change. Will the evidence collected be useful for communities, implementers and decision-makers?

Even with this guidance in mind, it is rare to find all the evidence one wants. Indicators are *indicators*, they are not necessarily final proof. Indicators do not need to record absolute change. It is often enough to identify relative change.

Part of the process of collecting baseline information should be to identify those indicators that will be most valid for M&E. However, experience as the work progresses may highlight other issues and require changes to the project. Some indicators may have to be modified or new ones will emerge, so it is important to be flexible. Monitoring methods should be designed to pick up these issues so that decisions can be made.

Where baseline data are lacking, or previously identified indicators are found difficult to assess or simply irrelevant, new indicators must be developed. In practice, this happens quite often, but the process must be managed carefully to avoid confusing or misleading stakeholders. An open, participatory approach is needed here, and the aim should be to achieve the highest possible level of consensus.

Be aware of the problem known as the ‘indicator dilemma’. Indicators that are chosen to verify impact can only identify *expected* change, and will only reflect those changes that have been made explicit or agreed by the stakeholders. But what happens where change is unexpected or was not agreed by stakeholders, or where a particular stakeholder group did not reveal an area of change that was important to them?

Conventional M&E methods usually focus on positive impacts. Few initiatives are without some negative impacts, although in most projects there is a reluctance to review these. All partners in a project should be open about the importance of identifying negative impacts and groups that have been overlooked or excluded. This requires a high degree of trust between those involved in running the project, which may be difficult to achieve owing to the unequal relationship between poor communities and external organisations bringing resources.

Some development agencies have experimented with approaches to assessing change that do not use predetermined indicators – instead, poor and vulnerable people review the changes that have taken place over a particular time and related factors.

Other indicator issues are covered below in the discussion of how to measure impact.

### 18.3.6 Identifying cause and effect

Many factors combine to make people vulnerable and create situations of risk. No project intervention can address all of these factors. All projects will be influenced by them. This influence must be understood in order to assess a project’s achievements. To what extent are particular changes due to the project itself or its environment? It can be difficult to make a judgement here, particularly when evaluating long-term impact.

Moreover, good risk reduction work should comprise a range of diverse activities: organisational, educational, structural, economic. These activities are meant to be mutually reinforcing: for example, training in safe building tech-

niques should be complemented by regulation of land use, and the setting and enforcement of building standards, as well as by measures to address the economic and social pressures that force poor people to live in flimsy housing in hazardous locations. Where risk reduction adopts such a broad approach, with numerous interlocking elements, how can one assess the results arising from one particular type of intervention against another? It may be impossible to identify specific linkages between cause and effect. Consequently, how can one set priorities for intervention?

Some development project evaluations have used control groups for comparative purposes, but there are methodological problems with this approach and, in the case of risk reduction, it is arguably unethical to study at-risk groups that one has not attempted to protect. Some agencies specifically investigate external influences when assessing projects: this at least puts evaluation findings into context, even if it often cannot demonstrate particular cause and effect linkages.

Cross-checking (or triangulation) of different data sets and sources is helpful in isolating particular factors affecting success or failure. In most cases, the sources and types of information will vary. In particular, there will be a mixture of quantitative and qualitative information. Using different stakeholders or assessors to review the same issue can reveal similarities and differences. It is very important to consider the views of differently vulnerable groups. Direct observation is a useful way of checking if there are discrepancies between what people say and what they do (see Case Study 9.1, page 136).

The problem is reduced wherever evaluators can focus on specifics. Assessment of disaster preparedness and response measures tends to be simpler, for example. Warning and evacuation procedures can be tested through practice drills and by events. It is also relatively easy to isolate each element in the preparedness-response system for analysis. Responses to early warnings have been studied on many occasions, throwing light on community attitudes and the effectiveness of warning systems.<sup>5</sup> Such knowledge has supported the development of sophisticated methods for evaluating the condition of early-warning systems.<sup>6</sup>

### 18.3.7 Outputs or impact?

M&E manuals sometimes speak of ‘process’ and ‘impact’ indicators. Process indicators measure the implementation of project activities, and are usually quantitative. Impact indicators, which can be quantitative and qualitative,

measure changes that occur as the result of project activities. The difference between the two types of indicator is important.

Most evaluations of disaster mitigation and preparedness projects focus on outputs rather than impact. They tend to be short-term studies, usually carried out at the end of a project, when it is too soon to assess its long-term consequences. Post-project impact assessments are rare. The lack of critical long-term studies is also apparent in the published literature. Published case studies of well-regarded initiatives usually appear at a relatively early stage in a project's life or are based on early evidence. The exceptions tend to be drought/food security initiatives. These demonstrate that projects' impact can be judged only over a period of some years. They also reveal the extent of rethinking and modification that takes place even in successful projects. This is not to say that process indicators are not important – they often have to act as proxy indicators of impact. They are particularly important where hazards are infrequent (e.g. earthquakes, volcanic eruptions).

M&E is designed to measure change. Indicators are chosen accordingly. However, risk reduction presents problems because of what has been called its 'reverse logic': i.e. the success of an initiative is that something – the disaster – does *not* happen.

Structural/physical mitigation measures are relatively easy to assess. The quantity and quality of, for example, embankments, flood shelters, earthquake-resistant houses and soil and water conservation structures can be assessed visually, as can the extent to which alternative technologies or techniques are adopted. Judgement about the quality of such technical innovations serves as a proxy indicator for their impact – i.e. their resilience to actual hazard events.

Non-structural measures involving changes in attitude, skills, organisation or awareness are much more challenging. Proxy indicators of impact can be picked out but they are less certain than those for physical change. For example, interviews or discussion groups can reveal how interventions have changed a community's attitudes towards risk, but they do not allow us to judge how that community will actually behave when confronted with a disaster.

Given these challenges, the need for triangulation of different evidence is clear. Good impact evaluations should be wide-ranging in their search for relevant signs of increased resilience to risk, as well as objective about the strength of the evidence collected (e.g. Case Study 18.4).

## Case Study 18.4

### Evaluating the impact of rainwater harvesting

In 1997, the NGO ITDG commissioned an independent evaluation of a rainwater harvesting initiative in Kenya that had been launched over ten years previously (see Case Study 15.4, page 267). This built up a comprehensive picture from a range of indicators and sources.

The evaluation was based on project documentation (including local partners' monitoring records), interviews with project and partner staff, five group discussions with beneficiaries (104 people in total), individual interviews with 12 gardeners, a local trader and a chief, and some field observation. The discussion groups and individual interviews were based on PRA techniques.

The evaluation covered eight aspects:

1. Impact on average sorghum yields, and comparison of yields between traditional sorghum gardens and those improved by rainwater harvesting.
2. How the sorghum harvest was used, in good and bad years (e.g. to purchase food, seeds or livestock, to sell for cash, or to give to relatives and friends).
3. Impact on diet.
4. Impact on wealth.
5. Gender issues in control and decision-making, relating to decisions about whether to improve a sorghum garden, when to begin planting, division of labour and control over disposal of the harvest.
6. Impact on women's status (linked to point 5).
7. How the creation of new sorghum gardens affected traditional land tenure arrangements.
8. Positive and negative impact on the environment (water run-off, soil erosion, soil fertility).

The PRA methods were effective in obtaining respondents' views and stimulating discussion. Much of the evidence was qualitative. In some cases, quantitative data would have been valuable, but were not readily available. To obtain relative data on the use of increased sorghum yields and constraints on sorghum production, the evaluators used the techniques of ranking and proportional piling, in which individuals were given piles of stones (or donkey dung by the lakeshore, where stones were not available) and asked to place them in separate piles to indicate amounts.

*(continued)*

**Case Study 18.4** *(continued)*

Data on crop yields proved more difficult. Local-level monitoring systems were of limited use and there were widespread variations in the type of soil, pest levels and rainfall between different sites. Moreover, the sorghum growers were reluctant to reveal their full yields to outsiders. Here it was necessary to piece together limited evidence from different sources: project records, discussions with project staff and the assessments of the gardeners

themselves. This was compared with data from previous project reviews and workshops. The evaluators noted that no outsiders making short visits can expect to obtain specific data on such sensitive subjects, and that easily obtained replies might well be erroneous.

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C. Watson and B. Ndung'u, 'Rainwater Harvesting in Turkana: An Evaluation of Impact and Sustainability', mimeo (Nairobi: ITDG, 1997).

Little work has been done on methodology for assessing the impact of risk reduction, yet organisations need guidance in this area, especially regarding appropriate indicators and means of verification. Agencies are comfortable with indicators of output (especially quantitative indicators), but are unsure about how to select and apply indicators of impact.

It is therefore common for evaluations to come up with the kinds of achievement indicator listed in Table 18.1. These are output indicators that itemise and quantify the measures taken by a disaster preparedness project. The figures appear impressive at first glance, but they cannot demonstrate the nature or extent of the project's effectiveness in improving performance. There is no measure of quality here. The training and orientation activities may have been very effective in improving knowledge and skills, but one cannot tell this merely from the numbers taking part. A considerable number of posters and leaflets have been circulated, but there is no indication of the impact these have made on people's perceptions and actions. Grain stores and funds have been established, but we cannot judge how well they work. The nearest this list comes to impact is in item 7, which refers to the number of people's voluntary teams that are 'functioning', without explaining what this means or how it was verified.

**Table 18.1** Output indicators

	<i>Indicator</i>	<i>Target</i>	<i>Achievement</i>
1.	Number of households oriented in disaster preparedness and management.	120,000	140,000
2.	Number of volunteers trained in disaster preparedness and management.	118	118
3.	Number of [partner agency] staff trained in disaster preparedness and management.	600	598
4.	Number of other NGO staff trained in disaster preparedness and management.	80	72
5.	Number of government representatives trained in disaster preparedness and management.	118	118
6.	Number of flood level indicators established.	130	130
7.	Number of people's voluntary teams functioning.	118	118
8.	Number of posters circulated.	–	2,367
9.	Number of leaflets circulated.	–	10,650
10.	Number of radio sets distributed.	118	118
11.	Number of torches and whistles distributed.	118	118
12.	Number of email connections installed.	2	4
13.	Number of grain stores constructed.	20	20
14.	Number of grain store maintenance teams trained.	20	20
15.	Number of grain store management teams trained.	20	20
16.	Emergency credit fund established.	1	1
17.	Number of grain store management teams trained in credit operation.	20	20
18.	Flood insurance fund established.	1	1

Projects that have clear objectives and targets can develop a hierarchy of indicators that link process to impact and thereby make M&E more coherent. An example is given in Box 18.2. This is an extract from the Strategic Objective and Results Framework of the Asian Urban Disaster Mitigation Program (AUDMP), a major regional initiative run by the Asian Disaster Preparedness Center (see Box 14.2, page 249).

## Box 18.2

### Linking Process to Impact (1)

**Program Goal:** Reduced natural disaster vulnerability of urban populations, infrastructure, lifeline facilities and shelter in the Asian region.

**Program Objective:** Establishment of sustainable public and private sector mechanisms for disaster mitigation in the Asian region.

*Objective Indicators:*

1. Number of operational plans developed with resources identified by national collaborating institutions to carry out mitigation measures after demonstration activities end.
2. Number of replications or adaptations of mitigation skills and procedures promoted in AUDMP demonstration activities by other organizations, communities or countries in the Asian region.
3. Amount of investment from non-AUDMP funding sources attracted by Program and demonstration activities.

4. Number of households potentially benefiting from AUDMP-sponsored activities to reduce disaster vulnerability.

*Results:*

1. Improved capacity of municipal officials to manage risk, apply mitigation skills and technologies.

*Indicators:*

- 1.1 Number of new or improved assessment methods and guidelines/standards used for public or private sector development.
- 1.2 Number of emergency preparedness and response plans written or revised to reflect improved information on hazards and vulnerability.
2. Improved access to hazard mitigation information and skills (techniques, methodologies, experience) throughout the region.

(continued)

**Box 18.2** (continued)

Indicators:	contact network established during the Program.
2.1 Percent[age] of public and private sector professionals with AUDMP-initiated disaster mitigation training who are using the knowledge gained in fields impacting disaster management or urban development.	3. Improved policy environment for disaster mitigation
2.2 Number of institutions where AUDMP-initiated training and professional development course modules are institutionalized.	Indicator:
2.3 Level of participation in the AUDMP regional information and	3.1 Improved policy environment for disaster mitigation.
	<hr/>
	'Strategic Objective and Results Framework', undated, Asian Urban Disaster Mitigation Program website: <a href="http://www.adpc.ait.ac.th/audmp/ME-framework.html">www.adpc.ait.ac.th/audmp/ME-framework.html</a> .

The principal indicators here are mostly numerical. However, the framework goes down to a more detailed level (an extract is given in Box 18.3). This characterises the subsidiary evidence required to arrive at the numerical conclusions, and outlines sources of information and the evidence-gathering activities to be undertaken. The emphasis remains quantitative, although the subsidiary indicators are more diverse.

### 18.3.8 Cost–benefit analysis

In risk reduction work, cost–benefit analysis is usually applied to large-scale projects, especially those involving structural mitigation, and this is reflected in the standard methodological guidance available.<sup>7</sup> The results of cost–benefit analyses make a convincing case for risk reduction (see Box 18.4).

Such examples should be treated with caution, however. They are few and far between, at least in the published literature, where they are usually presented as statements of fact without explanation of how the calculations were made. The readiness with which publications on disasters repeat such assertions should perhaps be worrying, as it suggests that little substantiated data is available.

**Box 18.3****Linking Process to Impact (2)**

<p>Objective Indicator 2: Number of replications or adaptations of mitigation skills and procedures promoted in AUDMP demonstration activities by other organizations, communities or countries in the Asian region.</p>	<p>Result 1: Improved capacity of municipal officials to manage risk, apply mitigation skills and technologies.</p> <p>Indicator 1.1: Number of new or improved assessment methods and guidelines/standards used for public or private sector development.</p>
<p>Standard/Target: 25 replications or adaptations.</p> <p>Replication should be initiated during the Program period even if not completed until after the Program ends. Replications may be of methodologies, sets of skills/procedures, guidelines/standards, or policies. Replications must be attributable to the example of the demonstration projects.</p>	<p>Standard/Target: At least 10 new or improved methods or guidelines/standards adopted and used during the Program period. Count ordinances, development regulations, building standards, vulnerability/risk analyses – and means a community or municipality has for controlling or regulating development, incorporating hazard information. Monitor applications and enforcement of standards/regulations by city officials and private professionals. Target is based on one new or improved assessment method or set of guidelines/standards used per national demonstration project.</p>
<p>Data Sources: Activity reports; surveys and evaluations; requests for guidelines/models received by ADPC Management Team and national partners.</p>	<p>Data Sources: Regularly scheduled activity reports; municipal records; published regulations.</p>

*(continued)*

### Box 18.3 (continued)

Critical Activities: Process documentation of demonstration activities and methodologies. Promotion and public awareness efforts with relevant government officials, decision-makers, community groups and professionals (e.g. promotional materials, training, city-sharing workshops, community meetings, electronic networking).

Critical Activities: Preparation of hazard, vulnerability maps; identification of elements at risk; recommendations for mitigation strategy; identification of implementation options and priorities.

### Box 18.4

#### Economic costs and benefits of risk reduction measures

- The World Bank and US Geological Survey calculated that economic losses worldwide from natural disasters in the 1990s could be reduced by \$280bn if \$40bn were invested in preparedness, mitigation and prevention strategies.<sup>8</sup>
- In China, \$3.15bn invested over 40 years in measures to control floods is estimated to have prevented potential losses of \$12bn.<sup>9</sup>
- A World Bank team working in La Paz, Bolivia, calculated that disaster prevention and preparedness would cost \$2.50 per capita, whereas annual losses from property damage alone resulting from natural disasters were estimated at \$8 per capita.<sup>10</sup>
- According to Oxfam, the value of cattle saved on a flood shelter covering approximately four acres in Bangladesh during the 1998 floods was Tk4m, against a construction cost of only Tk700,000.<sup>11</sup>
- The owner of a sweetshop in the Indian city of Indore, interviewed in 1994, said he had paid Rs25 to put stepping stones around his shop so that customers would not have to stand in flood water. Not to have done so would, he believed, have cost him Rs100–200 in lost business.<sup>12</sup>

**Box 18.5****Economic costs of disasters**

The economic costs of disasters are usually divided into three kinds: direct, indirect and secondary.

- Direct costs relate to the capital cost of assets (e.g. buildings and other physical infrastructure, raw materials, crops) destroyed or damaged.
- Indirect costs are the damage to the flow of goods and services (e.g. lower output from factories destroyed or damaged, loss of sales income due to damaged infrastructure, costs of having to buy materials or services from elsewhere, medical expenses, lost productivity).
- Secondary effects are the short- and long-term impacts on overall economic performance (e.g. deterioration in external trade and government budget balances, reallocation of planned government spending, increased indebtedness, changes in income distribution patterns, changes in the scale and incidence of poverty).

At local level, and in initiatives involving non-structural mitigation measures, cost–benefit analysis has not been greatly used. This is partly because the principal local actors, NGOs and CBOs, are unwilling to give too much weight to purely quantitative features of complex socio-economic processes, partly because of their lack of familiarity with the methods, and partly because of the difficulty of carrying out this kind of analysis.

There are three significant problems with cost–benefit analysis of risk reduction in addition to the wider difficulty of assessing impact outlined above.

First, it is extremely difficult to assess the impact or cost of disasters, spatially or temporally. Data on disasters' human and economic impact have improved over the years, but remain unreliable. Estimates of the human costs (deaths and injuries) are often guesses, especially in developing countries, where most disasters take place. Estimates of disasters' economic impact generally focus on direct costs. It is much harder to assess indirect and secondary costs (see Box 18.5 for an explanation of these terms). In developing countries, the problem is even harder. For example, assessment of direct losses becomes much more difficult if a large proportion of losses are

uninsured; and it is very difficult to calculate a secondary cost such as loss of income when a significant proportion of economic activity takes place in the informal sector.

The second issue relates to the first. Methodologies for economic impact assessment in disasters have several weaknesses.<sup>13</sup> They include:

- lack of standardisation (e.g. variations in the scope of assessments, reporting formats and methods of valuing damage);
- lack of training for assessors;
- limitations in coverage (e.g. assessors focusing on their institutions' areas of interest; overlooking damage that is not eligible for government assistance; political pressures to over- or under-report damage); and
- pressure to carry out assessments soon after a disaster, and quickly (while this is important in addressing relief needs, there is often no follow-up and hence no assessment of disasters' longer-term consequences).

Finally, the main criticism of economic cost–benefit analysis is that it values costs and benefits in purely monetary terms. Yet it is difficult to put a price on the environmental, social, political and psychological costs of disasters and the benefits of mitigation and preparedness. A focus on economic costs and benefits addresses only one aspect of people's vulnerability to disasters.

### 18.3.9 Using M&E findings

M&E is worthless unless it leads to improvements in agencies' work to reduce risk. M&E reports are potentially valuable documents. They allow for practical lessons to be learned within and across programmes and regions. They provide a basis for discussion about better practice and policy change. They also contribute to institutional memory, which is important in organisations such as NGOs that suffer from rapid staff turnover.

Agencies of all kinds are poor at absorbing the particular and general lessons that come from evaluations. Often, the review or evaluation report is filed, to be acted upon at another time but then forgotten amidst the pressure of work. Many organisations have poor information storage and retrieval systems, making it very difficult to find documents.

Few staff have the time to reflect upon the lessons learned from individual projects, and fewer still are able to consider what can be learnt from several

**Table 18.2** Characteristics of cost–benefit and vulnerability analysis

Cost–benefit analysis	Vulnerability analysis
Specific hazard(s) whose frequency and severity can be calculated with a relatively high degree of certainty.	Vulnerability context – including hazards and socio-economic factors.
Structural projects.	Mix of structural and non-structural measures.
Large-scale projects.	Community-level, small-scale projects.
Where data sets are sufficient, or resources exist to collect sufficient data.	Limited formal data needed; data can be collected locally.
Developed countries, developed or urban regions within developing countries.	Developing countries, poor and remote communities.
Macro-level analysis.	Micro-level analysis.
Quantitative data.	Qualitative data.
Specialists required for research and analysis.	Skills for research and analysis easily acquired and applied by non-specialists.
Externally driven, or top-down.	Participatory.

projects. In NGOs in particular, overwork and pressures of work constitute a ‘systemic weakness’ preventing thinking and innovation.<sup>14</sup>

Participatory M&E creates a sense of ‘ownership’ of the final product among the stakeholders involved. This greatly increases the likelihood that lessons will be noted and acted upon.

Much more transparency is needed in M&E. In particular, the failure to share and publish evaluations hinders the acquisition of knowledge about successes and failures. This culture of concealment also runs counter to the principle of accountability that many agencies claim to follow. There is a particular reluctance to document mistakes and share lessons learned from them.

## 18.4 Chapter summary

- M&E is important in making agencies accountable, demonstrating that risk reduction works and improving understanding of how it works.
- Organisations involved in risk reduction have given low priority to M&E and it is poorly covered in technical manuals and other literature. This makes it difficult to offer a view of ‘good practice’ in this area.
- M&E systems must be planned carefully, bearing in mind that no two projects are identical. The purpose and methods of any evaluation exercise should be clearly defined and agreed, there should be some focus to the assessment, and its objectives must be realistic.
- Many evaluators are not given the time or resources to do their work thoroughly. However, snapshots of initiatives, and small-scale or rapid assessments, can be useful.
- M&E should be approached as a mutual learning process for all involved. Beneficiary communities should be involved in evaluation, remembering that they are not the only project stakeholders.
- The balance between external and internal assessors, between local people and outsiders, between different technical specialists and generalists and between women and men are important considerations when assessment teams are formed.
- Identifying linkages between cause and effect is a particular challenge, especially since good risk reduction work should comprise a range of diverse but mutually reinforcing activities. Triangulation of different data sets and sources is important.
- Most evaluations of mitigation and preparedness projects focus on outputs rather than impact. There are few long-term impact assessments.
- Choice of indicators presents a number of problems, including identification of suitable proxy indicators of impact and the need to draw on very diverse data sets (quantitative and qualitative).
- Cost–benefit analysis is generally held to make a convincing case for risk reduction, but it is very difficult to carry out – particularly in pricing the environmental, social, political and psychological costs and benefits. A focus on purely economic aspects addresses only one dimension of vulnerability.
- M&E findings must be used to improve agencies’ performance, but organisations of all kinds are poor at absorbing these lessons. Much more transparency is needed in M&E: the failure to share and publish evaluations hinders the acquisition of knowledge about success and failure.

## Notes

- 1 C. Roche, *Impact Assessment for Development Agencies: Learning to Value Change* (Oxford: Oxfam/Novib, 1999); A. Hallam, *Evaluating Humanitarian Assistance Programmes in Complex Emergencies* (London: Humanitarian Practice Network, Good Practice Review 7, 1998); A Wood, R. Apthorpe and J. Borton (eds), *Evaluating International Humanitarian Action: Reflections from Practitioners* (London: Zed Books/ALNAP, 2001).
- 2 *Living with Risk: A Global View of Disaster Reduction Initiatives* (Geneva: UN International Strategy for Disaster Reduction, 2002), pp. 330–34.
- 3 Roche, *Impact Assessment for Development Agencies*, p. 21.
- 4 L. Noson, 'Hazard Mapping and Risk Assessment', in ADPC (ed.), *Proceedings, Regional Workshop on Best Practices in Disaster Mitigation, 24–26 September 2002, Bali, Indonesia* (Bangkok: Asian Disaster Preparedness Center, 2002), pp. 83–84.
- 5 J. Twigg, 'The Human Factor in Early Warnings: Risk Perception and Appropriate Communications', in J. Zschau and A. N. Küppers (eds), *Early Warning Systems for Natural Disaster Reduction* (Heidelberg: Springer Verlag, 2003), pp. 19–26.
- 6 See for example D. Parker, 'Criteria for Evaluating the Condition of a Tropical Cyclone Warning System', *Disasters*, vol. 23, no. 3, 1999, pp. 193–216.
- 7 See for example *Primer on Natural Hazard Management in Integrated Regional Development Planning* (Washington DC: OAS, 1991), pp. 2/16–2/29, [www.oas.org/usde/publications/Unit/oea66e/begin.htm](http://www.oas.org/usde/publications/Unit/oea66e/begin.htm); *Mitigating Natural Disasters: Phenomena, Effects and Options – A Manual for Policy Makers and Planners* (New York: Office of the United Nations Disaster Relief Coordinator, 1991), pp. 137–40.
- 8 M. Dilley and B. N. Heyman, 'ENSO and Disaster: Droughts, Floods and El Niño/Southern Oscillation Warm Events', *Disasters*, vol. 19, no. 3, 1995, pp. 181–93.
- 9 Y. Zheng, 'China: Disaster Reduction and Social Sustainable Development', *Stop Disasters*, vol. 29, no. 3, 1996, pp. 6–7.
- 10 A. Kreimer and M. Preece, 'Case study: La Paz Municipal Development Project', in A. Kreimer and M. Munasinghe (eds), *Managing Natural Disasters and the Environment* (Washington DC: The World Bank, 1991), p. 33.
- 11 *DEC Bangladesh: 1998 Flood Appeal. An Independent Evaluation* (London: DEC, 2000), [www.dec.org.uk](http://www.dec.org.uk), p. 20.
- 12 C. Stephens, R. Patnaik and S. Lewin, '*This Is My Beautiful Home*': *Risk Perceptions towards Flooding and Environment in Low-Income Urban Communities: A Case Study in Indore, India* (London: London School of Hygiene and Tropical Medicine, 1995), p. 27.
- 13 *Assessment of the Economic Impact of Natural and Man-made Disasters. Expert Consultation on Methodologies* (Brussels: Centre for Research on the Epidemiology of Disasters, 1997).
- 14 J. Twigg and D. Steiner, 'Mainstreaming Disaster Mitigation: Challenges to Organisational Learning in NGOs', *Development in Practice*, vol. 12, nos. 3 and 4, 2002, p. 475.