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Funding support is provided by institutional donors (AusAID, CIDA, DANIDA, DFID, Development Cooperation Ireland, MFA Netherlands, SIDA, USAID), non-governmental organisations (British Red Cross, CAFOD, Concern, MSF, Oxfam, Save the Children (UK), World Vision) and UN agencies (WFP).

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Disaster risk reduction Mitigation and preparedness in development and emergency programming

John Twigg

Humanitarian Practice Network
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Number 9
March 2004

Good Practice Review

Disaster risk reduction
Mitigation and preparedness in development and emergency programming

Commissioned and published by the Humanitarian Practice Network at ODI

John Twigg

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Website: www.odihpn.org

Layout and production: Publish-on-Demand Ltd
Printed and bound in the UK

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ISBN: 0 85003 694 1
Price per copy: £10.00 (excluding postage and packing).

Contents

Acronyms and abbreviations

BBC	British Broadcasting Corporation
CBO	community-based organisation
CSR	corporate social responsibility
CVA	Capacities and Vulnerabilities Analysis
DFID	Department for International Development
FAO	UN Food and Agriculture Organisation
GDP	gross domestic product
GIS	geographical information system
IDNDR	International Decade for Natural Disaster Reduction
IFRC	International Federation of Red Cross and Red Crescent Societies
ISDR	International Strategy for Disaster Reduction
M&E	monitoring and evaluation
MFI	micro-finance institution
NGO	non-governmental organisation
PAHO	Pan-American Health Organization
PRA	participatory rural appraisal
PTD	participatory technology development
RRA	rapid rural appraisal
SEWA	Self Employed Women's Association
UNDP	United Nations Development Programme
VA	vulnerability analysis
VCA	Vulnerability and Capacity Assessment

Acknowledgements

Many colleagues and friends have helped me to research and write this Good Practice Review, by providing information and commenting on drafts. They are too numerous to thank individually, but I hope they will recognise their influence on the pages that follow.

An advisory group was set up to support the project. Its members, chosen to provide specialist knowledge of the different dimensions of this multi-faceted subject, were: Charlotte Benson, Zenaida Delica, Allan Lavell, Frances Mason, John Mitchell, Mary Myers, David Peppiatt, Adam Poulter, Anshu Sharma, Rob Stephenson and Ben Wisner. I have profited hugely from their considerable expertise. Nevertheless, all errors and omissions in the book are the responsibility of the author alone.

Special thanks are due to Frances Stevenson and Matthew Foley at the Humanitarian Practice Network for having the imagination to commission this review, remaining calm in the face of missed deadlines and a growing word count, and helping to shape the finished product.

The Benfield Hazard Research Centre at University College London, where I hold an honorary research fellowship, has provided a helpful and congenial working environment. My task would have been difficult, if not impossible, without this support.

I dedicate this book to Judith, Sonia and Adam, who can now expect to see more of me.

John Twigg
London, March 2004

The author and publisher are grateful to the following for permission to reproduce images: The International Strategy for Disaster Reduction (Figure 1.1); Terra Publishing (Figure 2.1); Routledge (Figure 2.2); Lynne Rienner Publishers (Figure 4.1); and ITDG Publishing (Figures 11.3 and 15.1).

Carmen Schlosser kindly gave permission to use an unpublished diagram (Figure 16.1).

The photographs on pages 81, 115, 135, 149, 234, 252 and 255 were kindly supplied by ITDG's image library.

Grateful thanks to Jean Long for her help in selecting them.

Chapter 1
Introduction

1.1 Disaster reduction: a challenge for everyone

As this Good Practice Review was being drafted, a series of news stories demonstrated why such a book is needed.

On 23 May 2003, the BBC News website reported that at least 200 people had died from dehydration and sunstroke in a heat wave in the southern Indian state of Andhra Pradesh. Temperatures had soared to 47.2°C. The previous year, a heat wave had killed more than 1,000 people in the state and caused widespread drought. In the northern state of Rajasthan, which was suffering its fourth consecutive year of drought, all 32 districts were declared drought regions, and the state's Chief Minister asked the national government for $1.5bn of aid. Two weeks later, the government of Sri Lanka appealed for nearly $30m in international aid as monsoon rains caused the worst floods in the country's history. Two hundred and thirty-five people died, 108,000 families were affected, and 9,000 houses and 90 schools were destroyed. Hundreds of kilometres of power lines needed replacing.

Elsewhere in the world, other natural hazards were exacting their toll. In late April, a mountain hamlet in Guatemala was destroyed by a landslide. At least seven people were killed, a dozen were missing and 250 made homeless. Residents said they had been urged to evacuate the area some time before, because the mountainside was unstable, but they were so poor they could not afford to move. In early May, a 17-second earthquake flattened a school boarding house in Turkey, killing 83 children. On 21 May, earth tremors killed over 2,200 people and injured 10,000 in Algeria; the government authorised a $1.8bn rebuilding package.

There was encouraging news too. The BBC's correspondent in Cameroon reported that ten new seismographs costing over $300,000 had been installed on Mount Cameroon, an active volcano, to monitor its activity and give warning of future eruptions. Meanwhile, an NGO worker in Malawi was recording that the response to the country's food crisis had averted a major disaster. She described visiting a village whose harvest had been damaged by floods as well as drought. The villagers were concerned that their intensive farming practices were eroding the riverbanks, and so they had started a tree nursery, planting saplings along the banks to help bind the soil.

These examples illustrate two important points.

First, natural disasters – that is, disasters resulting from natural hazards such as cyclones, droughts, floods, earthquakes, landslides and volcanic eruptions – are widespread and numerous in developing and middle-income countries. They can cause great loss of life and immense damage to communities, infrastructure and national economies. Ethical, humanitarian considerations oblige us to act to protect human life and prevent suffering. Many researchers and aid institutions have identified natural disasters as a major threat to sustainable development (see Chapter 2).

Second, there is much that can be done to protect vulnerable communities against disasters. The good news stories from Cameroon and Malawi exemplify the range of different approaches to disaster reduction, from scientific and high-tech to community-managed with local resources. This book presents many other examples.

1.2 The risk management approach

The literature on hazards and disasters is full of technical terms. Two – mitigation and preparedness – are commonly used to categorise the main methods of protecting communities against hazards and disasters. They appear in the title of this book for that reason. 'Mitigation' is any action to minimise the impact of a potential disaster; 'preparedness' refers to specific measures taken before a disaster strikes, usually to issue warnings, take precautions and facilitate a rapid response.

These and other key terms, such as disaster, hazard and vulnerability, are explained more fully in Chapter 2. However, this Review sidesteps the technical jargon as far as possible because many people working in aid and development find it off-putting. A related problem is that use of the emotive word 'disaster' automatically conjures up images of emergency relief and often leads to disaster reduction work being viewed solely as an aspect of humanitarian aid, when it should also be a central component of development programmes.

The basic principle underlying this Good Practice Review is that programming should adopt a risk management approach – a systematic approach to identifying, assessing and reducing risks of all kinds associated with hazards and human activities. Risk management should be an integral part of the way organisations do their work, not an add-on or a one-off action. The modern risk management approach recognises that a wide range of geological, meteorological, environmental, technological and socio-political hazards threaten

society – individually and in complex interaction. Risks are located at the point where hazards, communities and environments interact, and so effective risk management must address all of these aspects. Hence disasters are no longer seen only as unfortunate one-off events to be responded to, but also as deep-rooted and longer-term problems that must be planned for.

Historically, disaster mitigation and preparedness have tended to fall into the gap between development cooperation and humanitarian assistance. In one sense the distinction between relief and development is artificial in that risk is not a distinct sector. It should be everyone's business and, as this review shows, an extensive range of options and approaches is available. Project planners and managers should take a very broad view of the options available to them, and they should be imaginative in their approach.

Nevertheless, the principles and activities of humanitarian agencies differ from those of development agencies in some important respects. The primary goals of humanitarian action are distinctive: to protect life, where this is threatened on a large scale, and to reduce excessive human suffering. Some elements of risk management fit more naturally into one sphere or another – for example, disaster preparedness is closely linked to emergency response, whereas longer-term mitigation approaches tend to have much in common with development processes. Greater coherence between developmental and humanitarian interventions is essential, but this must be based on a realistic assessment of the purpose and limits of the different agendas.

1.3 Readership

This Good Practice Review is intended for practitioners: principally project planners and managers working at sub-national and local levels, mostly in NGOs but also in local government and community-based organisations (CBOs). It is also aimed both at people working on long-term development programmes and those involved in emergency management. The book is for those working with vulnerable people, wherever they may be, and before, during and after disasters.

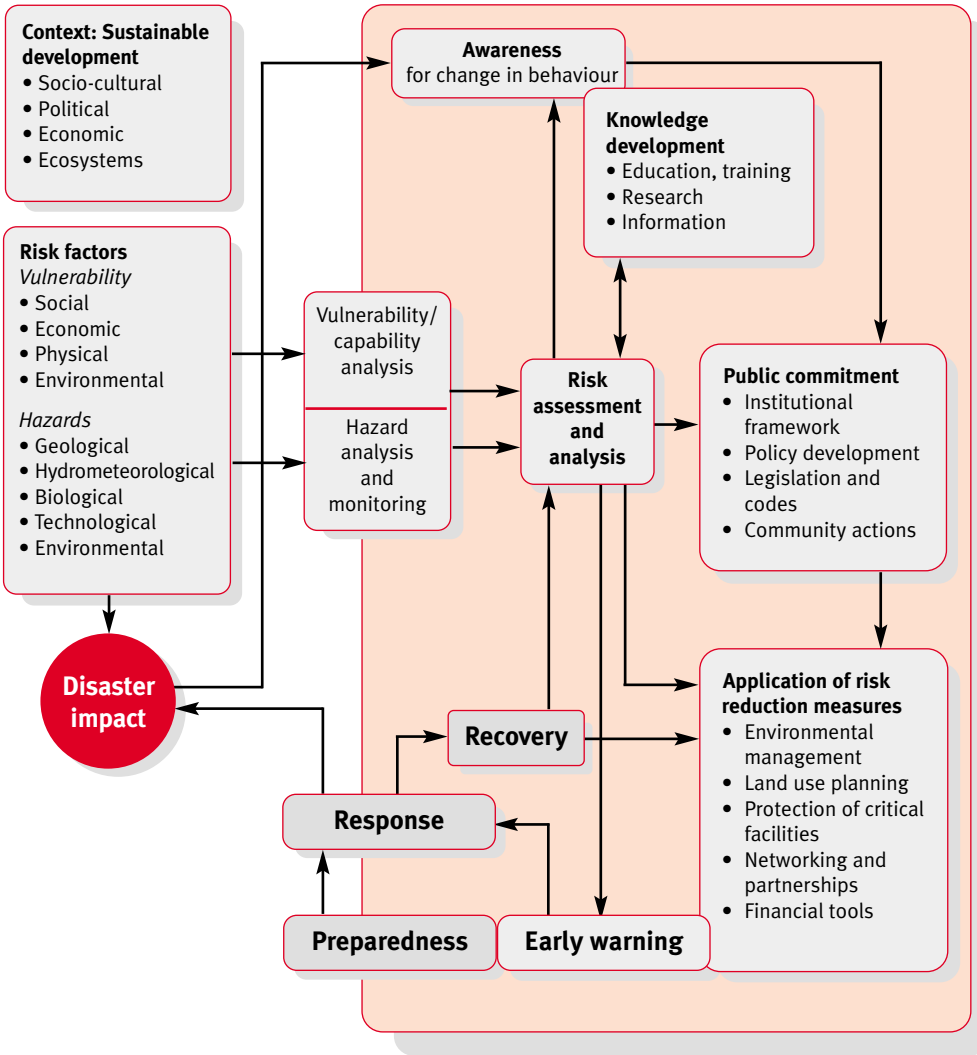
1.4 Aims and scope

This Review aims to help project planners and managers to:

- appreciate the significance of hazards (primarily natural hazards) and the risks associated with them;

Figure 1.1

A framework for disaster risk reduction



Living with Risk: A Global View of Disaster Reduction Initiatives (Geneva: UN International Strategy for Disaster Reduction, 2002), p. 23.

Case Study 1.1
An integrated approach to local risk management

The Lower Lempa River Valley in El Salvador covers 850 square kilometres and has a population of 30,000–40,000 people, living in nearly 90 villages and small towns. It is fertile and agriculturally productive. Seasonal flooding is a regular feature, but few reports of disastrous floods were recorded before the 1990s. Since the end of hostilities between the government and the Farabundo Marti National Liberation Front (FMLN) in 1992, land in the area has been given over to ex-combatants, and many poor families have been relocated there. Many of the new inhabitants are from urban centres and were put in flood-prone areas. Institutional and political divisions led to quite different approaches to environmental management being adopted on opposite banks of the river.

In 2000, a project began to coordinate disaster risk reduction and sustainable development in the valley. Its starting-point was that disaster risk could only be addressed holistically, in the context of the everyday insecurity experienced by over 70% of the local population who lived below the poverty line.

A broad-based diagnosis of the situation, with extensive community participation, led to a portfolio of project proposals that addressed disaster and development needs. It included:

- improved woodland management as a natural buffer to floods and for sustainable economic exploitation;
- a training programme on risk management for local organisations and communities;
- strengthening local early-warning systems;
- land planning and community reorganisation, including improved access to public services and work places and for emergency operations;
- construction of safer housing and relocation of people living in particularly hazardous areas; and
- clean water supply systems and hygiene projects.

A. Lavell, 'The Lower Lempa River Valley, El Salvador: From Risk to Sustainability. Experience with a Risk Reduction and Development Project', in G. Bankoff, G. Frerks and D. Hilhorst (eds), *Mapping Vulnerability: Disasters, Development and People* (London: Earthscan, 2003).

- appreciate the need for risk management in project planning and implementation, and the value of such efforts;
- recognise the main issues that must be understood and addressed when carrying out risk reduction or disaster mitigation and preparedness initiatives; and
- understand – at least in broad terms – how to address these issues in practice, throughout the project cycle.

It is easy to be intimidated by the scale and extent of the problem, and the variety of counter-risk approaches that can be taken. But lasting protection against disasters will not be reached overnight. It is a long-term goal to be attained through a continuous process of improvement. Community resilience to hazards can be built up incrementally over time, as long as the basic approach is sound.

This Review is above all a practical document. However, it is not a manual. Its emphasis is on the *process* of planning and implementing risk reduction initiatives. It focuses on key issues and decision points and how to address them. Readers are referred to more detailed technical manuals and studies where appropriate. It has been difficult to present a balanced coverage of such a broad and diverse subject, and there are inevitable gaps. Nevertheless, the book is evidence-based. The descriptions and discussions are supported by case studies, which aim to give a sense of the range and diversity of practical approaches that can be used.

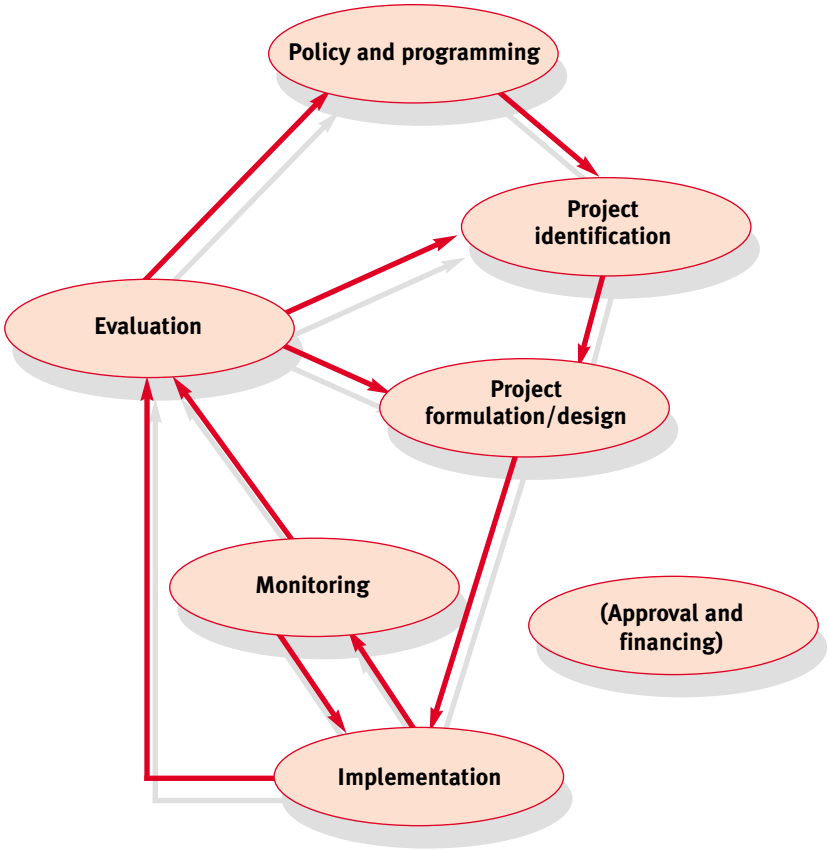
1.5 Contents and structure

The approach taken in the following chapters is based upon the 'project cycle', highlighting issues that appear at stages in the cycle and giving guidance on how to deal with them. Hence, there are chapters on planning (3 and 4), implementation (5–17) and monitoring and evaluation (18).

Every operating manual seems to have its own formulation of the 'project cycle', but most contain the following four main features, outlined here in simplified form (the cycle is shown diagrammatically in Figure 1.2).

- *Policy-making and general programming*. An organisation's policies and strategies (thematic or geographical), country plans and the like, which guide the general direction of its work and approach taken.
- *Project planning*. Identifying needs, defining approaches, setting objectives and designing a scheme of work, obtaining formal approvals and resources to carry out the work.

Figure 1.2
The project cycle



- *Implementation*. Carrying out the planned activities over a set period of time to achieve the desired outputs, monitoring activities and results, and making appropriate modifications to the project.
- *Evaluation*. Analysis of the outputs and impact of the project during its lifetime, when it finishes and – ideally – some time after it has finished; feeding the findings of the evaluation into future projects and into general policy and programming guidelines.

A similar cyclical approach is used in the risk management process, although the terminology and focus are different from that of development programming. It can be seen as a five-stage process:[1]

1 Establish the context (strategic, organisational, other).
2 Identify potential risks.
3 Analyse the risks by assessing the likelihood and impact of an event.
4 Set priorities for addressing the risks (which can include a decision not to address some risks).
5 Treat the risks (identify, plan and implement activities).

Stages 1–4 are equivalent to project identification; stage 5 comprises both project formation and implementation. Monitoring, review and feedback comprise an additional element that operates throughout the project cycle.

The approach adopted in this Review does present some problems, however. The first is that real-life initiatives never fit neat 'project cycle' concepts. For the sake of analytical clarity, this Review has adopted a schematic approach, while recognising the limitations. Second, one could go further and argue that, because risk reduction is an ongoing process, it should not be artificially 'projectised'. This is a sound argument, and the following chapters illustrate problems that project-based approaches can cause. However, the aim is to present an approach that will be readily understood by people working in all fields of development or humanitarian work. Viewing risk reduction as a goal or ongoing process means that organisations can make the standard project cycle approach progressively more 'risk-aware' or 'risk-oriented' over time. This pragmatic approach is particularly helpful when it comes to incorporating mitigation features into development planning.

Notes

1 Standards Association of Australia, *Risk Management. AS/NZS 4360: 1999* (Strathfield: Standards Association of Australia, 1999), p. 11.

Chapter 2
Disasters explained

2.1 Disasters and sustainable development

In the words of Didier Cherpitel, Secretary General of the International Federation of Red Cross and Red Crescent Societies (IFRC):

> *Disasters are first and foremost a major threat to development, and specifically to the development of the poorest and most marginalized people in the world. Disasters seek out the poor and ensure they stay poor.*[1]

Disasters resulting from natural hazards killed on average more than 60,000 people each year between 1992 and 2001. Over the same period, they directly affected on average 200m people each year (through damage to homes, property, crops and livestock and local infrastructure). The number affected indirectly (for example by rising prices or job losses caused by adverse economic consequences) is incalculable. The average annual economic loss worldwide from natural disasters between 1992 and 2001 amounted to $69bn. All of these are conservative estimates.

Developing countries are hit hardest by natural disasters. Between 1992 and 2001, 96% of deaths from natural disasters were in countries classified by the UN Development Programme (UNDP) as of medium and low human development. Over the same period, 98% of those directly affected lived in these countries. In absolute terms, most of the economic losses are felt in wealthier countries: 63% of economic loss between 1992 and 2001 was in countries of high human development, owing to the concentration of wealth in these countries. However, the economic impact on developing countries is also severe, and in relative terms usually much higher. Hurricane Mitch in 1998 was said to have put Honduras' economic development back 20 years (see Case Study 2.1). In Peru, El Niño-related storm damage to public infrastructure alone caused damage valued at $2.6bn in 1998 – equivalent to 5% of the country's GDP. Losses from major earthquakes in 1999 cost Turkey $20bn, and losses from landslides in Venezuela in the same year cost $10bn – equivalent to over 10% of each country's GDP.[2]

The imbalance in impact between developed and developing countries is due partly to geography. Many developing countries are highly hazard-prone. The

Case Study 2.1
Honduras and Hurricane Mitch

Hurricane Mitch has been described as the Western Hemisphere's worst-ever disaster. The exceptionally heavy rainfall it brought over a 48-hour period in October 1998 caused flash floods and landslides across Central America, leaving 10,000 people dead and nearly 20,000 missing. Over 2.5m people were in need of emergency aid.

Honduras, the second-poorest country in the Western Hemisphere, was hit hardest. The US Geological Survey estimated that the hurricane triggered over a million landslips and mudslides. Almost 6,000 people were killed and 11,000 declared missing. A million people – one-sixth of the population – were made temporarily homeless. More than 35,000 houses were destroyed and another 50,000 badly damaged. A year after the hurricane, 26,000 people were still living in camps, and another 100,000 with friends and relatives or in makeshift shelters.

Seventy per cent of the country's productive infrastructure was damaged or destroyed; over 90 major bridges were wrecked. The government initially estimated the cost of reconstruction at $5bn. Damage to the agricultural sector was severe, creating food shortages and destroying vital export crops: 25% of coffee plantations and 50% of banana plantations were lost. The two main banana-producing companies laid off 25,000 workers for 12 months, claiming the crop would not recover until 2000. Peasant farmers on marginal lands on hillsides and along river banks were among the worst affected (60% of Honduran farmers have access to only 6% of the country's arable land, mostly of poor quality) because the rain and landslides took topsoil away, and the flooding rivers deposited large amounts of sand on the fields.

M. Rodgers, *In Debt to Disaster: What Happened to Honduras After Hurricane Mitch* (London: Christian Aid, 1999), http://www.christian-aid.org.uk/reports/indebt/indebt.html.

Philippines, for example, suffers from volcanic eruptions, earthquakes, floods, landslides, cyclones (typhoons) and, in some places, drought. The Indian state of Gujarat, which was struck by a severe earthquake in January 2001, had already been in the grip of drought for several years, and had recently been affected by a major cyclone, bubonic plague and civil unrest. But physical

geography is far from a complete explanation. The resilience of a country's economy, society and institutions must also be taken into account. The US, for instance, is also very hazard-prone: like the Philippines it faces earthquakes, volcanoes, droughts, floods, landslides and hurricanes – and also suffers from frequent tornadoes, wildfires and snowstorms. These hazards sometimes cause considerable damage and affect many people, but the country as a whole is able to protect itself against disasters and recover from them effectively.

The human and economic cost of disasters has risen steeply over the past few decades. The number of people affected in the 1990s was nearly three times greater than during the 1970s. Economic losses in the 1990s were nearly five times higher *in real terms* than in the 1970s. Global warming, which is likely to create many more 'extreme' weather events such as storms and droughts, as well as flooding, could push economic losses up to more than $300bn a year within decades.[3] The increasing concentration of the world's population in towns and cities, many in hazardous locations such as earthquake zones, could lead to many more major urban disasters (see Chapter 14).

Beyond the headline-grabbing major events and global and national disaster statistics lie individual communities and families whose lives have been ruined. In November 1993, the sea flooded 3,200 acres of farmland on the coast of Gujarat. Salt water stood on the land for 15 hours, killing wheat and cotton crops and wrecking the livelihoods of 800 families. Farmers reckoned they would have to migrate in search of work for several years until the land recovered. There were also other social consequences: 'Nobody wants to give a daughter [in marriage] to a young man from this area', said one villager.[4] 'We lost everything we had worked for during our lives,' said a Mozambican woman after the floods in 2000, 'we do not know when and where to start.'[5] Moreover, standard disaster statistics underestimate the impact of natural hazards on society because the impact of many harmful events falls below the threshold of what constitutes a 'disaster'. Yet the cumulative impact of such events may be considerable (see Box 2.1).

2.2 Terms and concepts

While this Review tries to avoid jargon wherever possible, there is no getting around some basic terms and concepts. The terms fall into two groups:

1. *Disaster terminology:* terms concerning the nature and elements of disasters.
2. *Disaster management terminology:* terms for different components of disaster management.

Box 2.1
'Everyday disasters'

A 'disaster' is normally defined as damage and disruption that exceeds the affected society's capacity to cope (see Chapter 2.2). Databases define disasters according to levels of casualties and losses. The EM-DAT database managed by the Centre for Research on the Epidemiology of Disasters (CRED), the most authoritative source of data on disasters' impact worldwide, requires at least one of the following four criteria to be met for an event to be recorded as a disaster:

- ten or more people reported killed
- 100 reported affected
- a call for international assistance
- and/or a declaration of a state of emergency

There is a growing body of research from Latin America showing that the cumulative impact of what are sometimes referred to as 'everyday disasters' – small, local events triggered by natural hazards that do not usually require external humanitarian assistance – may in some countries be greater than that of the much smaller number of larger events that are formally recorded as disasters. For example, data from Guatemala on all hazard events during the period 1988–98 (excluding Hurricane Mitch) records 1,666 individual events leading to 1,393 deaths and 395,961 people affected. Over the same period (and including Mitch), the EM-DAT database recorded only 19 disaster events in Guatemala, leading to 859 deaths and affecting 192,830 people.

G. Gellert, *Algunas lecturas de riesgo y vulnerabilidad en Guatemala, utilizando la herramienta DesInventar* (Guatemala: FLACSO, 1999); CRED, EM-DAT International Disaster Database Website, http://www.cred.be/emdat/intro.html.

Researchers and practitioners do not use these terms consistently and many definitions are academic and hence over-elaborate. This Review follows common usage, but technical language is sometimes turned into more everyday language – at the risk of oversimplification. Other terms are explained later, as and where necessary.

2.2.1 Disaster terminology

- *Hazard*. A potential threat to humans and their welfare. Hazards can be natural (such as earthquakes and droughts) or induced by human

processes (such as industrial accidents). Some people use the term 'environmental hazards'. Box 2.2 categorises hazards in more detail.
- *Risk*. The likelihood of a specific hazard occurring and its probable consequences for people and property.
- *Vulnerability*. The extent to which a person, group or socio-economic structure is likely to be affected by a hazard (related to their capacity to anticipate it, cope with it, resist it and recover from its impact: see Chapter 2.3). Note that scientists and engineers often use the term in a more narrow sense, referring to physical structures.
- Disaster. What occurs when the impact of a hazard on a section of society (causing death, injury, loss of property or economic losses) overwhelms that society's ability to cope. Box 2.3 identifies different categories of disaster.

2.2.2 Disaster management terminology

- *Mitigation*. Any action taken to minimise the extent of a disaster or potential disaster. Mitigation can take place before, during or after a disaster, but the term is most often used to refer to actions against potential disasters. Mitigation measures are both physical or structural (such as flood defences or strengthening buildings) and non-structural (such as training in disaster management, regulating land use and public education).
- *Preparedness*. Specific measures taken before disasters strike, usually to forecast or warn against them, take precautions when they threaten and arrange for the appropriate response (such as organising evacuation and stockpiling food supplies). Preparedness falls within the broader field of mitigation.
- *Prevention*. Activities to ensure that the adverse impact of hazards and related disasters is avoided. As this is unrealistic in most cases, the term is not widely used nowadays.

The more general term 'disaster reduction' or 'disaster risk reduction' is often used, to mean the broad development and application of policies, strategies and practices to minimise vulnerabilities and disaster risks throughout society, through prevention, mitigation and preparedness.

'Disaster management' is also often used in a general sense, covering the implementation of preparedness, mitigation, emergency response and relief and recovery measures.

2.2.3 The disaster cycle

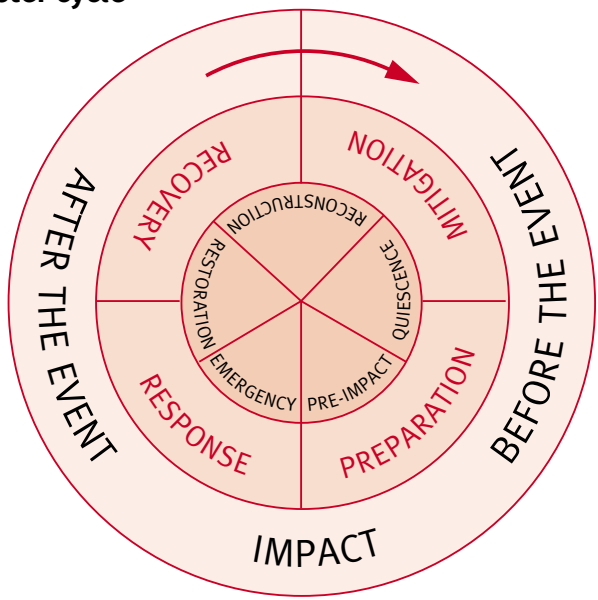
Many manuals and training courses present the idea of a disaster 'cycle' to illustrate where the different elements of disaster management (including

relief and recovery) link with one another (see Figure 2.1). This is an over-simplification, as the components do not fit together neatly or in exact sequence in the way shown in most diagrams: there can be substantial overlap. Nevertheless, a diagrammatic presentation may be helpful.

2.3 Vulnerability: disasters and development processes

The traditional view of disasters held that they were temporary interruptions of a linear development process that was leading to ever-improving standards of living. The task of humanitarian aid, therefore, was to patch things up so that the process of development could start up again. Emergency relief would be followed by rehabilitation, leading in turn to renewed development work.

Figure 2.1
The disaster cycle



D. Alexander, *Principles of Emergency Planning and Management* (Harpenden: Terra Publishing, 2002), p. 6.

Box 2.2

Types of hazard: natural, technological, environmental

Hazard

Potentially damaging physical event, phenomenon and/or human activity, which may cause loss of life or injury, property damage, social and economic disruption or environmental degradation.

Natural hazards

Natural processes or phenomena occuring in the biosphere that may constitute a damaging event.
Natural hazards can be classified by origin: geological, hydrometeorological or biological.

Origin	Phenomena/Examples
Geological hazards Natural earth processes or phenomena in the biosphere, which include geological, neotectonic, geophysical, geomorphological, geotechnical and hydrogeological nature	• Earthquakes, tsunamis; • Volcanic activity and emissions; • Mass movements i.e.: landslides, rockslides, rockfall, liquefaction, submarine slides; • Subsidence, surface collapse, geological fault activity.
Hydrometeorological hazards Natural processes or phenomena of atmospheric, hydrological or oceanographic nature	• Floods, debris and mud flows; • Tropical cyclones, storm surges, thunder/hailstorms, rain and wind storms, blizzards and other severe storms; • Drought, desertification, wildland fires, heat waves, sand or dust storms; • Permafrost, snow avalanches.
Biological hazards Processes of organic origin or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bio active substances	Outbreaks of epidemic diseases, plant or animal contagion and extensive infestations.

Technological hazards

Danger originating from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause loss of life or injury, property damage, social and economic disruption or environmental degradation. Sometimes referred to as anthropogenic hazards. Some examples: industrial pollution, nuclear activities and radioactivity, toxic wastes, dam failures; transport, industrial or technological accidents (explosions, fires, spills)

Environmental degradation

Processes induced by human behaviour and activities (sometimes combined with natural hazards), that damage the natural resource base or adversely alter natural processes or ecosystems. Potential effects are varied and may contibute to an increase in vulnerability and the frequency and intensity of natural hazards.
Some examples: land degradation, deforestation, desertification, wildland fires, loss of biodiversity, land, water and air pollution, climate change, sea level rise, ozone depletion.

Living with Risk: A Global View of Disaster Reduction Initiatives
(Geneva: UN International Strategy for Disaster Reduction), p. 44.

The 1980s and 1990s showed that development has its failures, as well as its successes. A closer look at natural disasters has undermined the belief that victims' lives can soon return to normal. Moreover, the development process itself can make people vulnerable to natural hazards. Human vulnerability is becoming increasingly prominent in aid and development thinking.

The phrase 'natural disaster', which is widely used by specialists and generalists alike, often causes confusion and has been the subject of debate. Strictly speaking, there is no such thing as a natural *disaster*: there are only natural *hazards*. The difference between a hazard and a disaster is an important one. A disaster takes place when a society or community is affected by a hazard (it is usually defined as an event that overwhelms a society's capacity to cope). In other words, the impact of the disaster is heavily influenced by the degree of the community's *vulnerability* to the hazard.

This vulnerability is not natural. It is the human dimension of disasters, the result of the whole range of economic, social, cultural, institutional, political and even psychological factors that shape people's lives, and create the environment that they live in. Extensive research over the past 30 years has shown that, in general, it is the weaker groups in society that suffer worst from disasters: the poor (especially), the very young and the very old, women, the disabled, and those who are marginalised by race or caste (see Chapter 6). Those who are already at an economic or social disadvantage tend to be more likely to suffer during disasters. This question of society's resilience and vulnerability is very important for understanding the impact of disasters, and making choices about how to intervene.

Vulnerability is more than just poverty, but the poor tend to be most vulnerable. This is perhaps most apparent in the economic pressures that force people to live in cheap but dangerous locations, such as flood plains and unstable hillsides. An earthquake in 1976, which killed 1,200 people and made 90,000 homeless in Guatemala City, was popularly called a 'class quake' because most of the victims lived in slum areas; many of their homes were in dangerous ravines that were the only places they could afford to live in. The rich, in better constructed houses and safer locations, were affected far less.[6]

Another very visible cause of vulnerability is environmental degradation. In 1995, a World Bank publication estimated that 80% of the poor in Latin America, 60% of the poor in Asia and 50% of the poor in Africa lived on 'marginal lands that are characterized by poor productivity and high vulnerability to natural degradation and natural disasters'.[7] The human impact on the

Box 2.3
Types of disaster and emergency

Disasters and emergencies are sometimes grouped into six main categories:

- *Natural, rapid-onset*. These are triggered by natural hazards such as earthquakes, cyclones, floods, landslides, avalanches, volcanic eruptions and certain types of disease epidemics. They occur suddenly, often with very little warning.
- *Technological, rapid-onset*. These are the result of industrial accidents (for example a chemical or oil spill or a nuclear accident), major transport accidents, or disruption to other technological systems. They also occur suddenly, with little warning.
- *Slow-onset*. This term is used mostly to refer to food shortage or famine triggered by drought or pest attacks on crops, where the crisis builds up over several weeks or months. It can also cover disasters caused by environmental degradation or pollution (see Chapter 15).
- *Complex political emergencies*. Natural hazards, especially drought, may be a factor here, but a complex political emergency is characterised by protracted political instability and often high levels of violence.
- *Permanent emergencies*. These are the result of widespread structural poverty that requires more or less permanent welfare, but can be made worse by natural hazards.
- *Mass population displacements*. Displacement can be a cause or a consequence of other types of emergency.

Adapted from B. Byrne and S. Baden, *Gender, Emergencies and Humanitarian Assistance* (Brussels: European Commission, 1995), p. 5.

natural environment heightens the risk of disaster in many ways. For example, cutting down trees causes soil erosion and landslides that in turn can silt up rivers and cause flooding downstream. Building on flood plains reduces the amount of ground surface that can absorb rainfall, and so rain water runs off much faster into rivers, putting pressure on river banks and thereby increasing the likelihood of flooding. Overgrazing and over-cultivation can lead to soils becoming exhausted, or to erosion and landslides.

Case Study 2.2
Causes of the 2002 food crisis in Southern Africa

By the middle of 2002, it was clear that a major food crisis was likely to occur in Southern Africa. Nearly 13m people in six countries were considered at risk of extreme food shortages or even starvation before the next main harvest was due, in April/May 2003. A massive regional and international aid effort was begun to provide food aid. The crisis had no single cause across the region, or in individual countries. A complex mix of factors was at work and the relative influence of these was hotly debated during the next few months.

The most obvious problem was the weather. There had been a prolonged drought, causing widespread crop failure. This was exacerbated here and there by unseasonal flooding that destroyed growing crops. The price of the main staple food, maize, shot up – by 300% or more in some places – putting it beyond the reach of many poor people. But the underlying factors were at least as important. Poverty, widespread in the region, was particularly significant. Even in a normal year, 40–50% of households use up the food they have produced four or five months before the next harvest: for the rest of the time, they have to buy food and use other coping strategies such as reducing the number of meals. The drought affected production not only of food crops but also of cash crops, thereby reducing purchasing power. It was also argued that high levels of HIV/AIDS in the region were weakening people's capacity to farm their land effectively, as many in the most productive age group were infected.

There was much debate about the impact of economic liberalisation policies on seed and food supplies, and about the role of international financial institutions in imposing such policies. Without some state intervention in the food market (through price controls and subsidies for production and agricultural inputs) to provide a safety net, it appeared that poor people were much more vulnerable to shocks such as erratic weather. Malawi, one of the countries worst affected, had sold off its grain reserve on the advice of the International Monetary Fund (though it was not clear what it had done with the money). In several countries poor governance – misguided agricultural policies, limited administrative capacity, corruption and bias towards particular groups – was also blamed.

Crisis in Southern Africa, Briefing Paper 23; *Death on the Doorstep of the Summit*, Briefing Paper 29, Oxfam, 2002.

The underlying factors contributing to vulnerability are less immediately visible. For example, one needs to consider not just the fact that people live in flimsy houses in hazardous locations, but *why* they live there, which could be the product of such forces as:

- poverty (itself the result of local, national and even global economic forces);
- population growth;
- displacement due to economic development (for example loss of smallholdings to commercial agriculture);
- migration to towns and cities (which has a variety of socio-economic causes);
- legal/political issues, such as lack of land rights;
- discrimination;
- government macro-economic and other policies; and
- other political features, such as the failure of government and civil society institutions to protect citizens.

The chain of causality, from root causes to local dangers, can be both long and complex, but by tracking it one can identify a 'progression' of vulnerability that builds up pressures on communities. These pressures can be released by taking measures to reduce vulnerability all along the causal chain (see Figure 2.2).

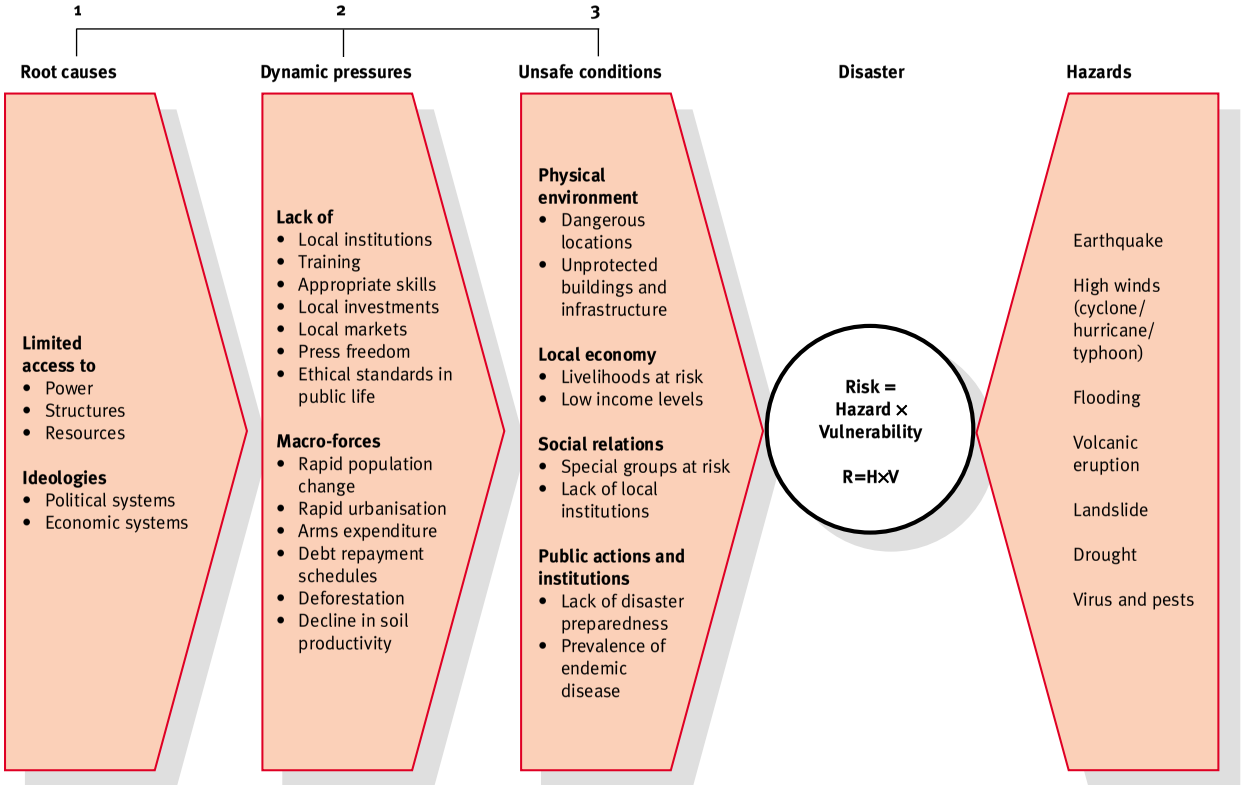
Even well-intended development programmes can increase vulnerability. For example, promoting heavily irrigated rice agriculture can lead to the increased incidence of malaria because mosquitoes breed where there is standing water; building embankments for new roads and railway lines can block natural flood drainage channels.

2.4 Disaster myths

Myths about disasters are widespread and persistent, despite repeated experience to the contrary and the findings of social science research. They are often reinforced in the public mind by media coverage. Disaster myths are a significant problem, because they influence the way operational agencies think and act. Among the most prominent myths are the following:[8]

- Disasters are acts of God (which means that nothing can be done about them) or acts of nature (which means that the problem can be resolved by scientific or technical interventions alone).
- People are fatalistic about disasters and do not take action to protect themselves against future events.
- When a disaster strikes, people are helpless, passive, dependent victims

Figure 2.2
The progression of vulnerability



B. Wisner et al., *At Risk: Natural Hazards, People's Vulnerability and Disasters* (London: Routledge, 2004), p. 51.

incapable of carrying out even basic tasks. Therefore they rely on help from aid agencies.
- People panic during disasters; they cannot be relied upon to react rationally at times of great danger.
- The chaos that follows disasters encourages many people to engage in anti-social behaviour (particularly looting).
- External 'experts', with their advanced knowledge and technologies, are the main agents in risk reduction and disaster response.
- The situation will return to normal within a few months of the disaster, and support for rehabilitation need only be for the short term.

2.5 Chapter summary

- Disasters triggered by natural hazards are a major threat to life and to sustainable development, especially in developing countries.
- The human and economic cost of disasters is rising, mainly because societies are becoming more vulnerable to hazards.
- Socio-economic vulnerability is complex and often deep-rooted.
- The weaker groups in society suffer most from disasters.
- Many persistent myths about disasters should be discarded.

Notes

1 D. Cherpitel, 'Deadly Forces', *The Guardian*, 28 March 2001.
2 *World Disasters Report 2002: Focus on Reducing Risk* (Geneva: International Federation of Red Cross and Red Crescent Societies, 2002), pp. 10, 186–88.
3 *Ibid.*, p. 10.
4 Mihir Bhatt, 'Participation, Planning and Mitigation in Dhandhuka', *Appropriate Technology*, vol. 22, no. 4, 1996, pp. 12-15.
5 *World Disasters Report 2002*, p. 11.
6 I. Davis, *Shelter after Disaster* (Oxford: Oxford Polytechnic Press, 1978), pp. 13–15, 21–22; P. Blaikie, T. Cannon, I. Davis and B. Wisner, At Risk: *Natural Hazards, People's Vulnerability and Disasters* (London: Routledge, 1994), pp. 170–71.
7 C. Clarke and M. Munasinghe, 'Economic Aspects of Disasters and Sustainable Development: An Introduction', in Munasinghe and Clarke (eds), *Disaster Prevention for Sustainable Development: Economic and Policy Issues* (Washington DC: The World Bank, 1995), p. 2.
8 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, pp. 16–18; C. De Ville de Goyet, 'Stop Propagating Disaster Myths', *Australian Journal of Emergency Management*, vol. 14, no. 4, 1999–2000, pp. 26–28.

Chapter 3
Institutionalising risk reduction

3.1 Introduction

When planning a programme or project of any kind, there are two important points to consider. First, planning and policy decisions are never made in isolation from the wider context of events, societies and institutions. In this sense, they are essentially 'political' decisions; they are certainly not purely technical ones. In particular, the ideologies and policies of governments and other institutional actors, and the factors that affect them, are part of the context in which the work will take place, and should be analysed as part of project planning (see Chapter 5).

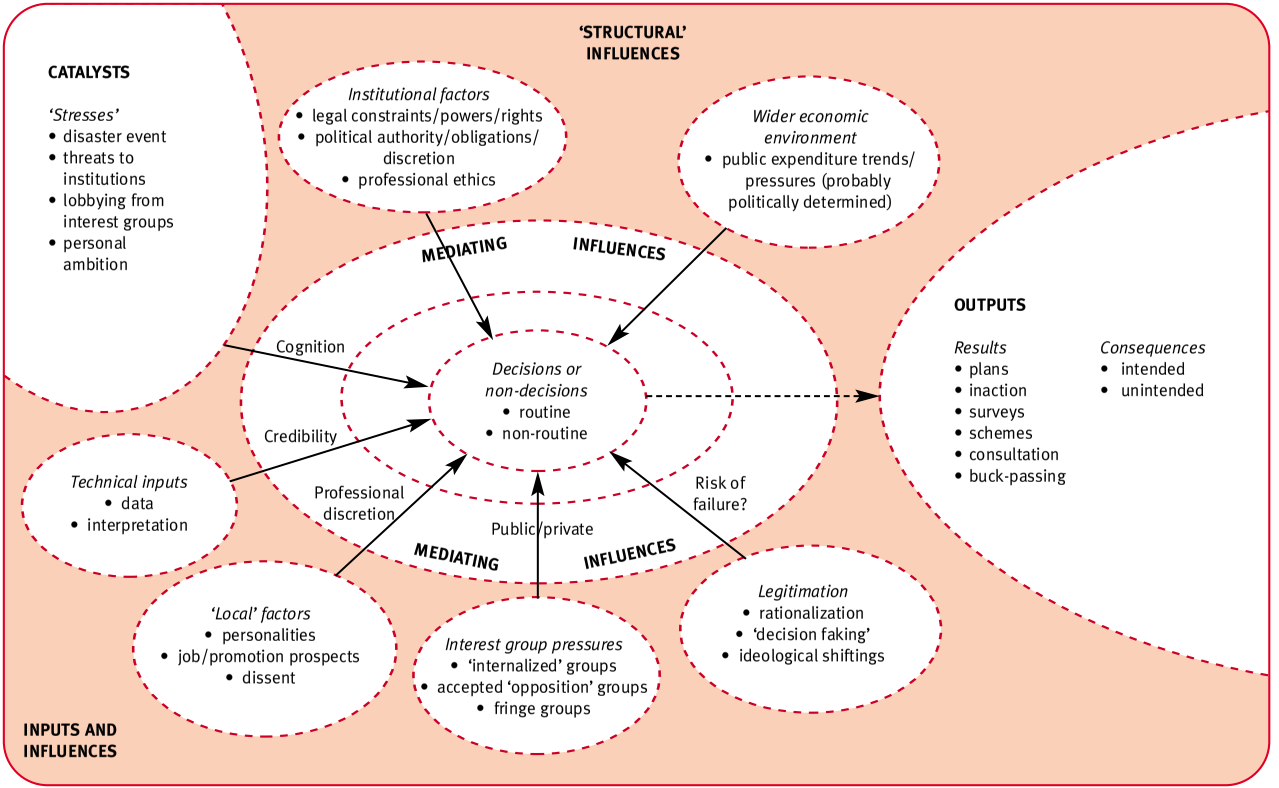
Second, the nature of the organisation planning the programme influences the way in which it approaches disaster reduction (or indeed any other issue). Programmes in the field must be supported by appropriate organisational attitudes, structures and systems. This means that institutional development is a vital part of the risk reduction process. Awareness of disasters and risk, and commitment to dealing with them, must be incorporated at all levels within an organisation. Risk management, in the broadest sense, should be an integral part of organisational strategy, procedures and culture. There is little guidance available on how to do this, and the guidance that there is usually takes the form of general principles, unsupported by examples of good or bad practice.

This chapter covers two aspects of the problem:

1. It identifies and comments on a few basic indicators that can show how far disaster risk reduction is being incorporated at organisational level.
2. It summarises some of the main challenges to 'mainstreaming' mitigation and preparedness within agencies, and the main opportunities for doing so.

The prospect of 'institutionalising' risk reduction in this way can be intimidating to organisations, but it becomes less so if it is approached as a process. It is unrealistic to expect organisations to mainstream mitigation overnight: it will usually take some time to achieve this, especially in large organisations. Improvements can be made incrementally. The reviews of policies, strategies and systems that all organisations carry out periodically offer a good opportunity to incorporate risk awareness and reduction practices with minimal

Figure 3.1
Decision-making in a political context



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), p. 18.

disruption. However, gradualist approaches should not be used as an excuse for delay: disasters can strike agencies, and those they aim to help, at any time.

3.2 Indicators of institutionalisation

Indicators can be found at all levels of an organisation, covering many different aspects of its work.

3.2.1 The policy level

Policy statements should refer to the importance of disasters, vulnerability or risk and commit the organisation to addressing these issues. They should set out the agency's broad goals in overcoming the problem, linked to its strategic objectives. Firm commitments to take action are particularly important, but are likely to be vague or rhetorical, and are often absent even when the importance of disasters has been acknowledged. Hazard-induced disasters may be placed under the catch-all heading of 'external shocks and stresses', which can indicate that the agency concerned is taking a holistic approach to vulnerability, but may lead to their particular significance being played down.

Nevertheless, general policy statements are important because they give a mandate to managers and planners within organisations. A specific risk/disaster policy can be helpful, but will only be feasible for large organisations. Even there, such a policy may become just one of many.

3.2.2 The strategic level

The limitations of policy statements make it essential to provide support at the level of strategic planning. An organisation's strategy or business plan should not only identify the importance of disaster risk reduction, but also set priorities and targets for addressing the challenge over a specified period. These might cover incorporation of risk/vulnerability questions into project planning guidelines, staff training in issues and methods, assigning responsibility for relevant tasks, giving appropriate authority to those responsible and establishing monitoring and reporting procedures.

3.2.3 Operational guidelines

Many relief and development organisations work to operational guidelines for planning and implementing projects (and for running the organisation itself).

Ranging from simple checklists to heavyweight manuals, they aim to ensure quality and consistency in agencies' work.

Risk analysis, treatment and monitoring can be inserted into the simpler operational guidelines without great difficulty. The simplest way is to add a few basic questions or criteria to standard checklists, such as:

- Will the project affect people's vulnerability to man-made and other disasters?
- What impact will the project have on socio-economic vulnerability?
- What significant hazards might affect the target group?
- What are the project's plans for identifying and reducing hazard risks to its beneficiaries?
- Projects should give consideration to the likelihood of disasters and, where appropriate, prepare the community and the project itself to deal with disaster situations.

Detailed operational manuals are another matter: here, more detailed guidance will be required. The rest of this book covers issues that such manuals will need to consider. (Organisations also need standard operating procedures for dealing with emergencies or disasters that affect themselves.)

The existence of operational guidelines does not, of course, guarantee that staff will use them. There must be supporting commitment among agency personnel.

3.2.4 Geographical and sectoral plans

Most agencies work to geographical plans, at regional, country or district level. A few plan their work sectorally (for example, small enterprise development, health, education). Such plans should contain an assessment of the major hazards, vulnerabilities and risks facing the communities with which the project works. They should also outline appropriate risk reduction strategies. Methods for carrying out such assessments are outlined in Chapter 4.

3.2.5 Programme and project proposals

Like geographical and sectoral plans, programme and project proposals should include risk assessment and plans to deal with risks. Where agencies use logical frameworks of one kind or another to design their projects, as

many do nowadays, the 'risks/assumptions' column should take hazards and disasters into account. Because these are always viewed as external factors beyond a project's control, mere identification of risks is only a weak indicator that project designers are actually planning to deal with them. In one NGO project's logical framework, the phrase 'No natural disasters' was repeated in every line down the risks/assumptions column – clearly a token gesture, with no thought given in the proposal to how the project might protect itself and its beneficiaries. So-called 'killer' assumptions, where projects are likely to fail if the assumptions turn out to be wrong – such as the assumption that there will be no major disasters – are sometimes left out of logical frameworks in funding proposals, for fear of frightening donors.

3.2.6 Structures and systems

The challenge of incorporating risk reduction into an organisation goes far beyond formal documents and project planning. Policies and practices must be understood, implemented and maintained. Risk management manuals stress that responsibility and authority must be clearly defined within the organisation, and sufficient resources allocated. Organisations should assess their own capacity to understand and address the disaster problem. Review procedures should be set in place.

Organisations are run by *people*, and the general level of understanding, capacity and commitment needs to be increased by information sharing and training at all levels of the organisation. The process must be firmly supported by senior managers if it is to succeed, but there must also be ownership throughout the organisation.

3.2.7 External relations

No organisation should work alone in this field (see Chapter 5). Agencies should be linked to other key players and relevant coordinating or networking bodies to share information, expertise and resources as required. Where appropriate, they should have a clearly-defined role in national and local government disaster management plans. They should also follow relevant international codes and standards (see Chapter 12).

3.3 Mainstreaming risk reduction: challenges and opportunities

Anyone who has tried to change policy and practice within an organisation will appreciate how difficult this can be, but change is possible and there are some encouraging signs in the field of risk reduction.

Case Study 3.1
Preparing organisations for disaster

In 2001, the IFRC drew up a set of guidelines called *Characteristics of a Well-Prepared National Society*. This simple, two-page document sets out 33 indicators that can be used by Red Cross and Red Crescent national societies around the world to assess their capacity to predict disasters, reduce their impact on vulnerable communities and respond to them.

The indicators cover every aspect of organisational capacity, from policy and planning to human, financial and material resources and advocacy. Indicators also cover the role of a national society in government emergency planning and the extent of its coordination with other organisations.

A questionnaire based on the checklist was developed to help national societies and IFRC staff obtain a picture of the status of disaster preparedness within the IFRC. The questionnaire was sent to 35 national societies to fill in as a self-assessment exercise. A revised version was then sent to another 60.

The self-assessment method needed to strike a balance between being quick and easy to use on the one hand and generating meaningful information on the other; it was not easy to manage this. Experience also showed that participatory assessment is desirable; otherwise questionnaires might be filled in by individuals or small groups who do not represent the views of their national society as a whole or whose knowledge of its disaster preparedness work is inadequate.

Notwithstanding these problems, many of the national societies that completed the questionnaire found it valuable for self-assessment and planning, providing a benchmark for monitoring progress. Many had not viewed their disaster preparedness capacity in such a way before. Some people argued that there were already so many systems and procedures to ensure good management that there was little added value in assessing disaster preparedness, but for many others its added value lay in giving a systematic overview. Some national societies used the assessment findings for action planning and preparing fundraising appeals. Collated findings were used at regional and international level to identify strengths and weaknesses.

Characteristics of a Well-Prepared National Society (Geneva: IFRC, 2001); 'DFID/IFRC Partnership: Disaster Reduction Global Workshop, Khartoum, Sudan, 16–18 December 2002. Thematic Report', unpublished workshop report (Geneva: IFRC, 2002).

3.3.1 Challenges

Introducing or modifying strategies can be a long and sometimes tortuous process, not least because few development or humanitarian organisations would now contemplate policy changes without extensive consultations with all the main stakeholders, especially their local partners. Considerable time, effort and money may be spent on this. Senior managers are unwilling to revise policies or strategies unless they are convinced it is necessary, and only after seeing the impact of those already in place.

Large agencies have more time, money and enthusiasm for strategic planning, whereas smaller ones lack the resources for this. International agencies operating in many countries can find it difficult to implement coherent regional strategies where individual countries' circumstances and priorities may vary widely. It may be unrealistic to attempt to standardise thinking and approaches, and more practical to encourage greater information sharing and collaboration (i.e. harmonisation) over time.

Operational guidelines may be revised more frequently, but these vary greatly in quality. In larger agencies they are more likely to be comprehensive and detailed, but for this reason less likely to be read. Simpler versions may be more accessible, but many contain limited practical guidance on planning and implementation, or on assessing proposals from partners. Moreover, operational guidelines usually contain so many issues to consider that no development or emergency programme can address them all adequately, and some are bound to be squeezed out by those that appear to be more important. The guidelines themselves tend to allow for this, often being meant to guide and not to prescribe. This gives project planners and managers considerable discretion. Where an organisation's mechanisms for monitoring or assuring project quality are weak, the gap between theory and practice will widen. Even when issues are firmly established at strategic level and in planning guidelines, individual projects may still continue to show little or no understanding of the subject.

Organisational size is an obvious influence on the rate of change. Small organisations, especially grass-roots ones and NGOs, often function as teams of individuals and can adapt their outlooks and systems relatively quickly. As organisations get larger, their structures become more formal and complex, and it becomes much more difficult to make substantive changes. This can be a very great challenge in large, high-profile organisations. A tradition of institutional and cultural barriers between relief and development professionals can also impede progress. Such tension has been observed in many agencies that work in both fields.

Institutional memories are weak in many organisations. Project documentation may be non-existent or difficult to find, and of poor quality. Much written material on disaster issues is found in books and academic journals, which few operational staff are likely to read. In development organisations especially, staff are uncomfortable with the technical language of disaster management, and this acts as a barrier to their engagement with risk and vulnerability questions.

Overwork is another major obstacle. Its significance cannot be overstated. Most people working in relief and development agencies are too busy, most of the time, to reflect about or absorb new ideas. In many agencies overwork, and pressures of work, have become *systemic weaknesses*.

3.3.2 Opportunities

In most agencies, especially NGOs, policy or strategy review seems to be a semi-permanent condition, which should give grounds for optimism about the uptake of relevant ideas at policy level in the medium term (the next two to five years). Recent strategy changes in international donor agencies and NGOs reinforce this view. Disaster mitigation and preparedness and vulnerability to natural hazards are rising up the policy agenda. Attitudes are shifting, with the old view of disasters as one-off events being gradually replaced by awareness of the connections between disasters and development processes.

This shift has taken place mainly as a result of the severe 'natural' disasters in the past few years – hurricanes Mitch and Georges in 1998, the Bangladesh floods of the same year, the Orissa cyclone in 1999, the Mozambique floods in 2000 and the Gujarat earthquake in 2001 – which forced many agencies to rethink their approach. Change has also been influenced by the considerable research and academic debate on vulnerability (Chapter 2) and thinking on the linkages between relief and development (Chapter 17.2) since the 1980s, and the current enthusiasm for sustainable livelihoods (Chapter 4.2.6) may stimulate more development organisations to take vulnerability and risk on board.

There is evidence that determined individuals can push significant innovations through, even in large organisations, if there is sufficient space within institutional structures and systems. People in senior positions or who have been in an organisation for a long time (with good knowledge of the system and extensive personal networks) are particularly well placed to do this. Specialist technical advisers can be very influential in encouraging, advising and supporting project managers. They can operate across an organisation

which may otherwise be compartmentalised in its structure and the focus of its work and thinking – a real problem for larger institutions. They have a mandate and, crucially, time to think. Their influence can come not just from their position and expertise, but also from their personality and approach, and the length of time they have worked in the organisation. In larger organisations, the decentralisation of authority – from international headquarters to country offices, or from capital cities to districts – is gathering pace. This may make agencies more sensitive to hazards and vulnerability, at least at local level.

3.4 Chapter summary

- Organisations should seek to 'institutionalise' risk reduction by incorporating it throughout their thinking, structures, cultures and operations.
- There are many challenges to be overcome, especially in large and more formal institutions, but change is possible and there are encouraging signs of progress in many organisations.
- Recent experiences of disaster are a significant influence on organisational change.
- Determined individuals can push significant innovations through, even in large organisations.

Chapter 4
Project planning

4.1 Introduction

This chapter looks at the two main aspects of planning:

1. Understanding the problem. This covers methods of analysing risk, principally by finding out about the hazards that vulnerable people face; understanding the social, economic and other human factors that make them vulnerable; and identifying the capacities of communities and institutions to reduce risk.
2. Project design to meet those needs. This covers issues in decision-making, deciding the approaches to be taken and setting priorities.

Understanding and design do not follow each other in a neat, linear process. Better understanding of the problem should be acquired throughout the project cycle through analysis and monitoring, and fed back into the design and implementation of subsequent phases.

4.2 Understanding the problem

The first stage in any project is an analysis of the problem to be addressed, which should set out its nature and causes. Here, the problems are to do with the nature of the risks faced by people living under the threat of natural hazards and their vulnerability to disaster. This section therefore focuses on 'risk analysis' in the broadest sense of the term, covering hazards, vulnerability and capacities analysis.

In particular, the discussion will cover sources and forms of information, their availability and usefulness. Information on hazards, risk and vulnerability is normally judged according to four criteria:[1]

- the form it comes in;
- the level of accuracy;
- how quickly it can be obtained; and
- the scale of coverage.

The focus will be on access to information and its application at the local level, but information needed to understand the bigger picture or context at global,

regional and national levels (i.e. information that will support policy- and strategy-making) will also be covered.

4.2.1 Hazards assessment

Project planners and managers need to understand hazards: their nature, characteristics, causes, geographical distribution, frequency, magnitude or severity, and the kind of damage they do. Development and disaster workers do not need to be hazards specialists, but ought to understand the main features of the hazards in the places where they work. General information on hazards is available in standard text books and manuals.[2] Hazards should also be seen in a broader context, as part of eco-systems and the environment in general. In field projects and programmes, more location-specific data are needed. Again, the technical manuals give more detail.[3]

Hazards data are largely scientific: quantitative or spatial. They take many forms, for example:

- geological hazard maps showing fault lines or unstable slopes liable to cause landslides;
- hydrological maps of flood-prone areas;
- wind, rainfall and sea-surface temperature data;
- recordings of seismic activity from monitoring stations; and
- local rainfall and flood level records.

A high level of accuracy and detail can be obtained visually (for example, in geological mapping and satellite images; geographical information systems are discussed in section 4.2.5 below) and prediction (for instance, complex flood models that model rainfall to runoff, the movement of floodwaters through waterways and floodplains, and flood inundation areas). Data of this kind are used particularly for 'microzonation': the identification of areas subject to hazards.

Valuable though such information is for project planning, it is not always easy to use or obtain. It is usually prepared by and for specialists, such as state geological and meteorological services, or university research institutes. Therefore, specialists may be needed to interpret it (although maps should be translated into more readily intelligible formats if they are to be used to raise awareness among decision-makers and the public).

Access to other relevant material also varies greatly. Even a basic atlas will contain some geological and meteorological data; information on weather

and rainfall is generally distributed through media channels (press, TV and radio) and is increasingly available online; and data from academic research are likely to be in the public domain.

However, in many countries, maps are considered militarily sensitive and high-resolution maps in particular are not available to the public. Government or industry hazard and risk maps may be considered too commercially or politically sensitive to share. Information on technological hazards is likely to be hard to find as many sources of such hazards are commercial industrial operations such as factories. Governments' official enquiries or health and safety departments may have produced relevant reports and there may be some published research. Environmental pressure groups may be a useful source of information as they often document such threats (see Case Study 12.4, page 207).

Hazards data are extensive in many countries, but not in all. Many poor countries find it difficult to collect and maintain data sets because of cost and skills shortages. Hazard monitoring requires considerable infrastructure and staffing. The provision and maintenance of seismic monitoring equipment, for example, may be beyond the resources of national or local governments. Project planning must therefore consider how extensive and accurate existing hazard monitoring and information systems are.

Initiatives need not always be planned on the basis of complete and up-to-date data sets. In practice, field agencies often have to make decisions according to the information that is available. For example, the Kathmandu Valley Earthquake Risk Management Project accepted at the start the need to work in conditions where data were lacking. Instead of carrying out further research, the project used previously collected geological and seismological information, matched this to the current state of infrastructure and the built environment and adapted an existing loss estimation method to the Kathmandu context.[4]

It is not always necessary to rely on sophisticated technologies and outside specialists. Visual surveys by experienced people can identify areas at risk from landslides; simple stream gauges or flood marks can be used to monitor rising water and identify areas likely to be flooded; and local people's knowledge of hazards is often more accurate and extensive than outsiders appreciate (see Chapters 9 and 10).

4.2.2 Vulnerability assessment

Vulnerability is complex. It has many dimensions: economic, social, demographic, political and psychological. It is influenced by a number of factors at

different levels, from the local to the global. It is also dynamic, altering under the pressure of these many different forces. Many attempts have been made to develop methods for identifying and analysing the different facets of human vulnerability – and human resilience or capacity, which is the other side of the coin. These vulnerability analysis (VA) methods are starting to make a major contribution to disaster mitigation and preparedness work, especially for NGOs in developing countries. The first and perhaps still the best known method is the Capacities and Vulnerabilities Analysis (CVA), devised in the late 1980s (see Case Study 4.1).

Case Study 4.1
Capacities and Vulnerabilities Analysis

CVA is a framework for NGOs to use in planning and evaluating projects. It was designed to make relief interventions more developmental, but has been used more widely in disaster preparedness and mitigation. It is above all a practical and diagnostic tool.

The basis of the CVA framework is a simple matrix for viewing people's vulnerabilities and capacities in three broad, interrelated areas: physical/material, social/organisational and motivational/attitudinal (see Figure 4.1). Each of the three areas covers a wide range of features:

1. Physical/material. This is the most visible area of vulnerability. It includes land, climate, environment, health, skills and labour, infrastructure, housing, finance and technologies. Poor people suffer from crises more often than people who are richer because they have little or no savings, few income or production options, and limited resources. They are more vulnerable and recover more slowly. To understand physical/material vulnerabilities, one has to ask what made the people affected by disaster physically vulnerable: was it their economic activities (e.g. farmers cannot plant because of floods), geographic location (e.g. homes built in cyclone-prone areas) or poverty/lack of resources?

2. Social/organisational. How society is organised, its internal conflicts and how it manages them, are as important as the physical/material dimension of vulner-

(continued)

Case Study 4.1 *(continued)*

ability, but less visible and less well understood. This aspect includes formal political structures and the informal systems through which people get things done. Poor societies that are well organised and cohesive can withstand or recover from disasters better than those where there is little or no organisation and communities are divided (by race, religion, class or caste). To explore this aspect, one has to ask what the social structure was before the disaster, and how well it served people when disaster struck. One can also ask what impact disasters have on social organisation.

3. Motivational/attitudinal. This includes how people in society view themselves and their ability to affect their environment. Groups that share strong ideologies or belief systems, or have experience of cooperating successfully, may be better able to help each other at times of disaster than groups without such shared beliefs, or who feel fatalistic or dependent. Crises can stimulate communities to make extraordinary efforts. Questions to be asked here include what people's beliefs and motivations are, and how disasters affect them.

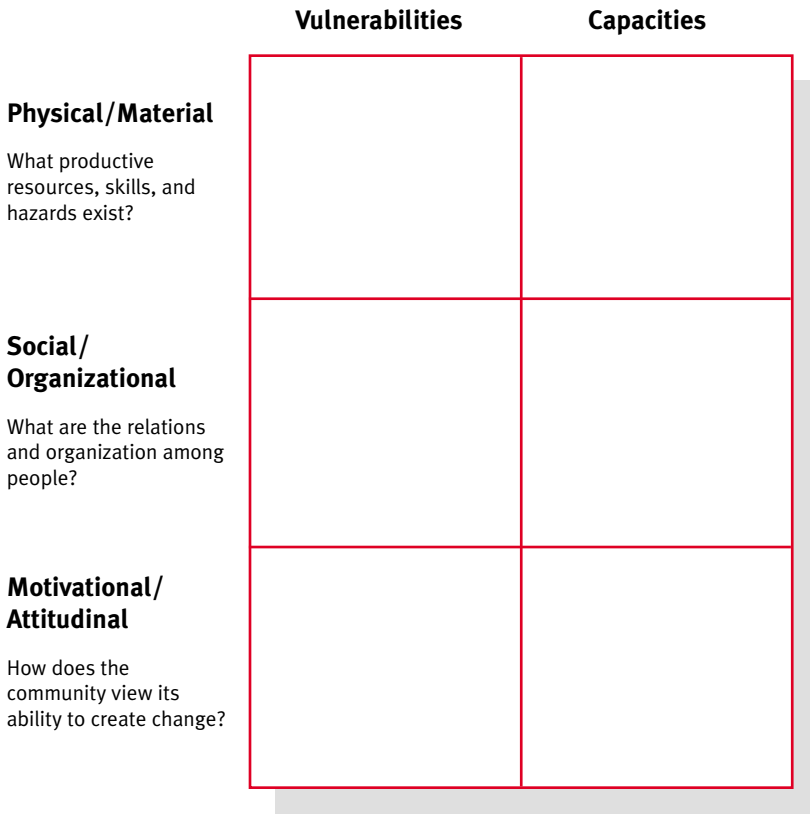
Five other factors can be added to the basic matrix. These are: disaggregation by gender, disaggregation by other differences (e.g. economic status), changes over time, interaction between the categories, and different scales or levels of application (e.g. village or national levels).

M. B. Anderson and P. J. Woodrow, *Rising from the Ashes: Development Strategies in Times of Disaster* (London: I. T. Publications, 1998), pp. 9–25.

A number of other vulnerability analysis methods build on the CVA framework. Which approach to take depends on the user, but the best ones, such as IFRC's Vulnerability and Capacity Assessment (VCA), supply a 'toolkit' of methods from which to choose. The discussion that follows draws extensively on this toolkit, as well as on more recent writing on how vulnerability analysis methods work in practice.[5]

Figure 4.1

CVA matrix



Anderson and Woodrow, *Rising from the Ashes*, p. 12.

4.2.3 Vulnerability assessment in practice

Level of application

A vulnerability analysis can be carried out at different levels. Usually, it takes place locally, but national-level analyses have sometimes been produced (see Case Study 4.2).

Methods

Most local-level vulnerability analysis will be based on participatory techniques and tools, largely derived from participatory rural appraisal (PRA) and rapid rural appraisal (RRA) work, and including:

- transect walks;
- mapping and modelling (physical and socio-economic – this is particularly important in vulnerability analysis);
- wealth and well-being ranking and other forms of social grouping;
- stories and oral histories;
- semi-structured interviews and focus groups;
- daily time charts and seasonal calendars;
- long-term time lines showing trends and change;
- problem trees and flow charts;
- direct observation; and
- Venn diagrams of institutional linkages.

Secondary sources of information – maps and other documents – can easily dominate the investigation, and are often best used to cross-check information generated in the field.

There is still much to learn about how different vulnerability analysis methods are applied, and the operational issues associated with their use, but a few general points can be made with some confidence.

1. *Process*. How the vulnerability analysis is done is as important as its findings. Analysis should be seen not just as an information-gathering exercise by project planners. If it is done properly, with vulnerable people themselves taking part, it can build community capacity by raising awareness and increasing knowledge of the risks people face and their ability to deal with those risks.
2. *Participation*. Community participation should be integral to the vulnerability analysis. It is essential that the views of all groups in the community are heard (see Chapter 8).
3. *Timing*. To build up a comprehensive view of vulnerabilities and capacities requires time, because these are complex and not easily perceived. Vulnerability analysis should not be rushed, therefore. It should be carried out well before a potential disaster, allowing hazards and risks to be set within the broader socio-economic issues affecting the community. It can also be done as part of long-term rehabilitation after a disaster, and in long-term development.
4. *Resources and capacity*. Vulnerability analysis can require considerable resources, particularly staff and community time. Staff training in the req-

uisite methods will probably be needed. Many field agencies lack sufficient experience and skills to implement analyses effectively. Much more training is needed, although there are still few trainers in vulnerability analysis methods.

5. *Techniques*. A vulnerability analysis should use a variety of sources and types of information (see below). Information-gathering methods can be equally diverse. Simple techniques are often the best.
6. *Indicators*. There are many different indicators of vulnerability and capacity. Some are more helpful than others; some (such as indicators of coping ability) are particularly hard to obtain. Do not rely on only a few indicators, or those that are most easily identified. Careful triangulation of the different indicators is needed to build up an overall picture.
7. *Consensus*. Because vulnerability is not simple, and the data will be diverse, it may be difficult to reach agreement on priorities. Organisations carrying out vulnerability analysis may have to put significant effort into reaching a consensus on how to proceed.
8. *Repetition*. Ideally, vulnerability analysis should be an ongoing process, not a one-off, because vulnerability is itself dynamic and ever-changing. There should always be an up-to-date vulnerability analysis for the district or communities being assisted. In practice, this rarely happens because agencies lack the resources to carry out repeated vulnerability analysis exercises. Typically, analysis is undertaken at the start of a project or programme.

Sources of information

Many kinds of quantitative and qualitative information can be used. Hazard data (see above) are clearly important, and over-emphasis on the purely socio-economic aspects of vulnerability can cause hazards to be overlooked. Vulnerability analyses often draw upon existing sources of information that are publicly available, such as general social and economic surveys by governments and other agencies. Other commonly used data sources are drought and food security early-warning systems, situation reports by operational agencies, the news media, analyses commissioned or carried out by international and bilateral donors, and anthropological studies.

Such sources can provide a large amount of data, especially quantitative data. Finding and extracting relevant information can be a major job, however. Official surveys are often out of date, inaccurate or biased. Coverage may be incomplete: data may only cover selected aspects of community or household economies, for example. Documents may not say much about vulnerability itself, although they may provide useful background. Often, analyses rely solely on basic national-level indicators of socio-economic development (e.g.

size of land holdings, per capita income, literacy levels, mortality and morbidity rates, access to clean water), which are readily available in government statistical yearbooks or international aid agency publications such as the UNDP's *Human Development Report* or UNICEF's *State of the World's Children*. These give valuable insights into vulnerability, but the picture is by no means comprehensive. Alternative national-level indicators of vulnerability are now being developed. The World Wide Fund for Nature's *Living Planet Index* addresses different aspects of environmental stress. The UNDP is developing a global index for disaster risk.

Everyone acknowledges that it is a very difficult task to find a method that is comprehensive enough to capture the different elements of vulnerability and capacity, without becoming too complex and cumbersome an exercise. There seems to be a particular difficulty in assessing the capacity of structures and policies to deal with disaster risk – both government capacity and that of civil society, although there are some useful research studies of particular countries and regions.[6] Major disasters occasionally prompt thinking and publication on how well a country is coping. However, there is no generally accepted methodology for assessment. The UN International Strategy for Disaster Reduction (ISDR) has begun work to develop such a framework.

Small agencies are unlikely to have the resources or capacity required for meaningful national-level analysis, and will usually have to rely on the work of larger agencies such as Oxfam, which in 2000 carried out a 'risk mapping' exercise, *Risk-Mapping and Local Capacities*, covering several Central American countries (see footnote 6). Key informants can be helpful in explaining systems and filling knowledge gaps, but may have individual biases.

Data on the frequency, location and impact of previous disasters are particularly useful. The EM-DAT database managed by CRED (www.cred.be/emdat/into.html) is the standard source of information on disasters worldwide since 1900. Its data sets are published annually in the IFRC's *World Disasters Report,* which is widely read and cited. The reinsurance company Munich Re also publishes an authoritative report each year on the economic costs of disasters globally (www.munichre.com/pdf/topics_ 2002_e.pdf). Because these do not cover many smaller events, they should be seen as underestimates. By contrast, the DesInventar database for Latin America (www.desinventar.org) records all hazard events. National data sets in some countries may also be more detailed. For example, the Ministry of Water Resources in Nepal publishes an annual review of disasters, covering events of all sizes throughout the country, with details of deaths, injuries, numbers

of families affected, animals lost, damage to housing and land, and estimated economic losses.

There are problems with all disaster data sets of this kind. Some limit themselves to larger events defined as 'disasters'. All rely on imperfect methods of collection, leading to omissions and inconsistency. They tend to be far less reliable on economic impact than on human casualties, and particularly weak on indirect effects. They tend to focus on numerical totals rather than the spatial distribution of impact. The figures produced are rarely linked explicitly to the wider vulnerability context.

Case studies of recent events are a valuable supplementary source of information on disasters' impact, the vulnerability of people and the capacity of agencies. It may not be easy to find good-quality case studies, however. The published literature may be limited, or hidden in academic journals. Agencies' situation reports generated during major disasters are more accessible (many are on the ReliefWeb site at www.reliefweb.int/w/rwb.nsf), but may have only a limited amount of information that is useful for vulnerability analysis.

Agencies may use some of the sources given above for context, but will base their understanding on local-level data, especially that generated by communities themselves through participatory methods. Such approaches give more limited coverage, geographically and in terms of the number of people involved. Because the methods used and data collected will vary according to time and place, the results are not standardised and it can be difficult to compare findings. However, these drawbacks are outweighed by the advantages: the approach supplies far more detail and provides much better insights into the multiple pressures that communities face and the causal links between them, local needs and priorities, people's understanding of their own vulnerability, indigenous methods for dealing with risks, and community capacity (actual and potential).

Data analysis

Experience suggests that vulnerability analysis tends to generate more information than is needed, and identifies more issues than local agencies can address. Excessive data collection is expensive and – if not used – wasteful. The task of processing volumes of information can put pressure on large and small organisations alike. This shows the importance of setting clear and realistic targets for a vulnerability analysis exercise. To be fair, it is not always easy to judge how much information will be necessary at each stage of project design and implementation, or for whom (community organisations, NGO field staff and headquarters staff will have different information needs).

Some field workers have suggested that a picture of vulnerability could usefully be built up gradually through a series of smaller assessment exercises, rather than a single intensive, complex vulnerability analysis. This would also enable an operational agency to fit its work around community activities, thereby causing minimal disruption.

Data analysis usually presents more problems than data collection. Data sets contain a variety of evidence and indicators that are not easily triangulated, collated or analysed. Methodological guidelines have little to say on the subject of analysis. There are signs that this causes problems for many staff who have used vulnerability analysis. As a result, in some cases the 'findings' are more descriptive than analytical, and this of course makes it difficult to set priorities for intervention. Where organisations follow an open-minded, participatory approach, the selection and weighting of indicators are usually left to participants in the analysis process, but this too causes problems for many field staff who need appropriate training and guidance.

Outcomes

An obvious point, but one that can be forgotten, is that vulnerability analysis should lead to *action*. In some cases it has been seen as an exercise in gathering information for its own sake – the same problem has sometimes beset PRA and similar methods.

Actions that result from a vulnerability analysis could take the form of improvements to project design and implementation that increase community resilience, changes in the thinking and practice of the operational agency itself, or policy changes at a higher level. The IFRC's experience is that application of its VCA method has led to better relationships with communities, national governments and other agencies that have been involved in the process or used the findings.

For many practitioners, one important question will be: how much information and analysis is actually needed before one can embark on a project? There is an inherent tension in project work between the need for knowledge gathering and understanding on the one hand, and the pressure to take action on the other.

Carrying out a vulnerability analysis can raise community expectations that the organisation concerned will intervene to solve all the problems identified. This is rarely possible. It is therefore important to discuss its purpose and likely outcomes with communities and other stakeholders at the outset.

Case Study 4.2
Vulnerability and capacity assessment in Palestine

In 1999, the Palestine Red Crescent Society (PRCS) decided to carry out a vulnerability and capacity assessment (VCA) as a first step towards a national disaster preparedness plan. The six-month assessment was explicitly participatory. It drew on interviews with officials and NGOs and 22 focus groups in towns, villages and refugee camps across the West Bank and Gaza, seeking to get a cross-section of Palestinian society. The work was carried out by PRCS staff, who received training in interview and group animation techniques. Two pilot studies were held to test the focus group method. Care was taken to ensure good gender balance in the focus groups, and the involvement of other vulnerable groups such as the elderly. Two information-gathering workshops were held involving PRCS employees, and a great deal of documentary data was collected.

One novel element of the VCA was that it included children and young people, who make up more than half of Palestinian society. They expressed their understanding of disasters and disaster mitigation through drawings.

Key institutional stakeholders were brought into the project's steering committee to ensure that the process would be taken forward. These included Palestinian Authority ministries and local NGOs.

The data analysis revealed many local capacities in the PRCS (including the quality of its specialised staff, equipment and supply levels, and the potential for recruiting more volunteers), but also highlighted the need for much more training in the community. It showed weaknesses in coordination between local institutions, and a lack of communication between communities and the authorities about hazard risks.

The interviewees and focus groups identified lack of water as their greatest priority in terms of hazards, with political events second. Road accidents, open sewers, pollution, fires, earthquakes and health came lower down the list. The significance given to water shortage surprised the analysts, who had expected political problems to be the dominant concern.

The VCA report was finalised in August 2000. Barely a month later, a renewed round of conflict between Palestinians and Israelis broke out. The VCA was rapidly overtaken by events and priorities shifted dramatically. Many proposed measures had to be put on hold and, inevitably, some communities that had hoped for more support

(continued)

Case Study 4.2 *(continued)*

felt let down. The exercise had nevertheless been valuable in helping the PRCS to understand its strengths and weaknesses, and this understanding was put to use in setting up more resilient organisational systems to deal with the new crisis. The PRCS was also able to take steps to address the water problem in some locations, such as camps for displaced people, by improving supplies and sanitation. In Gaza, where the VCA had identified open sewers as a major problem, PRCS volunteers, students and municipal authorities launched clean-up campaigns.

Vulnerability and Capacity Assessment: A Participatory Action Research Study of the Vulnerabilities and Capacities of the Palestinian Society in Disaster Preparedness (El Bireh: Palestine Red Crescent Society, 2000); *World Disasters Report 2002: Focus on Reducing Risk* (Geneva: International Federation of Red Cross and Red Crescent Societies, 2002), pp. 129–47.

4.2.4 Risk analysis

Many disaster management practitioners use what they call 'risk analysis' methods to draw up mitigation plans and make operational decisions. Technically speaking, risk analysis is different from hazards and vulnerability analysis, focusing on how often specified events may occur and the magnitude of their consequences. Risk analysis may be based on quantitative or qualitative data, or a combination of these. Qualitative analysis uses descriptive scales to describe the likelihood and magnitude of risks. It is mostly used as an initial screening, where the level of risk does not justify fuller analysis or where there are insufficient data for more quantitative analysis. It often takes the form of a probability/impact matrix, which can be quite simple to produce (see Figure 4.2 for an illustration).

Quantitative risk analysis is based on numerical values. This requires extensive and accurate 'hard' data, and uses mathematical manipulation of the data to produce tables that assign numerical values to the probability and frequency of risk, and to exposure to risk. For example, a fire risk assessment in the capital city of Laos, Vientiane, identified seven key risk factors and gave a numerical value to each to arrive at a total risk score for each geographical unit surveyed (Table 4.1).

Figure 4.2
Probability/impact matrix

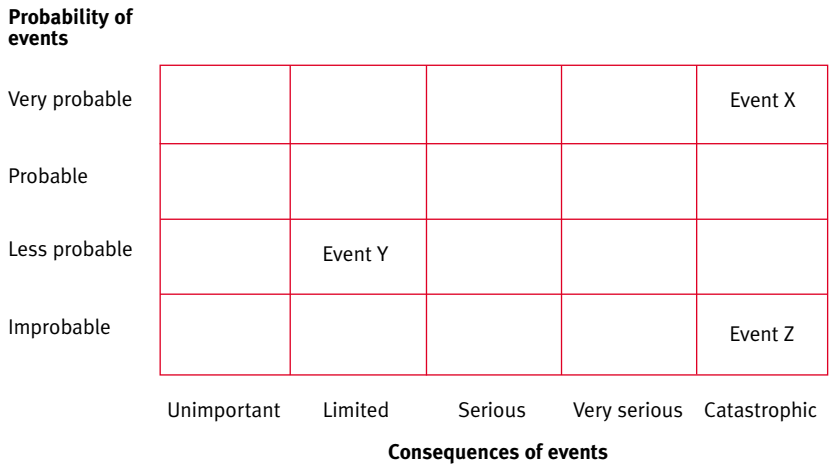


Table 4.1 Fire risk assessment in Vientiane

Risk factor	*Total score*
Building material type	25
Sources of flammable material	15
Fire-fighting scenario (availability of water and manoeuvring space for fire-fighters)	15
Quality of electrical wiring	5
Fire history	10
Building density	15
Accessibility (roads)	15
Total:	**100**

P. Sounnalath et al., 'Fire Risk Assessment in Vientiane Lao PDR', in *Proceedings: Regional Workshop on Best Practices in Disaster Mitigation. Lessons learned from the Asian Urban Disaster Mitigation Program and Other Initiatives, 24–26 September 2002, Bali, Indonesia* (Bangkok: Asian Disaster Preparedness Center, 2002), pp. 97–102.

There was a sub-set of quantifiable features within each of the seven categories. Again, each carried a numerical score. For example, under 'fire history', there were four categories of risk: high (four incidents of fire recorded during the past five years – score ten), moderate (three incidents – score five), low (two incidents – score three) and very low (one incident – score one).

The more sophisticated forms of risk analysis are often carried out by highly-trained specialists, found mostly in research institutions, government departments and emergency management agencies, insurance companies and other large businesses working in this field. But this may not be necessary. In the case of Vientiane referred to above, much of the data could be collected by visual surveys and the scoring system was straightforward. Moreover, in many cases the assignment of numerical values to particular features of risk is subjective.

For all its sophistication, one limitation of risk analysis as often practised is that it does not take a broad view of human vulnerabilities and capacities, tending instead to focus on more visible and quantifiable elements at risk, such as buildings and physical or financial assets, and human lives (although wider dimensions can be incorporated into qualitative or semi-quantitative models). It is possible to carry out more subjective, participatory risk analysis, and the results of such exercises can be valuable in understanding local perceptions and priorities (see Case Study 4.3).

In practice, the difference between risk analysis, hazards analysis and vulnerability analysis is often blurred, with the various terms being used by different people to mean similar things. There is often a lot of overlap. It is perhaps most helpful to see risk analysis in a broad sense, as an interpretation of all kinds of data on hazards, vulnerabilities and capacities in order to take decisions about priorities for intervention.

4.2.5 Geographical Information Systems

Rapid advances in information and communications technologies, especially Geographical Information Systems (GIS), are revolutionising the potential capacity to analyse hazards, risks and vulnerability, and plan for disasters (some helpful recent publications consider this in more detail).[7]

A GIS is a software package used for information storage, situation analysis and modelling. The software works with spatial data: it enables different kinds of data to be overlaid on maps. The kinds of data that can be inputted include:

Case Study 4.3
Risk-mapping among East African pastoralists

A team of US researchers developed a simple but systematic approach to classifying and ordering the sources of risk faced by pastoralist populations in arid and semi-arid districts of southern Ethiopia and northern Kenya. The aim was to find a robust participatory method that was less costly and time-consuming than full surveys.

There were two stages in the method: identifying risks; and ranking risks. The first stage was achieved using an open-ended questionnaire. The researchers emphasised to the pastoralist informants that they could each list as many problems as they wished, and should identify these through discussions amongst themselves.

The second stage used a simple numerical ranking method to group the risks in order of severity. Risks thought to be equally severe could be ranked equally. After they had done the ranking, the informants were asked to discuss each risk in turn, explaining how they dealt with the problem, or why they no longer could, and how they would like to overcome it.

Assessment of the incidence of a risk was based on the proportion of participants who identified it. Severity of risk was assessed using a mathematical calculation that translated the informants' perceptions into a simple risk scale. Findings could be plotted on maps to identify areas and groups at risk. Disaggregation by age, gender, wealth and other socio-economic characteristics was also possible.

The method was tested in the field over six months in 1998, involving 120 groups (59 groups of women, 61 of men). The responses identified 15 major sources of risk, ranging from availability of food and water to banditry. The most frequently mentioned problems were insecure access to food and water, livestock disease and access to health clinics. Food and water shortage were the only risks mentioned by a majority of informants, indicating that the extent of the other risks varied considerably across the region and its population, even though some (for instance malaria and conflict) were certainly severe in places.

K. Smith et al., *Participatory Risk Mapping for Targeting Research and Assistance: With an Example from East African Pastoralists,* Utah State University College of Natural Resources, 1999, www.cnr.usu.edu/research/crsp/tr199.htm.

- contour lines, hills, forests and watercourses and other geophysical phenomena;
- transport routes, power lines, housing and other features of the built environment;
- demographic and other social factors, including nutritional status and the distribution of particularly vulnerable individuals or groups; and
- the location of emergency services and facilities.

Data can be added to or removed from the program and its maps.

Several GIS packages are available. Some are custom-built, others are standard software. The main users have been scientists and national and local governments' emergency management services in developed countries.

How useful are GIS for NGOs and similar organisations working at local level in developing countries? There is still a lack of evidence about its application in the field, although there are examples of successful GIS risk management applications by NGOs. One of the best known is Save the Children's RiskMap package, which has been used for many years to monitor trends in food security (see Case Study 15.8, page 281). GIS has also been used by the Philippine Red Cross in a community-level disaster preparedness programme.[8]

Evidence from development applications has highlighted several common operational problems that cause GIS initiatives to fail.[9] These include:

- Underestimation of the considerable workload required to input, retrieve and analyse data, and the fact that much of the work is routine and tedious. This can lead to incomplete databases.
- Technical facilities (software, hardware, networks) that are inadequate, often because the lowest-cost option is chosen.
- Selection of data based on cost rather than usefulness.
- Too much time spent on systems and software, and on routine tasks, at the expense of practical applications.
- Lack of systematisation in collecting, inputting and storing data, leading to data sets that are hard to retrieve or do not match well.
- Inadequate training or staff who are not sufficiently qualified to manage GIS, and failure to upgrade skills.
- The risk that individuals with specialist GIS skills will gain power informally within their organisations.
- Loss of faith in GIS in the light of the practical problems listed above.

Case Study 4.4
Preparing for floods with GIS

In 1998, the NGO Action Against Hunger began an initiative to strengthen the capacity of people in Kampong Chan Province, northern Cambodia, to prepare for and respond to flooding of the Mekong River. The project had three main aims: identification and preparation of safe areas for evacuation, building the capacity of local Red Cross volunteer networks, and stockpiling emergency relief kits.

Interviews and questionnaires were used to identify areas at risk, safe areas and the patterns of movement of villagers and their livestock during floods. The safe areas identified were both external to the village (other villages on higher ground which traditionally receive evacuees) and internal (higher-placed houses). The data were incorporated into a simple GIS developed by the project team. Analysis revealed that the pattern of villager movement during evacuation was more complex, dynamic and diverse than expected. Once safe areas and likely evacuee numbers had been identified, the project could take steps to prepare them for emergencies, such as improving drinking-water supplies and sanitation facilities, and educating villagers in relevant hygiene issues. In at-risk villages and safe areas, Red Cross volunteers were trained to organise the movement of displaced people and manage relief efforts during floods.

Activities carried out during the first two years of the project included providing 21 external safe-area villages with new or rehabilitated water sources and latrines, and training 161 Red Cross volunteers in these villages and 54 flood-affected villages. A local flood early-warning system was established and a flood damage and safe area database covering 600 villages was developed.

Preparation for Flood-Related Disasters, NGO Initiatives in Risk Reduction Case Study 14 (London: British Red Cross Society, 2001), www.redcross.org.uk/riskreduction.

It has also been suggested that GIS' reliance on quantitative data may limit its potential application to vulnerability analysis. It is not always possible to assign a quantitative value to some dimensions of socio-economic vulnerability. Spatial representation is also made difficult by the different levels at which

Figure 4.3

A typical GIS map showing accessible water sources

different dimensions of vulnerability operate – e.g. root causes have an impact on a much larger geographical area or social group than locally unsafe conditions, but both interact to create vulnerability.[10]

Organisations thinking of using GIS are advised to consider the following four main questions regarding its practicality:

- *Cost*. GIS software is sophisticated and therefore expensive, requiring state-of-the art hardware to run effectively (though see Case Study 4.4 above). Back-up maintenance and support should also be considered.
- *Skills*. Staff will need extensive training in collecting, inputting and analysing data. The temptation to save costs by training only a few people in GIS should be avoided, since travel, illness or job change will leave the organisation without experts who can operate the system.
- *Need*. At local level, GIS may not be necessary. The problems may not be sufficiently complex to justify it.
- *Data*. To be really useful, GIS need reliable and extensive data. These may not be available, or it may be very difficult to obtain and process them. Data sets also need to be kept up to date, which takes time and can cost money.

4.2.6 Sustainable livelihoods

Vulnerable people face a number of risks in their everyday lives, of which hazards are only one. For many, poverty is the main problem. Their priorities and their capacities for dealing with disasters are directed by the need to earn a living.

Livelihoods and livelihood security will be a recurrent issue in this Good Practice Review because of the centrality of livelihood strategies to the lives of poor and vulnerable people, the close relationship between these strategies and risk reduction or coping strategies, and the importance of rebuilding livelihoods after disasters. Poor people's livelihoods are unlikely to be sustainable unless they can cope with the numerous external stresses and shocks that affect them.

Recent thinking in development circles is placing livelihoods – in particular, sustaining and strengthening livelihoods – at the centre of discussions about poverty reduction. Vulnerabilities, of all kinds, are viewed as part of the context in which livelihoods are shaped. The ideas and tools that are being developed in this area are commonly referred to as the 'livelihoods approach', 'sustainable livelihoods approach' or 'livelihood security approach'.

Literature on the theory and practice of sustainable livelihoods is extensive, and there is a 'gateway' website devoted to the subject (Livelihoods Connect: www.livelihoods.org). The account that follows draws on a handful of key sources.[11] Figure 4.4 (page 56) shows one widely used livelihood model in diagrammatic form.

Vulnerability context

A central feature of sustainable livelihoods approaches is that they recognise that poor people live and work within a context of vulnerability that frames the environment in which they exist, is responsible for many of the hardships they face, and has a direct impact upon their assets and the livelihood options that are open to them. This is something that poor people are only too aware of.

Many factors make up the vulnerability context. Long-term, large-scale trends are one: these include population trends, resource trends (including conflict over resources), economic trends (national and international), trends in governance and politics, and technological trends. The second main factor is external shocks: human health shocks (e.g. epidemics), natural shocks (e.g. natural hazard-induced disasters), economic shocks (e.g. rapid changes in exchange rates), conflict and disease, and drought or pest infestation that affects crops and livestock. Shocks can destroy assets directly (e.g. in the case of floods or storms). They can also force people to dispose of assets as part of coping strategies. The third main factor is seasonality: seasonal shifts in prices, production, food availability, employment opportunities and health. These are among the greatest and most enduring sources of hardship for poor people.

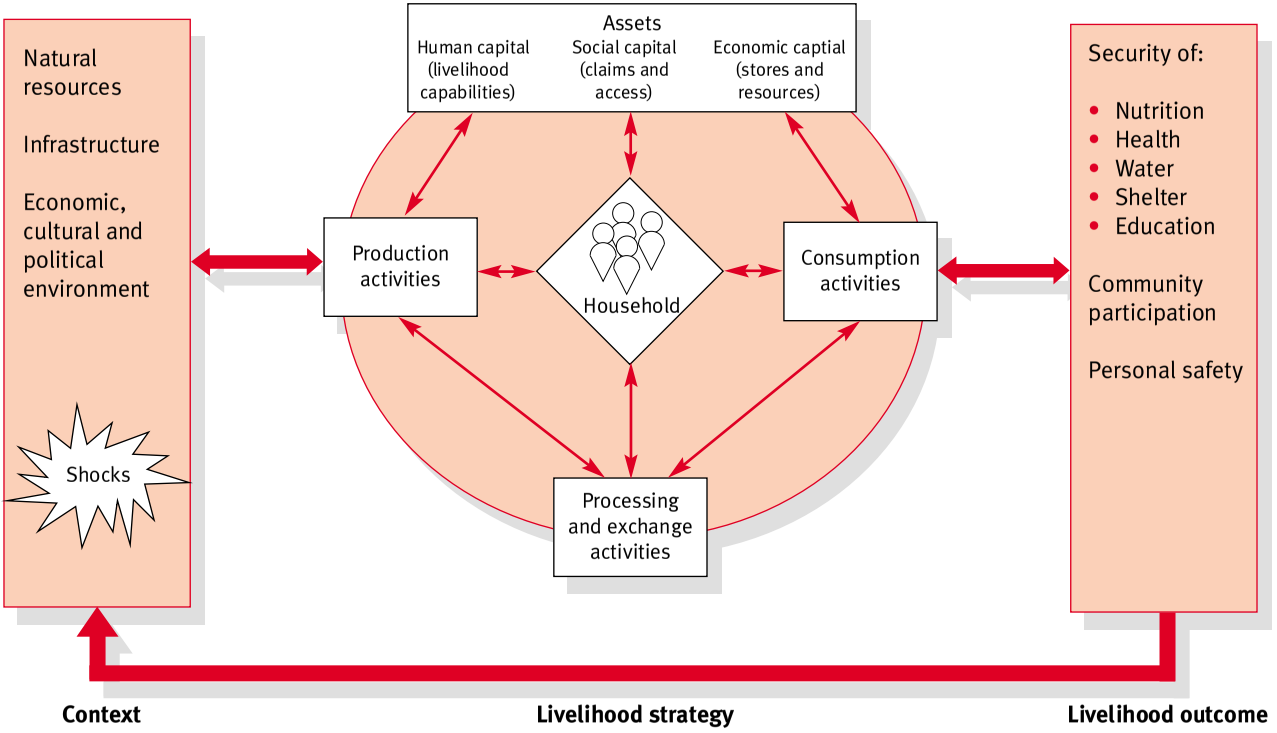
Livelihood assets

The term 'livelihoods' should be seen broadly, to include a range of assets and activities required for a means of living. Livelihoods approaches generally describe people's strengths or capacities as livelihood assets, which are destroyed and created as a result of the trends, shocks and seasonality of the vulnerability context.

Livelihood assets can be broken down into several different categories:

- *Human capital:* skills, knowledge, ability to labour, good health.
- *Social capital:* the social resources upon which people draw in pursuit of

Figure 4.4
CARE's livelihood model



M. Drinkwater and T. Rusinow, *Presentation on CARE's Livelihoods Approach for NRAC '99* (London: CARE International, 1999), www.careinternational.org.uk/resource_centre/livelihoods/cares_livelihoods_approach.doc, p. 2.

livelihood objectives (e.g. networks and connections, membership of groups, relationships of trust, reciprocity and exchange).

- *Natural capital:* the natural resource stocks from which resource flows and services are derived (e.g. land, forests, marine/wild resources, water, protection from storms and erosion).
- *Physical capital:* the basic infrastructure and producer goods needed to support livelihoods. Infrastructure components include affordable transport, secure shelter, adequate water supplies and sanitation, and access to information. Producer goods are the tools and equipment that people use to function more productively.
- *Financial capital:* includes savings and credit, and inflows of money other than earned income (e.g. pensions, remittances).

By perceiving livelihood assets in this way, one can gain valuable insights into the strengths and weaknesses of different types of asset, their relative importance and the linkages between them.

Livelihood strategies

In their livelihood strategies, poor and vulnerable people use their assets for consumption, production and exchange. If successful, the strategies will lead to a variety of improvements to their livelihoods, both economic and non-economic:

- greater income and more economically sustainable livelihoods;
- increased well-being (comprising non-material elements such as self-esteem, sense of control and inclusion, personal safety, community participation and political enfranchisement, and maintenance of cultural heritage);
- better access to services such as health, water, power and education;
- reduced vulnerability to external trends, shocks and seasonality;
- improved nutrition and food security – which is of fundamental importance; and
- more sustainable use of the natural resource base.

Institutions, organisations, policies and legislation all affect livelihood strategies by influencing access to assets and resources. These forces operate at all levels, from the household to the international arena, and in all spheres, from private to public.

Application of livelihoods approaches to risk reduction

Broad-based livelihoods approaches of the kind outlined above are now being widely used in development planning. There is little evidence of their applica-

tion specifically to risk reduction work, although the potential value is obvious. Livelihoods approaches could help to identify the extent and nature of the whole range of poor people's livelihood assets, and their vulnerability to hazards as well as other external forces. From this, it should be possible to identify entry points for protecting those assets that are most at risk, or that could be most valuable in a crisis.

The livelihoods approach also gives an insight into the factors influencing people's choice of livelihood strategy. In particular, it should help in understanding the reasons behind their willingness to tolerate hazards and risk – which is often due largely to the need to keep fragile livelihoods, particularly family incomes, going from day to day. Disaster mitigation and preparedness projects that fail to appreciate the fundamental importance of this will find it difficult if not impossible to achieve success.

Interventions to sustain and protect livelihoods can take place at any stage in the disaster cycle. Long-term livelihood strengthening can be part of pre-disaster mitigation strategies, integrated with development work. Shorter-term disaster preparedness initiatives can include steps to protect material assets, or move them to safety as part of contingency planning.

Social capital in the form of strong community organisation is of obvious benefit in an emergency (see Case Study 4.5). When a disaster strikes, emergency

Case Study 4.5
Social capital and self-reliance in disasters

Catuche, a neighbourhood in Venezuela's capital city, Caracas, was hit by severe floods in December 1999. Field reports suggested that community solidarity and strong community organisation combined to save hundreds of lives. As the flood waters rose, neighbours helped one another by passing on the latest news about water levels, helping older residents from their homes and in some cases forcing people who were reluctant to evacuate to move to safety. Only 15 people were believed to have been killed, whereas hundreds lost their lives in other similarly affected neighbourhoods.

D. Sanderson, 'Cities, Disasters and Livelihoods', *Environment & Urbanization*, vol. 12, no. 2, 2000, pp. 93–102.

relief can be used to maintain livelihood activities – for example, by providing seeds or tools that have been lost to the disaster – in addition to meeting basic needs. Livelihood support helps longer-term rehabilitation and recovery from disasters to proceed more quickly (see Chapter 17.3, page 323).

Human vulnerability analysis of the kind described above often picks up livelihoods issues but usually not systematically, which can lead to significant gaps in understanding. Yet it is not difficult to incorporate a livelihoods perspective into vulnerability analyses when they are carried out for research or baseline studies. It may also be possible in some cases to regroup or reinterpret existing data from such analysis according to the livelihoods point of view.

4.3 Project design

In this phase of planning, objectives must be set and a strategy for achieving those objectives drawn up, which includes selecting the approach to be adopted. This section looks at some of the general issues in decision-making, presented in the form of basic features of good planning.

Planning a project assumes that something will be done to address hazard and vulnerability problems. This may not always be the case, however. Conventional risk management approaches allow the option of ignoring the risks that have been identified, principally on the grounds that they are likely to be minimal or that the chance of a major disaster happening is too remote and there are other more immediate problems to address.

Only when a decision has been made to tackle the risks identified do other project planning processes come into play. The stages then are to identify and evaluate the different options for dealing with the risks, select the options and approaches to be taken, prepare plans and implement them.

4.3.1 Basic features of good planning

Many of the features of good project design set out in this section are common to project planning in general, while some are more specific to disasters. The following paragraphs draw on a variety of disaster mitigation guidelines.[12]

Among the main issues to be considered in planning are:

- *Process.* Planning should be approached as a process, not merely the production of written documents. In particular, it should be seen as a process

of continuous improvement, reflecting the idea of risk reduction as a long-term goal to be approached gradually. This means that one should not try to work out all the details at the outset.

- *Clarity.* There must be clarity about the goals, strategies and scope (broad parameters) of the activities to be undertaken. Project plans should also be clear about how proposed activities are linked to broader strategic objectives (logical frameworks and similar devices may help here).
- *Targets.* All projects should set targets whose achievement can be verified by monitoring and evaluation. Evaluation of risk reduction work does present problems, as Chapter 18 shows, but that is no excuse for avoiding the issue. Targets should be realistic and understood by everyone involved in the initiative. But targets may also have to shift, because vulnerability is not static.
- *Analysis.* The need for a thorough understanding of the problem cannot be overemphasised. Hazard, vulnerability and risk analysis are well worth the time and effort spent on them. The analysis should include thinking about what might realistically happen in the future, not just about what has happened in the past or what a vulnerability analysis shows could happen in the present. The nature of a community's vulnerability can shift very quickly under external pressures and opportunities. Climate change will probably change the hazard context in many regions. Anticipate problems.
- *Definition.* There are many different dimensions of human vulnerability to disasters and many different ways of approaching the problem. It is important to define clearly the nature of the project (e.g. activities, participants), its extent (time, location) and its outputs, together with performance criteria.
- *Resources.* Inputs and resources should be matched closely to the projected outputs – i.e. make sure that the outputs are realistic given the resources available. Assess the implementing organisation, its capacity to address the risks and needs identified, and factors that support or impair its capacity to deal with those risks. An institutional assessment of the kind outlined in Chapter 3.2 (page 24) will help here. Assess partner organisations' capacity, too (see below).
- *Setting priorities.* This is fundamental. All projects need to balance costs, benefits and opportunities. Should a project adopt an all-risks approach or a more selective approach targeting particular risks? Is the project designed to reduce the direct, indirect or secondary impacts of disasters? (See Box 18.5 (page 361) for an explanation of these terms.) How does one set priorities regarding not only different hazards and vulnerabilities, but also different vulnerable groups? What minor or remote risks are acceptable or tolerable? On what basis should such decisions be made (e.g. the magnitude and frequency of the potential disaster, beneficiary priorities, organisational

capacity and resources)? The criteria for making such decisions may be operational, technical, financial, social, humanitarian, political or legal. Analysis of costs and benefits (discussed in Chapter 18.3) forms part of this. In a development project, reducing risk will be only one of the project's goals, so the priority to be given to it must be agreed at the start.

- *Generic approach.* As a general rule, one should adopt an approach that is generic rather than hazard/risk specific – i.e. that builds up capacities to deal with the range of threats that will affect a given community. On many occasions this does not happen in practice, with separate planning around different hazards. This is inefficient and often leads to duplication and gaps in the coverage of disaster threats, as well as to conflict between disaster management agencies. This does not mean that agencies should not have priorities regarding what they can tackle, nor that all hazard threats are the same and can be treated identically; rather, it means that the basic human and organisational problems of preparing for disasters are similar, whatever the hazard. Many fundamentals of good planning apply to a wide range of hazards (e.g. participation, stakeholder partnership, and effective communication of risks and warnings). Moreover, one should not focus on one hazard risk to the extent that other significant risks are overlooked.
- *Partnership and capacities.* Agree roles and responsibilities within the organisation and with partners well in advance. No organisation or group can work alone. Identify all relevant internal and external stakeholders, considering everyone who might be affected by an intervention: what are their roles and capacities, how does the implementing organisation relate to them and how can its work complement or support theirs? Partners and other stakeholders should be involved in the planning process, not simply written into the plans. Understanding the capacities of individuals, communities and agencies who might be involved in a project is an essential element in planning, and needs to be considered. Stakeholder partnerships are discussed in more detail in Chapter 5.
- *Integration.* Take an integrated approach to the problem. There is rarely, if ever, one single option for reducing risk. A package of measures will be required, based on an all-round view of hazards, vulnerabilities and livelihood options. Choices will have to be made according to local needs, the likely success of different interventions and the resources available. Integration of risk reduction in development programmes is very important.
- *Flexibility.* This is essential. It requires process, not blueprint, planning, which can adapt according to changes in understanding and circumstances.

- *Assumptions*. These should be stated clearly at the outset so that all partners are aware of them. What external factors that are not influenced by the project might affect its implementation and long-term sustainability? What are the risks – natural, social, economic, political – to this risk-reduction initiative?

4.3.2 Fundraising

It is not feasible to give extensive practical advice on fundraising within the scope and length of this Good Practice Review, but a few general comments can be made.

The first is that dedicated funding for disaster mitigation and preparedness is very limited. There are two main reasons for this: the lack of commitment to this issue among governments and donor agencies; and the persistence of artificial divisions between emergency and development budgets (disaster mitigation and preparedness fall into the gap between the two).

Humanitarian assistance grants generally have short time limits and strict criteria that do not allow expenditure on anything other than meeting urgent needs. A few international humanitarian organisations which raise large amounts of money for disaster relief from public fundraising appeals are beginning to think about allocating a proportion of this money to preparedness and mitigation.

Development budget lines tend to categorise anything relating to disasters as a problem for their humanitarian aid counterparts. Drought mitigation is a notable exception to this tendency, since it can be packaged differently, as food security work. Other projects can be successfully presented as development in this way: an initiative to build earthquake-proof housing can also be a community-based housing project; a scheme to redress environmental degradation through reforestation and more sustainable use of natural resources also reduces risks from floods and landslides. But this ought not to be a cynical exercise in marketing. Funding applications of this kind are likely to be successful only insofar as they take a genuinely developmental approach.

4.4 Chapter summary

- Project planners need to understand hazards, vulnerability and risk.
- Relevant hazards data may not always be easy to obtain and may require specialist collectors and interpreters, but less sophisticated methods and incomplete data sets can be used effectively.

- A number of methods of vulnerability analysis are available, many derived from PRA techniques, although we still have much to learn about their application.
- Community participation should be central to vulnerability analysis.
- Data collection and particularly analysis present technical problems in vulnerability analysis. The whole process therefore needs to be thought through carefully.
- Vulnerability analysis must lead to action.
- Risk analysis can be based on quantitative or qualitative data and carried out to varying degrees of complexity.
- One limitation of risk analysis as often practised is that it tends to focus on more visible and quantifiable elements at risk. However, more subjective, participatory forms of analysis can be used.
- Geographical information systems are revolutionising our potential capacity to analyse hazards, risk and vulnerability, but organisations need to consider the cost, skills and data required.
- Sustainable livelihoods approaches may provide a conceptual means of mainstreaming disasters and vulnerability in development thinking.

Notes

1 *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. 12–13.

2 Such as Keith Smith, *Environmental Hazards: Assessing Risk and Reducing Disaster* (London: Routledge, 1996); *Primer on Natural Hazard Management in Integrated Regional Development Planning* (Washington DC: Organization of American States, 1991), www.oas.org/usde/publications/Unit/oea66e/begin.htm.

3 See, for example, D. Alexander, *Principles of Emergency Planning and Management* (Harpenden: Terra Publishing, 2002); UNDRO, *Mitigating Natural Disasters*; and A. Coburn, R. Spence and A. Pomonis, *Disaster Mitigation*, UNDP/DHA Disaster Mitigation Training Programme, www.undmtp.org/english/Disaster_mitigation/disaster_mitigation.pdf.

4 A. M. Dixit et al., 'Hazard Mapping and Risk Assessment: Experiences of KVERMP', in ADPC (ed.), *Proceedings: Regional Workshop on Best Practices in Disaster Mitigation – Lessons Learned from the Asian Urban Disaster Mitigation Program and Other Initiatives, 24–26 September 2002, Bali, Indonesia* (Bangkok: Asian Disaster Preparedness Center, 2002), pp. 103–106.

5 'DFID/IFRC Partnership: Disaster Reduction Global Workshop, Khartoum, Sudan, 16–18 December 2002. Thematic Report', unpublished workshop report (Geneva: IFRC, 2002); T. Cannon, J. Twigg and J. Rowell, 'Social Vulnerability, Sustainable Livelihoods and Disasters: Report to DFID Conflict and Humanitarian Affairs Department and Sustainable Livelihoods

Support Office', unpublished report (Greenwich: University of Greenwich Natural Resources Institute, 2003), www.benfieldhrc.org/DMU/OtherPublications/DFIDVulandLiveRepFino303.pdf.

6 See, for instance, A. Lavell and E. Franco (eds), *Estado, Sociedad y Gestión de los Desastres en América Latina* (Lima: LA RED/FLACSO/ITDG Peru, 1996); M. Trujillo et al., *Risk-Mapping and Local Capacities: Lessons from Mexico and Central America* (Oxford: Oxfam, 2000); the Pan-American Health Organization (PAHO)'s 1994 study of La Paz, *Desastre Natural de la Ciudad de La Paz*, www.disaster.info.desastres.net/lapazriada; and D. R. Godschalk et al., *Natural Hazard Mitigation: Recasting Disaster Policy and Planning* (Washington DC: Island Press, 1999).

7 See, for example, Alexander, *Principles of Emergency Planning and Management*, pp. 18–23; and R. Stephenson and P. S. Anderson, 'Disasters and the Information Technology Revolution', in *Disasters*, vol. 21, no. 4, 1997, pp. 305–34.

8 L. Masing, 'Integrated Community Disaster Planning: The Philippine Experience', in J. Ingleton (ed.), *Natural Disaster Management* (Leicester: Tudor Rose, 1999), pp. 201–203. See also Kerry Abbott, 'Geographic Information Systems in Food Security and Demining Programmes', *Humanitarian Exchange*, no. 24, July 2003, pp. 31–33.

9 C. Feldkötter, 'GIS – What Can Go Wrong?', in *Workshop Proceedings: Application of Resource Information Technologies (GIS/GPS/RIS) in Forest Land & Resources Management. October 18–20, 1999, Hanoi, Vietnam* (GTZ, 1999).

10 *Living with Risk: A Global View of Disaster Reduction Initiatives* (Geneva: UN International Strategy for Disaster Reduction, 2002), pp. 72–73.

11 DFID's *Sustainable Livelihoods Guidance Sheets*, www.livelihoods.org/info/info_guidancesheets.html; J. Twigg, *Sustainable Livelihoods and Vulnerability to Disasters* (London: Benfield Hazard Research Centre, 2001), www.benfieldhrc.org; and M. Drinkwater and T. Rusinow, Presentation on CARE's Livelihoods Approach for NRAC '99 (London: CARE International, 1999), www.careinternational.org.uk/resource_centre/livelihoods/cares_livelihoods_approach.doc.

12 These include Standards Association of Australia, *Risk Management. AS/NZS 4360: 1999* (Strathfield: Standards Association of Australia, 1999); 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; and UNDRO, *Mitigating Natural Disasters*.