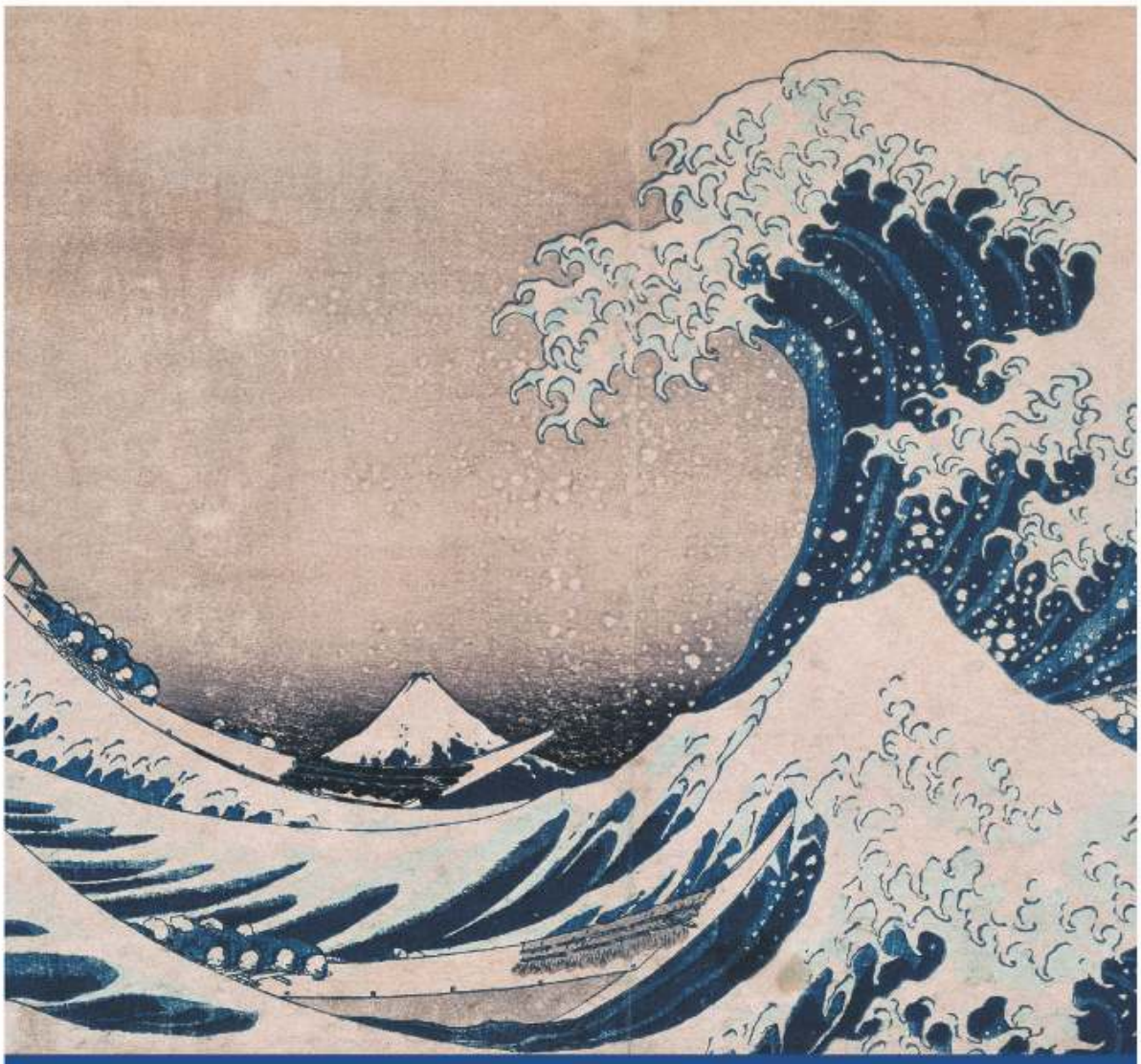

At Risk

Second edition

Natural hazards, people's vulnerability and disasters

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At Risk: natural hazards, people's vulnerability and disasters
Second edition
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The attached three chapters constitute Part I of the book, and have been made available in the public domain by the authors and Routledge as part of the UNDP follow up to the Hyogo Framework for Action 2005.

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Part I

FRAMEWORK AND THEORY

1

THE CHALLENGE OF DISASTERS AND OUR APPROACH

In at the deep end

Disasters, especially those that seem principally to be caused by natural hazards, are not the greatest threat to humanity. Despite the lethal reputation of earthquakes, epidemics and famine, a much greater proportion of the world's population find their lives shortened by events that often go unnoticed: *violent conflict, illnesses, and hunger* – events that pass for normal existence in many parts of the world, especially (but not only) in less developed countries (LDCs).[1] Occasionally earthquakes have killed hundreds of thousands, and very occasionally floods, famines or epidemics have taken millions of lives at a time. But to focus on these (in the understandably humanitarian way that outsiders do in response to such tragedies) is to ignore the millions who are not killed in such events, but who nevertheless face grave risks. Many more lives are lost in violent conflict and to the preventable outcome of disease and hunger (see Tables 1.1 and 1.2).[2] Such is the daily and unexceptional tragedy of those whose deaths are through 'natural' causes, but who, under different economic and political circumstances, should have lived longer and enjoyed a better quality of life.[3]

Table 1.1 Hazard types and their contribution to deaths, 1900–1999

Hazard type in rank order	*Percentage of deaths*
Slow onset:	
Famines – drought	86.9
Rapid onset:	
Floods	9.2
Earthquakes and tsunami	2.2
Storms	1.5
Volcanic eruptions	0.1
Landslides	<0.1
Avalanches	Negligible
Wildfires	Negligible

Source: CRED at www.cred.be/emdat

Table 1.2 Deaths during disasters, listed by cause, 1900–1999

Cause of death [a]	*Numbers killed (millions)*	*Percentage of deaths*
Political violence	270.7	62.4
Slow-onset disaster [b]	70.0	16.1
Rapid-onset disaster	10.7	2.3
Epidemics	50.7	11.6
Road, rail, air and industrial accidents	32.0	7.6
TOTAL	434.1	100

Notes:

[a]the source for political violence data is Sivard (2001). For all other causes, data is summarised from that available at www.cred.be/emdat

[b]this figure has been increased by us to an estimate of 70 million, much higher than the official data, which would give a total of around 18 million. This is to compensate for large-scale under-reporting of deaths from drought and famine. There are several reasons why this can occur. For instance, it is often the case that governments conceal or refuse to acknowledge famine for political reasons. The Great Leap Forward famine in China (1958–1961) was officially denied for more than 20 years, and then low estimates put the number of deaths at 13 million and higher ones at up to 30 million or more (see Chapter 4). A further problem is that sometimes recorded deaths in famine are limited to those who die in officially managed feeding or refugee camps. Many more are likely to die unrecorded at home or in other settlements.

However, we feel this book is justified, despite this rather artificial separation between people at risk from natural hazards and the many dangers inherent in 'normal' life. Analysing disasters themselves also allows us to show why they should *not* be segregated from everyday living, and to show how the risks involved in disasters must be connected with the vulnerability created for many people through their normal existence. It seeks the connections between the risks people face and the reasons for their *vulnerability* to hazards. It is therefore trying to show how disasters can be perceived within the broader patterns of society, and indeed how analysing them in this way may provide a much more fruitful way of building policies, that can help to reduce disasters and mitigate hazards, while at the same time improving living standards and opportunities more generally.

The crucial point about understanding why disasters happen is that it is not only natural events that cause them. They are also the product of social, political and economic environments (as distinct from the natural environment), because of the way these structure the lives of different groups of people (see Box 1.1).[4] There is a danger in treating disasters as something peculiar, as events that deserve their own special focus. It is to risk separating 'natural' disasters from the social frameworks that influence how hazards affect people, thereby putting too much emphasis on the natural hazards themselves, and not nearly enough on the surrounding social environment.[5]

Many aspects of the social environment are easily recognised: people live in adverse economic situations that oblige them to inhabit regions and places that are affected by natural hazards, be they the flood plains of rivers, the slopes of volcanoes or earthquake zones. However, there are many other less obvious political and economic factors that underlie the impact of hazards. These involve the manner in which assets, income and access to other resources, such as knowledge and information, are distributed between different social groups, and various forms of discrimination that occur in the allocation of welfare and social protection (including relief and resources for recovery). It is these elements that link our analysis of disasters that are supposedly caused mainly by natural hazards to broader patterns in society. These two aspects – the natural and the social – cannot be separated from each other: to do so invites a failure to understand the additional burden of natural hazards, and it is unhelpful in both understanding disasters and doing something to prevent or mitigate them.

Disasters are a complex mix of natural hazards and human action. For example, in many regions wars are inextricably linked with famine and disease, including the spread of HIV-AIDS. Wars (and post-war disruption) have sometimes coincided with drought, and this has made it more difficult for people to cope (e.g. in Afghanistan, Sudan, Ethiopia and El Salvador). For many people, a disaster is not a single, discrete event. All over the world, but especially in LDCs, vulnerable people often suffer repeated, multiple, mutually reinforcing, and sometimes simultaneous shocks to their families, their settlements and their livelihoods. These repeated shocks erode whatever attempts have been made to accumulate resources and savings. Disasters are a brake on economic and human development at the household level (when livestock, crops, homes and tools are repeatedly destroyed) and at the national level when roads, bridges, hospitals, schools and other facilities are damaged. The pattern of such frequent stresses, brought on by a wide variety of 'natural' trigger mechanisms, has often been complicated by human action – both by efforts to palliate the effects of disaster and by the social causation of vulnerability.

During the 1980s and 1990s, war in Africa, the post-war displacement of people and the destruction of infrastructure made the rebuilding of lives already shattered by drought virtually impossible. In the early years of the twenty-first century conflict in central and west Africa (Zaire/Congo, Liberia, Sierra Leone) has displaced millions of people who are at risk from hunger, malaria, cholera and meningitis.[6] The deep indebtedness of many LDCs has made the cost of reconstruction and the transition from rehabilitation to development unattainable. Rapid urbanisation is putting increased numbers of people at risk, as shown by the terrible toll from the earthquake in Gujarat, India (2001) and mudslides in Caracas, Venezuela (1999).

Box 1.1: Naturalness versus the 'social causation' of disasters

When disasters happen, popular and media interpretations tend to focus on their *naturalness*, as in the phrase 'natural disaster'. The natural hazards that trigger a disaster tend to appear overwhelming. Headlines and popular book titles often say things like 'Nature on the Rampage' (de Blij 1994), and visually the physical processes dominate our attention and show human achievements destroyed, apparently by natural forces. There have been numerous television documentaries in Europe, North America and Japan which supposedly examine the causes of disasters, all of which stress the impact of nature. Much of the 'hard' science analysis of disasters is couched in terms that imply that natural processes are the primary target of research. The 1990s was the UN International Decade of *Natural* Disaster Reduction (our italics).

The diagram shown in Figure 1.1 illustrates why this is a very partial and inadequate way of understanding the disasters that are associated with (triggered by) natural hazards. At the top of Figure 1.1, Boxes 1 and 2, the natural environment presents humankind with a range of opportunities (resources for production, places to live and work and carry out livelihoods [Box 3]) as well as a range of potential hazards (Box 4). Human livelihoods are often earned in locations that combine opportunities with hazards. For example, flood plains provide 'cheap' flat land for businesses and housing; the slopes of volcanoes are generally very fertile for agriculture; poor people can only afford to live in slum settlements in unsafe ravines and on low-lying land within and around the cities where they have to work. In other words, the spatial variety of nature provides different types of environmental opportunity and hazard (Box 2) – some places are more at risk of earthquakes, floods, etc. than others.

But crucially, humans are not equally able to access the resources and opportunities; nor are they equally exposed to the hazards. Whether or not people have enough land to farm, or adequate access to water, or a decent home, are determined by social factors (including economic and political processes). And these same social processes also have a very significant role in determining who is most at risk from hazards: where people live and work, and in what kind of buildings, their level of hazard protection, preparedness, information, wealth and health have nothing to do with nature as such, but are attributes of society (Box 5). So people's exposure to risk differs according to their *class* (which affects their income, how they live and where), whether they are *male or female*, what their *ethnicity* is, what *age group* they belong to, whether they are *disabled* or not, their *immigration status*, and so forth (Box 6).

Box 1.1 continued

Thus it can be seen that disaster risk is a combination of the factors that determine the potential for people to be exposed to particular types of natural hazard. But it also depends fundamentally on how social systems and their associated power relations impact on different social groups (through their class, gender, ethnicity, etc.) (Box 7). In other words, to understand disasters we must not only know about the types of hazards that might affect people, but also the different levels of *vulnerability* of different groups of people. This vulnerability is determined by social systems and power, not by natural forces. It needs to be understood in the context of political and economic systems that operate on national and even international scales (Box 8): it is these which decide how groups of people vary in relation to health, income, building safety, location of work and home, and so on.

In disasters, a geophysical or biological event is implicated in some way as a trigger event or a link in a chain of causes. Yet, even where such natural hazards appear to be directly linked to loss of life and damage to property, there are social factors involved that cause peoples' vulnerability and can be traced back sometimes to quite 'remote' root and general causes. This vulnerability is generated by social, economic and political processes that influence how hazards affect people in varying ways and with differing intensities.

This book is focused mainly on redressing the balance in assessing the 'causes' of such disasters away from the dominant view that natural processes are the most significant. But we are also concerned about what happens even when it is admitted that social and economic factors are the most crucial. There is often a reluctance to deal with such factors because it is politically expedient (i.e. less difficult for those in power) to address the technical factors that deal with natural hazards. Changing social and economic factors usually means altering the way that power operates in a society. Radical policies are often required, many facing powerful political opposition. For example, such policies might include land reform, enforcement of building codes and land-use restrictions, greater investment in public health, provision of a clean water supply and improved transportation to isolated and poor regions of a country.

The relative contribution of geophysical and biological processes on the one hand, and social, economic and political processes on the other, varies from disaster to disaster. Furthermore, human activities can modify physical and biological events, sometimes many miles away (e.g. deforestation contributing to flooding downstream) or many years later (e.g. the introduction of a new seed or animal, or the substitution of one form of architecture for another, less safe, one). The time dimension is extremely important in another way. Social, economic and political processes are themselves often modified by a disaster in ways that make some people more vulnerable to an

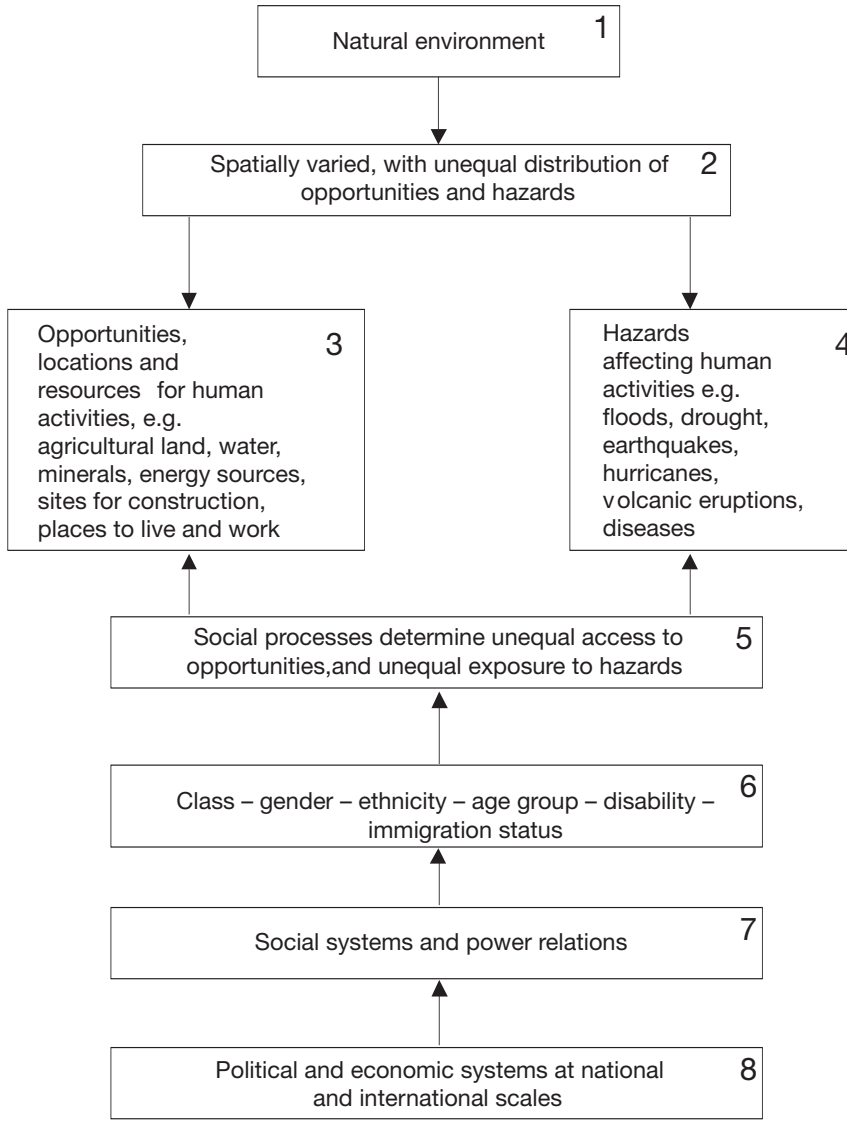

Figure 1.1 The social causation of disasters

extreme event in the future. Placing the genesis of disaster in a longer time frame therefore brings up issues of intergenerational equity, an ethical question raised in the debates around the meaning of 'sustainable' development (Adams 2001). The 'natural' and the 'human' are, therefore, so inextricably bound together in almost all disaster situations, especially when viewed in an enlarged time and space framework, that disasters cannot be understood to be 'natural' in any straightforward way.

This is not to deny that natural events can occur in which the natural component dominates and there is little place for differential social vulnerability to the disaster other than the fact that humans are in the wrong place at the wrong time. But such simple 'accidents' are rare. In 1986 a cloud of carbon dioxide gas bubbled up from Lake Nyos in Cameroon, spread out into the surrounding villages and killed 1,700 people in their sleep. In the balance of human and natural influences, this event was clearly at the 'natural' end of the spectrum of causation. The area was a long-settled, rich agricultural area. There were no apparent social differences in its impacts, and both rich and poor suffered equally.[7]

One example of a natural event with an explicitly inequitable social impact is the major earthquake of 1976 in Guatemala. The physical shaking of the ground was a natural event, as was the Cameroon gas cloud. However, slum dwellers in Guatemala City and many Mayan Indians living in impoverished towns and hamlets suffered the highest mortality. The homes of the middle class were better protected and more safely sited, and recovery was easier for them. The Guatemalan poor were caught up in a vicious circle in which lack of access to means of social and self-protection made them more vulnerable to the next disaster. The social component was so apparent that a journalist called the event a 'class-quake'.

It is no surprise that poor people in Guatemala live in flimsier houses on steeper slopes than the rich and that they are therefore more vulnerable to earthquakes. But what kind of social 'fact' is differential vulnerability in a case such as this? Above all, we think this case involves historical facts. Referring to a long history of political violence and injustice in the country, Plant (1978) believed Guatemala to be a 'permanent disaster'. The years of social, economic and political relations among the different groups in Guatemala and elsewhere have led some to argue that such histories 'prefigure' disaster (Hewitt 1983a). In Guatemala, after the 1976 earthquake, the situation deteriorated, with years of civil war and genocide against the rural Mayan majority that only ended in 1996. During this period, hundreds of thousands of Mayans were herded into new settlements by government soldiers, while others took refuge in remote, forested mountains and still others fled to refugee camps in Mexico. These population movements often saw marginal people forced into marginal, dangerous places.

This book attempts to deal with such histories and to uncover the deeply rooted character of vulnerability rather than taking the physical hazards as

the starting point, thereby allowing us to plan for, mitigate and perhaps prevent disaster by tackling all its causes. The book also builds a method for analysing the actual processes which occur when a natural trigger affects vulnerable people adversely.

Conventional views of disaster

Most work on disasters emphasises the 'trigger' role of geo-tectonics, climate or biological factors arising in nature (recent examples include Bryant 1991; Alexander 1993; Tobin and Montz 1997; K. Smith 2001). Others focus on the human response, psychosocial and physical trauma, economic, legal and political consequences (Dynes et al. 1987; Lindell and Perry 1992; Oliver-Smith 1996; Platt et al. 1999). Both these sets of literature assume that disasters are departures from 'normal' social functioning, and that recovery means a return to normal.

This book differs considerably from such treatments of disaster, and arises from an alternative approach that emerged in the last thirty years. This approach does not deny the significance of natural hazards as trigger events, but puts the main emphasis on the various ways in which social systems operate to generate disasters by making people vulnerable. In the 1970s and early 1980s, the vulnerability approach to disasters began with a rejection of the assumption that disasters are 'caused' in any simple way by external natural events, and a revision of the assumption that disasters are 'normal'. Emel and Peet (1989), Oliver-Smith (1986a) and Hewitt (1983a) review these reflections on causality and 'normality'. A competing vulnerability framework arose from the experience of research in situations where 'normal' daily life was itself difficult to distinguish from disaster. This work related to earlier notions of 'marginality' that emerged in studies in Bangladesh, Nepal, Guatemala, Honduras, Peru, Chad, Mali, Upper Volta (now Burkina Faso), Kenya and Tanzania.[8]

Until the emergence of the idea of vulnerability to explain disasters, there was a range of prevailing views, none of which dealt with the issue of how society creates the conditions in which people face hazards differently. One approach was unapologetically naturalist (sometimes termed physicalist), in which all blame is apportioned to 'the violent forces of nature' or 'nature on the rampage' (Frazier 1979; Maybury 1986; Ebert 1993; de Blij 1994). Other views of 'man [sic] and nature' (e.g. Burton et al. 1978; Whittow 1980) involved a more subtle environmental determinism, in which the limits of human rationality and consequent misperception of nature lead to tragic misjudgements in our interactions with it (Pelling 2001). 'Bounded rationality' was seen to lead the human animal again and again to rebuild on the ruins of settlements destroyed by flood, storm, landslide and earthquake.

According to such views, it is the pressure of population growth and lack of 'modernisation' of the economy and other institutions that drive human

conquest of an unforgiving nature. This approach usually took a 'stages of economic growth' model for granted (Rostow 1991). Thus, 'industrial' societies had typical patterns of loss from, and protection against, nature's extremes, while 'folk' (usually agrarian) societies had others, and 'mixed' societies showed characteristics in between (Burton et al. 1978, 1993).[9] It was assumed that 'progress' and 'modernisation' were taking place, and that 'folk' and 'mixed' societies would become 'industrial', and that we would all eventually enjoy the relatively secure life of 'post-industrial' society.

The 1970s saw increasing attempts to use 'political economy' to counter modernisation theory and its triumphalist outlook, and 'political ecology' to combat increasingly subtle forms of environmental determinism.[10] These approaches also had serious flaws, though their analyses were moving in directions closer to our own than the conventional views.

Now we try to reintroduce the 'human factor' into disaster studies with greater precision, while avoiding the dangers of an equally deterministic approach rooted in the political economy alone. We avoid notions of vulnerability that do no more than identify it with 'poverty' in general or some specific characteristic such as 'crowded conditions', 'unstable hillside agriculture' or 'traditional rain-fed farming technology'.[11] We also reject those definitions of vulnerability that focus exclusively on the ability of a system to cope with risk or loss.[12] These positions are an advance on environmental determinism but lack an explanation of how one gets from very *widespread conditions* such as 'poverty' to very *particular vulnerabilities* that link the political economy to the actual hazards that people face.

What is vulnerability?

The basic idea and some variations

We have already used the term *vulnerability* a number of times. It has a commonplace meaning: being prone to or susceptible to damage or injury. Our book is an attempt to refine this common-sense meaning in relation to natural hazards. To begin, we offer a simple working definition. By vulnerability we mean *the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard* (an extreme natural event or process). It involves a combination of factors that determine the degree to which someone's life, livelihood, property and other assets are put at risk by a discrete and identifiable event (or series or 'cascade' of such events) in nature and in society.

Some groups are more prone to damage, loss and suffering in the context of differing hazards. Key variables explaining variations of impact include class (which includes differences in wealth), occupation, caste, ethnicity, gender, disability and health status, age and immigration status (whether 'legal' or 'illegal'), and the nature and extent of social networks. The concept

of vulnerability clearly involves varying magnitudes: some people experience higher levels than others. But we use the term to mean those who are more at risk: when we talk of vulnerable people, it is clear that we mean those who are at the 'worse' end of the spectrum. When used in this sense, the implied opposite of being vulnerable is sometimes indicated by our use of the term 'secure'.[13] Other authors complement the discussions of vulnerability with the notion of 'capacity' – the ability of a group or household to resist a hazard's harmful effects and to recover easily (Anderson and Woodrow 1998; Eade 1998; IFRC 1999b; Wisner 2003a).

It should also be clear that our definition of vulnerability has a time dimension built into it: vulnerability can be measured in terms of the damage to future livelihoods, and not just as what happens to life and property at the time of the hazard event. Vulnerable groups are also those that also find it hardest to reconstruct their livelihoods following disaster, and this in turn makes them more vulnerable to the effects of subsequent hazard events. The word 'livelihood' is important in the definition. We mean by this the command an individual, family or other social group has over an income and/or bundles of resources that can be used or exchanged to satisfy its needs. This may involve information, cultural knowledge, social networks and legal rights as well as tools, land or other physical resources.[14] Later we develop this livelihood aspect of vulnerability in an 'Access model'. The Access model analyses the ability of people to deal with the impact of the hazards they face in terms of what level of access they have (or do not have) to the resources needed for their livelihoods before and after a hazard's impact (see Chapter 3).[15]

Our focus on vulnerable people leads us to give secondary consideration to natural events as determinants of disasters. Normally, vulnerability is closely correlated with socio-economic position (assuming that this incorporates race, gender, age, etc.). Although we make a number of distinctions that show it to be too simplistic to explain all disasters, in general the poor suffer more from hazards than do the rich. Although vulnerability cannot be read directly off from poverty, the two are often very highly correlated. The key point is that even a straightforward analysis on the basis of poverty and wealth as determinants of vulnerability illustrates the significance we want to attach to social forms of disaster explanation. For example, heavy rainfall may wash away the homes in wealthy hillside residential areas of California, such as Topanga Canyon (in greater Los Angeles) or the Oakland–Berkeley hills (near San Francisco), just as it does those of the poor in Rio de Janeiro (Brazil) or Caracas (Venezuela).[16]

There are three important differences, however, between the vulnerability of the rich and the poor in such cases. Firstly, few rich people are affected if we compare the number of victims of landslides in various cities around the world. Money can buy design and engineering that minimises (but of course does not eliminate) the frequency of such events for the rich, even if they are living on an exposed slope.

Secondly, living in the hazardous canyon environment is a choice made by some of the rich in California, but not by the poor Brazilian or Philippine job seekers who live in hillside slums or on the edge of waste dumps.[17] Without entering the psychological or philosophical definitions of 'voluntary' versus 'involuntary' risk taking (see Sjöberg 1987; Adams 1995; Caplan 2000), it should be clear that slum dwellers' occupancy of hillsides is less voluntary than that of the corporate executive who lives in Topanga Canyon 'for the view'. The urban poor use their location as the base for organising livelihood activities (e.g. casual labour, street trading, crafts, crime, prostitution). If the structure of urban land ownership and rent means that the closest they can get to economic opportunities is a hillside slum, people will locate there almost regardless of the landslide risk (Hardoy and Satterthwaite 1989; Fernandes and Varley 1998). This, we will argue, is a situation in which neither 'voluntary choice' models nor the notion of 'bounded rationality' (Burton et al. 1993: 61–65) are applicable.

Thirdly, the consequences of a landslide for the rich are far less severe than for the surviving poor. The homes and possessions of the rich are usually insured, and they can more easily find alternative shelter and continue with income-earning activities after the hazard impact. They often also have reserves and credit. The poor, by contrast, frequently have their entire stock of capital (home, clothing, tools for artisan handicraft production, etc.) assembled at the site of the disaster. They have few if any cash reserves and are generally not considered creditworthy (despite the rapid development of 'micro-credit' schemes in a number of countries – see Chapter 9). Moreover, as emphasised above, the location of a residence itself is a livelihood resource for the urban poor. In places where workers have to commute to work over distances similar to those habitually covered by the middle class, transport can absorb a large proportion of the budget for a low-income household. The poor self-employed or casually employed underclass finds such transport expenses onerous. It is therefore not surprising that large numbers of working-class Mexicans affected by the 1985 earthquake refused to be relocated to the outskirts of Mexico City (Robinson et al. 1986; Poniatowska 1998; da Cruz 1993; Olson et al. 1999; Olson 2000; see also Chapter 8).

Multiple meanings of 'vulnerable'

Just before and since the publication of the first edition of *At Risk*, there has been a very welcome increase in the writing about vulnerability (Wilches-Chaux 1992a; Jeggle and Stephenson 1994; Davis 1994; Buckle et al. 1998/99; Buckle et al. 2000; Currey 2002). In this revised edition we happily take on board much of what has been added. There are at least four streams of recent work we should acknowledge.

Firstly, some recent studies give more emphasis to people's 'capacity' to protect themselves rather than just the 'vulnerability' that limits them. Earlier

work (including, to some degree, our own) tended to focus most attention on the social, economic and political processes that make people 'vulnerable'. Understandably, it was necessary to use terminology that emphasised the *problem* that is generated by social processes – if people's capabilities were all working properly then there would be few disasters. This kind of analysis is essential, but it tends to emphasise people's weaknesses and limitations, and is in danger of showing people as passive and incapable of bringing about change. There is a need to register the other side of the coin: people do possess significant capabilities as well. Perhaps because of the influence of public health and social work professions, 'socially vulnerable groups' tended to be treated as 'special needs groups'. This approach can reduce people to being passive recipients, even 'victims' (Hewitt 1997: 167), and individuals without relationships. Usually, almost everyone has some capacity for self-protection and group action: the processes that generate 'vulnerability' are countered by people's capacities to resist, avoid, adapt to those processes, and to use their abilities for creating security, either before a disaster occurs or during its aftermath.

Secondly, there is now more interest in trying to quantify vulnerability as a tool of planning and policy making (Gupta et al. 1996; Davidson et al. 1997, 2000; Hill and Cutter 2001; UNDP 2003; Yarnal et al. 2002; Gheorghe 2003). With this has come debates about the correct balance between quantitative and qualitative data, and a deeper question concerning whether it is actually possible to quantify vulnerability. These efforts have been promoted by international agencies such as the Organization of American States (NOAA and OAS 2002), the United Nations Development Programme (UNDP 2003), DFID (Cannon et al. 2003), Emergency Management Australia (Buckle et al. 2001) and a large group of institutions led by FAO (FAO/IWAG 1998; UN-ACC 2000; WFP n.d.).

Thirdly, an increasing number of authors remind us of the cultural, psychosocial and subjective impacts of disasters. Definitions of vulnerability, including our own, usually include the notion of a potential for 'ill-being' (often expressed as an objectively assessed statistical probability) multiplied by the magnitude of the combined impacts of a particular trigger event. Thus, the conversion of risk is turned into a common metric, which enables different hazards to be compared (Rosa 1998), and this is the main analytical route taken by this book. Disaster impact is measured by a range of etic (external) and objectively verifiable indicators, such as mortality, morbidity, damage to property and physical assets, reduction in savings and so on.

While certainly necessary, these indicators are not sufficient, and we are aware that they tend to under-emphasise the cultural, the psychosomatic and subjective aspects of disaster impact (Perry and Mushkatel 1986; Oliver-Smith and Hoffman 1999; Johns 1999; Tuan 1979). Contemporary livelihood analysis must take conventional impact measures further to include notions of resilience and sensitivity, social capital and collective action. This conceptualisation of the

drawing down of different 'capitals' and the conversion of one to another offers a more holistic view of well-being and decision making, particularly under conditions of 'normal' life, and this is a contemporary development of disaster theory which we elaborate on at length in Chapter 3. However, even this approach tends to make many untested and simplistic assumptions about preferences, choices and values, particularly under conditions of acute stress and extraordinary circumstances. The disaster event itself alters both capabilities and preferences, in the short term (e.g. grieving, trauma, acute deprivation, sleep, shelter, child care and other intimate relations, with implications for making decisions and carrying them out) and in the longer term (alterations in the access qualifications required to satisfy preferences, the rules of collective action). It provides a shock to expectations that in turn are shaped by people's social constructions of the likelihood of a disaster event (Beck 1992). The individual, household, kinship network and larger collectivities may develop implicit or explicit strategies to manage risk, which themselves constitute an important element in well-being and provide the basis for action when vulnerability is made a reality by the disaster event itself.

Fourthly, overlapping with the previous point, there is a movement away from simple taxonomies or checklists of 'vulnerable groups' to a concern with 'vulnerable situations', which people move into and out of over time. 'Vulnerability', as we use the word, refers only to people, not to buildings (susceptible, unsafe), economies (fragile), nor unstable slopes (hazardous) or regions of the earth's surface (hazard-prone).[18] Typically, social characteristics such as gender, age, health status and disability, ethnicity or race or nationality, caste or religion, and socio-economic status are the focus of attention.[19] Special interest non-governmental organisations (NGOs) have produced detailed checklists to take account of the particular needs and vulnerabilities of such groups as elderly people or unaccompanied children, both in vulnerability/capacity assessments as well as post-disaster needs assessments (see Chapter 9). These post-disaster tools are very useful as *aides mémoires* for busy administrators and case workers in the chaotic situation of a refugee camp or large-scale disaster such as the earthquakes in Gujarat (2001) or north-western Turkey (1999). For example, religion and caste had to be taken into account as they had an impact on the distribution of relief in Gujarat, where there were fears by aid workers that Muslims and Dalits (untouchables) were not receiving an equitable share (Harding 2001).[20]

But the use of post-disaster checklists does not *in itself* help one to understand *why* and *how* those characteristics have come to be associated with a higher probability of injury, death, livelihood disruption and greater difficulty in recovery. The checklists now widely used by international agencies and NGOs are based on some combination of the agency's own empirical observations and the results of a growing number of post-disaster studies and audits, many of them by sociologists. However, the empirical discovery of an association or correlation does not explain the process that gave rise to

the association. For example, the finding that domestic violence against women increased after hurricane Andrew has to be understood in process terms. It is not female gender itself that marks vulnerability, but gender *in a specific situation*. These gender relations between women and men were played out in the context of the growth boom of south Florida in the1980s and early 1990s, weak regulation of the building industry, downsizing and restructuring that left many working-class men anxious about future employment. Such male anxieties and frustration were acted out as domestic violence following the hurricane (Peacock et al. 2001).

In contrast, the process of pre-disaster vulnerability/capacity assessment is undertaken in a more reflective state of mind, without the urgency of a typical disaster situation. Thus, within these contexts it is possible to investigate causal factors as well as the symptoms, assuming that political leaders permit such probing analysis.

Many vulnerability situations are temporary, and change as life stages do (marriage, child bearing, old age) or with changes in occupation, immigration status or residence. For example, one study found that there were large numbers of low-income, young, immigrant, non-English-speaking, single mothers living in an area bordering San Pedro harbour (part of greater Los Angeles). This specific geographical location has a higher probability than other parts of San Pedro (or surrounding areas) for cargo explosions, liquefaction and amplified shaking because of soil factors in an earthquake, and exposure to a toxic plume from refinery fires (Wisner et al. 1999). The concatenation of income, age, immigration status, language and single parenthood significantly shifts the meaning of 'gender' as a simple category or box-to-tick in a taxonomy of vulnerability. Only two miles away from San Pedro, other women live in mansions overlooking the Pacific Ocean from the heights of Rancho Palos Verde. They share the socially constructed identity of 'woman' with these young Guatemalan single mothers, but in most other respects, they inhabit a separate universe (Wisner 1999; Wisner et al. 1999).

Risk society?

There is a large and growing literature on risk that we acknowledge but do not directly engage with in this book. The main reason is that it focuses primarily on technological hazards facing the more developed, industrial countries and the condition of late modernity in which they find themselves. In contrast, we direct most of our attention to risk as experienced and interpreted in less developed countries. One influential author writing about risk during the 1980s and 1990s is Ulrich Beck. His books *Risk Society: Toward a New Modernity?* (1992) and *Ecological Politics in the Age of Risk* (1995), amongst a number of others, have been profoundly influential. In these publications he seeks the 'root causes' of environmental crisis just as we in this book look for the 'root causes' of vulnerability to disaster. Beck (like many other

researchers) finds those roots in the rampant consumerism of contemporary rich societies. But also (and this is of more interest to disaster studies) in two forms of social control of the consequences of over-consumption. One is 'ecological modernisation', by which the technicians of the 'risk society' attempt to 'fix' environmental problems without ever addressing root causes. The other is a form of amnesia or denial of environmental problems that he terms 'organized irresponsibility' (Beck quoted in Goldblatt 1999: 379).

Beck maintains that the more developed world is in a transitional state between industrial society and 'risk society': with so much wealth also come risks. With an increasingly complex and technologically driven society come new threats: 'hazards and insecurities induced and introduced by modernisation itself' (Beck 1992: 21). Many of these are treated by more affluent societies with a high degree of ambivalence, since a number of risks can no longer be directly experienced in a sensory manner (touched, seen or smelt as in the case of industrial society). Instead, there are risks of nuclear radiation, carcinogens in foodstuffs, toxicity from pesticides and risks associated with lifestyle. In addition, there is a background level of anxiety from a bewildering number of often ill-defined risks, some of them involving lifestyle and others involving incalculable horrors of unknown statistical probability, such as nuclear war or, we might add, since 11 September 2001, terrorist attack. Castel goes further to argue that modernity is involved in 'a grandiose technocratic rationalizing dream of absolute control of the accidental … an absolute reign of calculative reason' (Castel 1991: 289, quoted in Lupton 1999: 7).

Thus, industrial, affluent society is increasingly protected against the uncertainties faced in LDCs through the application of technology and higher levels of income. Yet it is none the less increasingly preoccupied with incalculable and diffuse risks, which have somehow eluded all the advances of science and medicine. Others have noted a correlation between the emergence of 'environmental' concerns (e.g. with the quality of water and air) and increased affluence of the middle class in the USA and Europe (Hays 1987). In addition, more discrete and dramatic 'surprises' continue to occur in more developed countries, such as the unanticipated scale of the devastation of Kobe by the Great Hanshin earthquake in Japan in 1995 (despite all of Japan's scientific and engineering prowess); the contamination of a large area following the explosion of the Chernobyl nuclear reactor in 1986; the outbreak of BSE (bovine spongiform encephalopathy or 'mad-cow disease') in Britain in 2001; or the loss of the Space Shuttle Columbia and the outbreak of SARS in 2003. This cultural environment of risk, it will be clear to the reader, overlaps with but is different from the concerns we address in this book.

Beck considers the ways in which people in highly developed societies involve themselves in 'reflexive modernity', an institutionalised activity and state of mind involving constant monitoring and reflection upon and

(according to Jacobs 1998) confrontation with these risks – whether they objectively exist or not. In particular, reflexive modernisation of risk can involve consideration of risks at the global level, an awareness that is a major incentive for international co-operation and practice, and leads to the globalisation of the meaning of risk. Thus transferred to the global scale, new concepts have been constructed and initiatives undertaken to 'manage' risk: for example, 'conserving biodiversity', 'reversing global warming' and 'disaster reduction' are forms of ecological modernisation conducted by the combined technocracy of rich, consuming nations (Sachs 1999). By extension, international efforts to 'manage' aspects of the impacts of hurricanes, droughts and volcanoes on behalf of poor, former colonial countries could also be considered a form of ecological modernisation. However, the fatal flaw in ecological modernisation is that it never deals with root causes. It is therefore never-ending and self-perpetuating. Later, we will return to several classic cases of this sort, such as the 'management' of the volcanic eruption in Montserrat (see Chapter 8).

Beck's work and the discussions it has stimulated are important and do, in some ways, overlap with our approach (Giddens 1990; Jacobs 1998; Lupton 1999). However it is rather remote from the dynamics of hazard, vulnerability and risk in LDCs that is our principle focus in this book. Nevertheless, there is another use of Beck's notion of reflexive modernisation that we find much closer to our purposes of the analysis of disasters in LDCs. While it can lead to perpetual anxiety and the self-defeating approach of ecological modernisation discussed above, reflexive modernisation can result in more focused political demands on authorities to address what we could call the 'root causes' of vulnerability. This pressure from below on authorities and corporations is that of citizens organised into what Beck calls an 'ecological democracy' (Beck 1995, 1998; Beck et al. 1994). Agreeing in large part with Beck's views, we place considerable emphasis on lay people, citizen groups and the vulnerable themselves as an important target audience of this book. Giddens (1992) has elaborated on the insights of Beck by exploring the relationship between 'risk' and 'trust'. Used in a different context, we also find that trust between, for example, citizen-based organisations and municipal governments, is critical in mobilising human resources for mitigating disaster loss and reducing vulnerability (Wisner 2002a) (see also Part III).[21]

Deconstructive approaches

The writings on risk, as in other subjects in social science, are distributed along a continuum of epistemological positions (Stallings 1997). At one end, there is a realist approach that takes risk as an objective hazard that exists and can be measured independently of social and cultural processes. Theories and methods associated with this epistemology are techno-

scientific, statistical and actuarial. Moving across the continuum, there are what could be termed 'weak constructionist' approaches, where risk is an objective hazard but is always mediated through social and cultural processes (Oliver-Smith and Hoffman 1999). Finally, there is the strong constructionist approach, where nothing is a risk in itself but is a contingent product of historically, socially and politically created 'ways of seeing' (Lupton 1999: 35). This book broadly takes a realist, and at times a weak constructionist, approach to risk. Many of the concerns and anxieties about which Beck and Giddens write so persuasively are a product of a late modern society in the more developed countries (MDCs), while the risks faced by many in developing countries are different. That is not to say that culturally constructed risks are any less apparent in LDCs. It is rather that they do not have the luxury of indulging in the anxieties found in MDCs, but instead face famine, flood, biological hazards, high winds and earthquakes – without the protection offered (to some) by affluent, industrial countries.

We part company with strong social constructionist approaches because we believe they do not lead, in any direct way, to an improvement in practice – either in disaster prevention or in post-disaster management. Therefore, for example, we acknowledge Bankoff's (2001) approach to famine as interesting but not useful from our perspective. He considers the historical roots of the discursive framework within which hazards are presented, and how that might reflect particular cultural values to do with the way in which certain regions of the world are usually imagined.[22] He characterises modernist approaches to disasters, risk and vulnerability as a historically constructed neo-colonial discourse which denigrates large regions of the world as 'tropical' (the unhealthy and dangerous 'other'), poverty-stricken and disaster-prone (ibid.). Although this view is accurate, we feel it is difficult to use it to contribute to the prevention or mitigation of disasters and improvement of relief and reconstruction. We acknowledge it but leave it to one side.

As noted above, the origins of the vulnerability approach we take in this book can be located in the 1970s when authors began to question the 'naturalness' of 'natural disaster' (O'Keefe et al. 1976). To that extent we have already been where Bankoff would ask us to go, and we now wish to provide more precise advice on linkages that transmit root causes into very specific unsafe conditions. Indeed, deconstructive critique is not new within geography and environmental studies, where for some time authors have pointed out that 'land degradation' and other environmental management categories come loaded with the assumptions and biases of the observer (Adams 2001; Leach and Mearns 1996; Gadgil and Guha 1995). The critique of structuralist, determinist methods is also well established within development studies (Crush 1995; Escobar 1995; Rahnema and Bawtree 1997) and has already had some influence on students of disaster.

There is, however, a heuristic aspect of such a post-structural critique of disaster discourse that we believe provides a valuable caution and corrective (Mustafa 2001). It could be argued that notions such as 'disaster management cycle', and terms such as 'relief', 'rehabilitation' and 'recovery' are technical constructs imposed on different cultural, economic, political and gender realities (Oliver-Smith and Hoffman 1999; Enarson and Morrow 2001). Such constructs fail to comprehend the lived reality of disaster and, to that extent, can fail to engage the co-operation of local people.

Vulnerability and normal/daily life

We argue in this book that feasible and informed practice in reducing disaster risk as well as a better theoretical understanding of disasters are possible only if one places the phenomenon of disaster 'in the mainstream' of policy and practice. Hewitt made this point twenty years ago when he wrote of how disasters had been mentally exiled to an 'archipelago' of exceptionalism (Hewitt 1983b). Agreeing wholeheartedly with Hewitt, we show how 'normal' historical processes contribute to the causation of disasters. We also show how 'normal' pressures in global, regional and national systems of economic, social and political power contribute to creating vulnerability to disaster. The material conditions of daily life, what one might call 'normal life', also underlie or, as Hewitt put it, 'prefigure' disasters (ibid.: 27). These material conditions are, above all, biological in the sense of our access to food, water and the air we breathe. We treat these material underpinnings of existence in some detail in Chapters 3 to 5. The Access model presented in Chapter 3 provides insight into how such material conditions of daily or normal life change with circumstances. It shows how major stress, such as an extreme natural event, can reverberate through a household's livelihood system, playing havoc with its ability to meet its needs, and, moreover, its ability to recover and protect itself against other, perhaps unrelated, stresses and crises at a later time.

Changes since the first edition

Nearly a decade has passed since the first edition of *At Risk* was completed. It has been ten years of very great change and, in some ways, unfortunate continuity. Much theoretical, practical and institutional work has been done on disaster 'vulnerability'. An entire United Nations International Decade for Natural Disaster Reduction (IDNDR) has passed (1990–1999). The language of major development agencies and banks has changed. Yet more and more costly and deadly disasters continue to occur.

The International Decade for Natural Disaster Reduction (IDNDR)

Not long after the publication of *At Risk*, in May 1994, the IDNDR held its mid-decade conference in Yokohama, Japan. This was an important watershed (see Chapter 9). Dissatisfaction emerged with the top-down, technocratic approach to disasters that had characterised the first half of the decade's activities. The resulting 'Yokohama Message' contained much that parallels the arguments we made in the first edition of *At Risk*. In particular, two prerequisites for disaster risk reduction are emphasised:

> 1 … [A] clear understanding of the cultural and organizational characteristics of each society as well as of its behavior and interactions with the physical and natural environment.
>
> 2 … [T]he mobilization of non-governmental organizations and participation of local communities.
>
> (Ingleton 1999: 320)

The 'Yokohama Message' warned of the danger of 'meagre results of an extraordinary opportunity given to the United Nations and its Member States' during the first half of the IDNDR.

During the second half of the IDNDR considerable efforts were made to involve NGOs and communities. A popular magazine, *Stop Disasters*, was published. Annual themes for 'World Disaster Day' included social issues, for example a focus on women in disasters. Perhaps the most important development was a turn toward cities during the last three years of the IDNDR. This began with an international electronic conference in 1996 that reached out to many practitioners and NGOs, as well as academics and government officials (IDNDR 1996). An ambitious pilot programme for urban earthquake risk assessment and mitigation was run from 1997 to 2000. This 'Risk Assessment Tools for Diagnosis of Urban Areas Against Seismic Disasters' programme (mercifully known by the short acronym RADIUS) involved a core of nine medium-sized cities in different parts of the world, with a total of 84 cities as observers participating in various ways.[23]

RADIUS displayed the mark of the 'Yokohama Message' very clearly, because work in the nine core cities involved a broad cross-section of sectors, citizens and scientific disciplines. It was focused on mitigation of loss, and it used accessible technologies. RADIUS began in each city with a study of earthquake hazard and vulnerability, and progressed through the development of city-wide action plans that, once again, involved many diverse sectors and institutions.

Urban growth and the growth of urban concerns

The IDNDR's urban turn reflected a judgement that rapid progress in reducing loss of life could be made by focusing on cities. Indeed, another major change since the first publication of *At Risk* is the speed with which the world's population is rapidly becoming urban.[24] The IDNDR's focus on cities was also co-ordinated to provide a contribution to 'Habitat II', a major world conference on urban settlements held in Istanbul, Turkey in 1997 (twenty years after Habitat I). How should we explain the decision to focus IDNDR activity on earthquake risk reduction in cities, as opposed to any one of other possible urban hazards (e.g. flood, storms, volcanic eruptions)? Part of the explanation is found in the origins of the IDNDR. Earthquake engineers were very prominent in its creation and remained influential. Also important was the fact that two costly earthquakes had recently surprised authorities and experts alike in the USA (Northridge, California in 1994, costing $35 billion) and Japan (Kobe in 1995, with losses of over $147 billion).

Changes in earth care

The language of 'sustainable development' had entered development studies and policy documents from the late 1980s, with the publication of *Our Common Future* (WCED 1987). The 'Earth Summit' was held in Rio de Janeiro in 1992, near the start of the IDNDR. Since then, at least on paper, disaster risk reduction has been included as an element of many of the national and local efforts to implement *Agenda 21*, the Rio Summit's plan of action. However, the processes undermining any positive moves to make concrete such diplomatic consensus were soon in evidence after the Summit. In 1998, hurricane Mitch struck several Central American countries and made it obvious that it was underlying processes of land degradation and de-vegetation that made people vulnerable (see Chapter 7). The death toll from this hurricane is estimated to have been 27,000 people, most of these in Honduras and Nicaragua. The majority of these deaths were from floods and landslides that could have been prevented if so much of these countries had not been stripped of their forest cover.

In 2002, the Johannesburg World Summit on Sustainable Development reaffirmed the place of disaster risk reduction within its notion of 'sustainable development'. In the run up to the Johannesburg Summit, ten years after the Rio Summit, the third Global Environmental Outlook report by the UN Environment Programme (UNEP 2002) included a substantial chapter on disasters (see Chapter 9 below). It noted some uneven progress in reducing disaster risk, mostly concentrated in the richer countries. But, on balance, it considered the significance of what it called a 'vulnerability gap', 'which is widening within society, between countries and across regions with the disadvantaged more at risk to environmental change and disasters' (ibid.: 297).

Since the original publication of *At Risk*, the science of global climate change has improved, while the political consensus behind the Kyoto Treaty[25] (on reducing greenhouse gas emissions) has made only slow progress, largely because of US opposition).[26] It appears that the severe impact of hurricane Andrew (which devastated much of Miami in 1992) and the huge floods in the Mississippi basin the following year have not convinced the Bush administration of the possible connection between greenhouse gas emissions and climate change. This is despite strong advocacy for 'sustainable development' by prominent US disaster researchers (Mileti 1999; Burby 1998). Perhaps another dose of rough weather from the next El Niño cycle will wake up the US government to the need for a 'war on wasteful consumption' to parallel its 'war on terrorism'.

In the run up to the Johannesburg summit numerous authors and institutions have revisited the connections between land use and disaster. They recalled the lessons of hurricanes Mitch (1998) and Andrew (1992), the Mississippi floods (1993) and floods throughout many parts of Europe during the 1990s, as well as almost annual huge floods in China. Deforestation and other kinds of land-use problems have been implicated in all of these disasters (Gardner 2002; Burby 1998). They also wrote of the wildfires in Indonesia, the USA, Australia, Mexico and Brazil. They reminded us of the great loss of lives in the flooding and mudslides in Venezuela in 1999, Algeria and Brazil in 2001, and a deadly landslide triggered by an earthquake in El Salvador, also in 2001 (Abramovitz 2001; ISDR 2002a; Wisner 2001f, 2001c). In all these cases, better land-use planning and enforcement could have prevented the extreme natural event becoming a disaster. We are also reminded that a population displaced by a large-scale dam is not likely to understand the hazards of the terrain, climate and ecosystem in the area in which they are resettled. It will be harder for them to protect themselves against natural hazards that are new to them (World Commission on Dams 2000b).

The emergence of the 'precautionary principle'

Natural scientists from many disciplines have begun to discuss the problems of uncertainty in their analysis of various natural phenomena (Handmer et al. 2001). In situations where human actions may be causing catastrophic harm to natural systems on a global scale, a prudent 'precautionary science' is needed. This may apply especially to situations where the probability of a catastrophic outcome may be low but the magnitude of the catastrophe very large (Johnston and Simmonds 1991; O'Brien 2000). A more conventional and optimistic view is that it is possible to 'manage the planet' if there is sufficient knowledge of all the interactions in such large-scale physical systems as the atmosphere, hydrosphere, lithosphere, asthenosphere[27] and biosphere (Clark 1989). Such a technocratic and managerial approach has

received increasing criticism over the past ten years. Our book will also challenge this latter line of thinking. Our effort is necessary in part because faith in simple technological fixes is still pervasive. As Zimmerman (1995: 175) notes: 'Too many of us blithely assume that we need not deal with the base causes of our environmental problems because soon-to-be-discovered technological solutions will make those problems obsolete'.

Critiques of economic globalisation

Another major change since this book first appeared is the increase in public and academic opposition to aspects of economic globalisation (including the street protests of Seattle and Genoa) (Hardt and Negri 2000; Sklair 2001; Wisner 2000a, 2001a; Pelling 2003a; Hines 2000; Monbiot 2003). In the first edition of this book, we dealt with the impact of such neo-liberal economic policies as 'structural adjustment' as a dynamic pressure leading to vulnerability. In the 1980s there was evidence that cutbacks in public expenditure on health and social protection were undermining the resilience of poor people to natural hazards. Since then the critique of neo-liberalism has been broadened to include the ideology of free trade and the institutions of economic globalisation such as the World Trade Organisation. In this new edition we recognise fully the role of economic globalisation as a 'dynamic pressure' affecting vulnerability to disasters (see Chapter 2). The scale of globalisation is enormous. As Friedman puts it:

> [G]lobalization is not simply a trend or a fad but is, rather, an international system. It is the system that has now replaced the Cold War system, and, like the Cold War system, globalization has its own rules and logic that today directly or indirectly influence the politics, environment, geopolitics and economics of virtually every country in the world.
>
> (2000: ix)

Starting in 2000 (in Porto Alegre, Brazil), the World Social Forum meets annually to act as a counterpoint to the business and governmental elite who meet at the World Economic Conference. The 2003 World Social Forum attracted 100,000 delegates (Wainwright 2003). Positive proposals are emerging for 'another globalisation' that is not based on dogmatic neo-liberal formulae for 'structural adjustment' of economies and 'free trade'. With widespread support by citizens' groups, churches and NGOs having caused governments to accept the notion of reducing the international debt of the least-developed nations, proposals such as a 'Tobin Tax' on international financial transactions may no longer be seen as utopian or fringe ideas.[28] In the face of rapidly accelerating privatisation of water supplies, others have begun to argue that as a basic need and human right, water

should not be considered a commodity among other commodities.[29] Our concern about control of water supplies by multinational corporations is especially about whether 'the market' is sufficient to guarantee resilience of water, drainage and sanitation systems in the face of natural hazards such as earthquakes, floods and storms; and if not, who bears the losses and costs?

Academic support for the critique of blind belief in economic growth as the predominant goal of development has been building up since the UNDP began to publish its *Human Development Report* (HDR) in 1990. Its Human Development Index (HDI) measures equity, health and education, and not just economic activity. In 1995 the HDR added gender-specific measures, and in 1997 two separate measures of human poverty: one for more developed countries and one for the less developed. Other international institutions have responded to the reintroduction of social and other human goals into the development discourse (UNRISD 2000). In 2001 the World Bank devoted two chapters to poverty and disaster vulnerability in its *World Development Report* (the annual publication which had tended to give priority to economic growth and which, to some extent, the *Human Development Report* was designed to counter) (World Bank 2001; however, compare Cammack 2002).

In its *World Disasters Report 2001*, the International Red Cross presented data from the UNDP and Centre for Research in the Epidemiology of Disasters (CRED) that compares the impacts of extreme natural events on countries with high, medium, and low scores on the HDI (IFRC 2001a: 162–165). They looked at data for 2,557 disasters triggered by natural events between 1991 and 2000. Half of these disasters took place in countries with medium HDI, but two-thirds of the deaths occurred in countries with low HDI. Only 2 per cent of the deaths were recorded in the countries with a high HDI. When tabulating deaths and monetary losses per disaster, the relationship with HDI is even clearer (Table 1.3).

UNDP took this analytical work even further in 2002 by commissioning the quantitative study of more than 200 possible indicators of disaster risk vulnerability and producing a vulnerability index for use in its *World*

Table 1.3 Level of human development and disaster impacts

	Deaths per disaster	Loss per disaster ($ millions)
Low HDI	1,052	79
Medium HDI	145	209
High HDI	23	636

Source: based on IFRC (2001a: 162, 164)

Note:

HDI is Human Development Index (see text for explanation).

Vulnerability Report. The worldwide results (for the years 1980–1999) are striking (UNDP 2003). The HDI again turns out to be the best predictor of deaths triggered by extreme natural events.

Changes in human development and well-being

In parts of the world (especially in many African countries), the improvements in access to education, health care and the greater longevity achieved in the 1960s and 1970s continued to decline in the 1990s (UNDP 2003b). We noted this trend in the first edition of *At Risk*, and argued that the programmes for managing international debt imposed on many of these countries by the World Bank and IMF had increased people's vulnerability to disaster. Despite reformulating, renaming and giving a 'human face' to these 'structural adjustment programmes' (SAPs) during the 1990s, the effects have continued.

Gardner (2002: 10) observed that health officials in the 1970s believed that the era of infectious disease was about to come to an end worldwide. However, today we find that '20 familiar infectious diseases – including tuberculosis, malaria, and cholera – [have] re-emerged or spread … and at least 30 previously unknown deadly diseases – from HIV to hepatitis C and Ebola – [have] surfaced' (ibid.: 10–11). HIV-AIDS deaths have grown from 500,000 worldwide in 1990 to nearly 3 million in 2000 (Barnett and Whiteside 2001). Most of the deaths from HIV-AIDS occur in the LDCs (the distribution is similar to that presented above for disaster deaths), and four-fifths of these are in sub-Saharan Africa (ibid.: 12). At the end of 1999, there were 34 million people living with HIV, of whom 25 million (74 per cent) lived in sub-Saharan Africa (1 million of them children). Over 12 million children had been orphaned by HIV-AIDS. The magnitude of this disaster dwarfs anything else we take up in this book, and the numbers are staggering. HIV-AIDS in Africa represents great complexity in its long-term consequences for production, social relations and vulnerability to future crises, including the effects of global climate change (see Chapters 2 and 5 on this series of interlinked problems, and Chapter 5 in particular for more on Africa and African HIV-AIDS). Although in 1998 the UNDP was able to conclude that, on average, health had improved in the previous 30 years (UNDP 1998: 21–23), in many African countries this was certainly not the case.

War and humanitarian relief

Since the first publication of *At Risk*, dozens of violent conflicts have broken out and many civilians have been killed, maimed (especially by land mines), injured, deliberately mutilated, starved, occasionally enslaved and displaced by the belligerent parties. So great has been the need for humanitarian relief

in these conflict and post-conflict situations that some 'normal' development assistance has been diverted, and opportunities for self-generated development delayed or destroyed, further worsening the position of marginal and vulnerable populations in the longer term. Furthermore, there has been confusion among development NGOs about how to act in regard to:[30]

- civilian/military relations during 'complex' emergencies;
- relations with war lords, local elites and the army;
- ways to move from relief to recovery, and to development;
- internationally acceptable standards of assistance;
- mobilisation of international support for relief.

Conflicts have continued to exacerbate natural extreme events such as drought in Afghanistan (2002; see Christian Aid 2002; World Food Programme 2002c) and the volcanic eruption in eastern Congo (2002). However, since the mid-1990s, the possible role of 'disaster diplomacy' in peace making has also been noted, and at least a dozen 'windows' for conflict resolution that opened during a natural hazard event have been documented.[31]

Violent conflict interacts with natural hazards in a wide variety of ways:

- It is often one of the main causes of social vulnerability.
- Displacement of large numbers of people in war and other violent conflicts can lead to new risks (exposure to disease, unfamiliar hazards in new rural or urban environments) (US Committee for Refugees 2002).
- Socially vulnerable groups in extreme natural events are often also vulnerable to abuse (injury, death, rape, forced labour) during violent conflict.
- Violent conflict can interfere with the provision of relief and recovery assistance.
- Participatory methods meant to empower and engage socially vulnerable groups may be difficult or impossible during violent conflicts.
- The application of existing knowledge for the mitigation of risk from extreme natural events is often difficult or impossible during violent conflict.
- Violent conflict often diverts national and international financial and human resources that could be used for the mitigation of risk away from extreme natural events (Brandt 1986; Stewart 2000).
- Conflict sometimes destroys infrastructure, which may then intensify natural hazards (e.g. irrigation systems, dams, levees) or compromises warnings and evacuations (e.g. land mines on roads).
- The failure of sustainable development can result in conflict over resources that can lead to violent confrontation.
- Violent confrontations often wreak havoc on vegetation, land and water, and this undermines sustainable development.

- Some economic development strategies and policies can lead to marginalisation and exclusion, and hence the creation of social vulnerability to extreme natural events, and may simultaneously provoke social unrest, e.g. food riots (Walton and Seddon 1994).

Media and policy selectivity

Another change since the first edition of our book is a growing concern about the highly selective treatment of disasters by the Western media, their tendency to overlook significant disasters, and a general decline in interest in the rest of the world. Even when such disasters are noticed, there is little follow up. Typically the most underreported humanitarian crises listed by Médecins Sans Frontières (MSF) for 2001 tend to be slow onset, long-term disasters, most often linked to war or post-war situations. We attempt to redress this balance in this edition of the book. Below is a list of 'missing' crises according to MSF (2001), some of which are dealt with in subsequent chapters:[32]

Malaria epidemic in Burundi: 3 million cases in a population of 6.5 million because of the severe spatial dislocation and displacement of people due to war since 1993.

Precarious situation of Chechnyan refugees in Ingushetia, where mafia-like business groups control the flow of food and other survival goods to the refugees (Agence France-Press 2002d).

North Korean famine refugees in People's Republic of China (PRC): brutality against hundreds of thousands of Koreans fleeing across the remote border with PRC.

Rural violence and urban marginalisation in Colombia: 2 million people have become internally displaced in Colombia since 1985; 300,000 alone in 2000. Rural health services have been destroyed. In urban areas these displaced persons live in very dangerous places. This is a recipe for increasing exposure to flood, landslide, earthquake and epidemic disease.

Breakdown of health care services in the Democratic Republic of Congo: MSF estimates that there are 2.5 million internally displaced persons (IDPs) in Congo. The volcanic eruption in the east added to this number (see Chapter 8). Camp environments are hazardous in many ways, as is isolated survival on the margins of the ongoing conflicts (see Chapter 5).

Continuing violence in Somalia: Despite inter-clan peace talks in Djibouti and other diplomatic initiatives, war lords continue to dominate Somalia. People there are exposed to drought, flood, cyclones and even earthquakes. Without a viable state, their vulnerability to these natural hazards will remain high.

20 years of war in Sri Lanka: 60,000 people have died in 20 years of war, and there are hundreds of thousands of IDPs. During 2001 there was both drought and flood in various parts of the country, and the conflict hampers mitigation of these hazards, response to their impacts, and recovery – as noted in Chapter 2.

Many displaced people in West Africa: Liberia, Sierra Leone, Guinea Bissau, Senegal, Nigeria and Angola have all been affected by severe internal, organised violence. In all these countries the result is to exacerbate vulnerability to 'normal' hazards such as flooding (e.g. Senegal in 2001), drought and outbreaks of human epidemic and animal epizootic disease (see Chapters 5 and 6).

Refugees and displaced people worldwide: MSF estimates that in 2001 there were 22 million refugees in the world (who had taken refuge across a national border) and another 20–25 million IDPs. Even before additional risk factors associated with gender, class, ethnicity, age, disability, etc. are taken into account, the very fact of being a refugee or internally displaced raises a person's vulnerability to some natural hazards.

Neglected diseases: MSF concludes its list of the top ten underreported humanitarian crises with an account of chronic diseases of the poor that had not made the headlines in the same way that HIV-AIDS has done. These include tuberculosis, malaria, human sleeping sickness (of which there are African and Latin American varieties) and Kala Azar (visceral leishmaniasis).[33] All four of these chronic, debilitating and potentially lethal conditions are linked to living conditions and there is considerable disease-agent resistance to available medication. Debilitation and disability mean that people have less time to invest in protecting themselves from other hazards by, for example, constructing or maintaining terraces, fire and wind breaks, farm or community wood lots, or carrying out irrigation works (see Chapter 5 and other chapters in Part II).

Convergence and critique

Convergence

During the 1990s there has certainly been a convergence of thinking – and to a limited degree, practice – concerning natural hazards, people's vulnerability and disasters. The IDNDR put vulnerability squarely on the development agenda. Work by many institutions on urban disasters in particular helped to focus and clarify our view of vulnerability: its causes, effects and remedies. A decade-long attempt to implement Agenda 21 – the programme of action following the Earth Summit – provided many illustrations of the strengths and weaknesses of sustainable development, a very slippery, ambiguous concept. Finally, the notion of human development and

its measurement using the HDI has offered new opportunities for planners and scholars to place disaster risk reduction in the mainstream. The evidence indicates that high levels of death and disruption of livelihoods by disasters are closely associated with low scores on the HDI at the national level. Whilst much of the analysis of *At Risk* is focused on the level of the household, neighbourhood or rural community, our understanding of vulnerability is consistent with these new results.

Critique

Commentary on *At Risk* has, on the whole, been positive. Some reviewers have suggested that we need to link more closely the two models presented in Chapters 2 and 3 and to use them more consistently in the chapters that make up Part II. Others have suggested ways to make the book more readable. Some have questioned whether we make enough allowance for human and social factors such as creativity and innovation (Haghebaert 2001, 2002). There have also been questions about whether we have 'thrown the baby out with the bath water' by not concentrating enough on the potential for actually affecting the natural and geophysical 'triggers' of hazards (Lavell 2001; Turner et. al. 2003). Haghebaert (2001) also wonders if our focus on 'root causes' distracts us from the less ambitious, but none the less life-saving, efforts of the state in providing safety. We have read this advice carefully and, where we concurred with it, applied it in the revision process.

A less approving critique involves what some see as the political implications of our approach. Some feel that our focus on root causes and social relations is of no practical use, and amounts to a call for social revolution. Smith (1996: 51) states that work such as ours, belonging to what he calls the 'structuralist school', 'can be criticized for rather stridently expressed views which, at worse, simply call for overall social revolution'.

Others take the opposite tack and believe we have abandoned the political struggle for justice in an unequal world. For example, Middleton and O'Keefe (1998) assert that we neglect political causes of disaster vulnerability on the national and international scale; that we limit ourselves in this way because of our desire to address multiple audiences, especially practitioners; and that we therefore rely exclusively on small-scale, incremental changes and improvement as solutions. Accusing us of sending a message 'of self-defeating counsel of prudence' (ibid.: 145), Middleton and O'Keefe write:

> … *At Risk* stops short of tackling the larger complex in which the world's poor are so vulnerable. (p. 11)

> … confining their examinations to unquestionably important detail, the authors add the fateful words that they do so in order not to

> oversimplify and not to produce 'a theory that is of little use to managers, planners, and policy-makers'. (p. 11)
>
> [The authors of *At Risk*] feel that sufficient attention to the smaller details will eventually force changes in the macro-economic and social conditions leading to the problems. (p. 162)

We do not propose to occupy a great deal of space giving a detailed defense of the first edition, but to focus on those criticisms which lead, however intentioned by the critics, to potential improvements to this edition. At the outset it must be said that Middleton and O'Keefe set out to write a very different sort of book from *At Risk*. Theirs is more focused on the political aspects, especially the politics of complex emergencies. They lay little claim to build theory; their main claim is to be 'radical'. Their book exposes rather than explains. One of the purposes of such a trenchant criticism of *At Risk* might have been to push aside an established book which occupied the central ground at the time, by differentiating the two different approaches. The issue of our preoccupation with detail at the expense of 'tackling the larger picture' is one way of excusing any author (including themselves) of taking the trouble to analyse in detail different approaches and theories of disasters. The Pressure and Release (PAR) model and the Household Access model, originally presented in the first edition of *At Risk* and re-introduced in an improved format in this edition, are not inconsequential details but tools that allow a carefully crafted explanation of disasters at different levels.

As the reader will soon see, Chapter 2 begins with 'root causes' that are truly global in scope and deeply rooted in history. In our schema we first break down 'root causes' into processes that are driven by ideology and that produce, reproduce and sustain political and economic systems. Secondly, we separate these into factors that distribute access within societies to power, structures and resources. In the schematic presentation of the model outlined in Chapter 2, we explain in the first edition that our intent is to show in detail how 'war, foreign debt and structural adjustment, export promotion, mining, hydropower development, and deforestation work through to localities' (p.24 of 1st edn).

True to our intention, in the first edition we took up, *inter alia*, the role of IMF structural adjustment programmes in undermining health in Nigeria and Zimbabwe (p.114), the role of international aid agencies in promoting a 'tech-fix' solution to flooding in Bangladesh (pp.138–143), the role that absentee land ownership plays in raising the stakes in coastal disaster risk (p.153) and the part played by inflation in Mexico in the lead up to its earthquake disaster of 1985 (pp.174–181). In the face of this evidence, how can our critics claim that we have 'a distaste for the large political issues'? All of these examples fit precisely that class of processes which Middleton and

O'Keefe claim falls outside the scope of *At Risk*: the macro-economic and the political.

These critics claim that the combination of our two models (outlined in Chapters 2 and 3) is capable of producing no more than the following tautology:

> People are vulnerable because they are poor and lack resources, and because they are poor and lack resources, they are vulnerable.
>
> (Ibid.: 12)

They mock this 'triumph of reason' but are kind enough to put it down not to our stupidity, but (returning to their favourite theme) to the fact that we are trapped in a 'fault in the logic of [our] models' (p. 12). This is an important source of misinterpretation. Poverty is not synonymous with vulnerability. The terms both imply relationships, but in the case of poverty it is relations with others in society which reproduces this state, while vulnerability implies causal relations with both society and also the physical environment at particular times. What Middleton and O'Keefe term circular reasoning is nothing of the kind. Our analysis often reveals the kind of vicious circle already mentioned earlier. Each time a disaster takes place, those most vulnerable are likely to be made even more vulnerable to the next extreme occurrence or stress.[34] Middleton and O'Keefe point out such vicious circles themselves in a number of their own case studies. Whether called the 'ratchet effect', 'underdevelopment trap' or 'marginalisation', this phenomenon is well established in the theoretical and empirical literature of development studies (Chambers 1983; Blaikie and Brookfield 1987). A vicious circle is not a tautology.

Audiences

This book will inevitably first come to the attention of academics and students in higher education whose work interests them in disasters, development and LDCs. We hope it will appeal to anthropologists, economists, sociologists, political scientists, geographers and others in social science. We also hope that the book will be read by engineers and natural scientists: physical geographers, geologists, oceanographers, seismologists, volcanologists, geomorphologists, hydrologists and climatologists.

Because we see this book as being useful for action as well as study, we want to identify other groups we hope will use this book. Normally, the discussion about a book's supposed readership is found in the preface, where it seems neutral and less significant. We would rather discuss our potential readers here, in relation to their own role in the social processes involved in making people vulnerable to hazards and in reducing vulnerability. By doing so we may assist in doing something to intervene in those processes to

reduce that vulnerability. Such groups may include professionals involved in disaster work as an essential element in their day-to-day activity (e.g. public health workers, architects, engineers, agronomists, urban planners, civil servants, business executives, bankers and investors, community activists and politicians).

The sociologist C. Wright Mills once wrote that there are three audiences for social analysis: those with power who are aware of the consequences of their acts on others; those with power who are unaware of the consequences; and the powerless who suffer those consequences (Mills 1959). In a similar way, we identify three other broad audiences for this book. There are, firstly, those with power who create vulnerability, sometimes without being aware of their actions. Secondly, we address those with power who are attempting to do something about hazards, but may be unable to make their work effective enough because of a failure to incorporate vulnerability analysis. Thirdly, we write for those who are operating at the grassroots level, who suffer the consequences of disasters, or who are working with people to reduce their vulnerability and increase their power.

The first is the group that creates and maintains the vulnerable condition of others. Such groups include major owners of resources at international, national and local levels (whose activities have significant effects on how and where other people live), foreign agribusiness firms, investment bankers, civil engineering contractors and land speculators. In some cases they may be unaware of the consequences their decisions have for the vulnerability of others.

The second audience is extremely broad, and consists of those who attempt to address and to reduce the impact of natural hazards. It includes a variety of levels in government, and people with a range of interests in government activity, whose normal work is not specifically aimed at disasters as such. However, in almost every country, governments and other bodies have assumed some sort of responsibility for dealing with disasters, and this often involves measures to mitigate hazards.

At the apex of political power, leaders will take decisions on disasters, possibly on the advice of their senior civil servants. At this policy formulation level, directives are developed on economic, financial or political grounds, and will involve decisions affecting planning, agriculture, water resources, health, etc. The implementation stage will not necessarily address vulnerable conditions in relation to hazards, and indeed some policies may increase vulnerability. We hope to demonstrate that it is not enough simply to deal with the hazard threat, so that policies will be designed to reduce vulnerability and therefore disasters. There is considerable opportunity to improve policy making and implementation at national, sub-national, and especially at municipal levels in many countries in these early years of the twenty-first century because of the emphasis given by the World Bank and other influential bodies to the question of ‘good governance’.

The implementation of policy extends beyond government ministries and agencies. Many voluntary agencies that have provided relief for disasters now see the need to address the pre-disaster conditions which give rise to patterns of repeated disaster and people's failure to cope. The Red Cross system is an example, and for ten years now it has published a *World Disasters Report* which (although not official policy) conveys a great deal of information and analysis on root causes and dynamic pressures.[35] Following an initiative by the Swedish Red Cross (Hagman 1984), many voluntary bodies have attempted to redefine their roles in terms of 'preventing' disasters rather than just alleviating their effects. We hope our book helps to enhance their future contribution.[36]

It is also possible to find representatives of the commercial sector among those involved with vulnerability who might be in a position to introduce mitigation measures. For example, a typical international civil engineering firm may include in its portfolio the design of large-scale engineering projects, such as high dams and flood defences that frequently exacerbate downstream flood hazards and thus increase vulnerability. But the same engineers may also create cyclone-resistant structures. Another example can be found in the logging industry, which can both increase risk (falling into the first category listed above) or it can work to reduce risk through measures such as selective cutting and replanting (Poore 1989; Fire Globe 2003). The same can be said of large-scale commercial agriculture and the mining industry, and parastatal firms such as electrical utilities (or their recently privatised descendants), for example in river basin management, including the construction and maintenance of dams. The construction industry can also, through its practices, either increase or decrease risk. A common perception that may motivate this second wide audience is that it is cheaper in the long run (in economic, social and political senses of the word) to prevent or mitigate disasters than to fund recovery (Anderson 1990). This is certainly the point of view of the World Bank, where its Disaster Management Facility has done the maths and shown without doubt that prevention is less costly than recovery (Gilbert and Kreimer 1999; Freeman et al. 2002). Now a consortium of banks and development agencies exists to promote prevention in the commercial as well as public sector – the ProVention consortium.[37]

The third group of readers are those who are vulnerable, or who at grassroots level are trying to deal with the processes that create vulnerability. We hope this book will assist organisers and activists who are part of grassroots struggles to improve livelihoods, for instance in the face of land deals and projects conceived by outsiders. Such locally organised pressure groups have proliferated rapidly during the 1980s and 1990s. They are now recognised as a major force for social change in general and disaster mitigation in particular (Anderson and Woodrow 1998; Twigg and Bhatt 1998; Fernando and Fernando 1997; Pirotte et al. 1999; Maskrey 1989).[38] This audience includes

members of regional NGOs and networks devoted to action research in partnership with vulnerable groups of people. The three groups to which we have donated the royalties from this edition of *At Risk* are part of this audience: La RED in Latin America, Peri Peri in southern Africa and Duryog Nivaran in South Asia.[39]

Scope and plan of the book

Chapters 2 and 3 set out the perspective of our book in detail. They describe how our view of disasters differs from the conventional wisdom, and also where they coincide. It is plainly wrong to ignore the role of hazards themselves in generating disasters, and the framework we are suggesting does not do so. Likewise, we are not suggesting that vulnerability is always the result of exploitation or inequality (just as it is not equivalent to poverty). It is integrally linked with the hazard events to which people are exposed. We also want to acknowledge that there are limits to this type of analysis. It is not always possible to know what the hazards affecting a group of people might be, and public awareness of long-return period hazards may be lacking. For instance, Mount Pinatubo in the Philippines erupted in 1991, but had been dormant for 600 years.

Chapter 2 introduces a simple model of the way in which 'underlying factors' and root causes embedded in everyday life give rise to 'dynamic pressures' affecting particular groups, leading to specifically 'unsafe conditions'. When these underlying factors and root causes coincide in space and time with a hazardous natural event or process, we think of the people whose characteristics have been shaped by such underlying factors and root causes as 'vulnerable' to the hazard and 'at risk to disaster'. This will be referred to as the 'Pressure and Release' (PAR) model, since it is first used to show the pressure from both hazard and unsafe conditions that leads to disaster, and then how changes in vulnerability can release people from being at risk.[40]

We consider that certain characteristics of groups and individuals have a great deal to do with determining their vulnerability to hazards. Some of these, such as socio-economic class, ethnicity and caste membership have featured in analyses since the 1970s. Others, especially gender and age, are more recent research categories, and have developed in part because of the influence of social movements such as feminism.[41] For example, in a classic example of the importance of gender, Vaughan (1987: 119–147) uses the oral evidence provided in women's songs and stories in Malawi to reconstruct a women's history of the 1949 famine that is strikingly different from the men's account:

> [Women], along with the very old and very young, were more likely than men to end up relying on government handouts … [W]omen

> stress how frequently they were abandoned by men, how harrowing it was to be left responsible for their suffering and dying children, how they became sterile, and how they were humiliated by the feeding system.
>
> (Ibid.: 123)

During the 1990s a large amount of work on gender and disaster yielded much more valuable evidence of this kind (Fernando and Fernando 1997; Enarson and Morrow 2001).[42] Others have emphasised the special needs, lack of status and access, and hence special vulnerability of the frail elderly, especially widows (Guillette 1991; Feierman 1985; Wilson and Ramphele 1989: 170–185).

Daily life comprises a set of activities in space and time during which physical hazards, social relations and individual choice become integrated as patterns of vulnerability.[43] These patterns are guided by the socio-economic and personal characteristics of the people involved. Here are found, sometimes (but not always), the effects of gender,[44] age,[45] physical disability,[46] religion,[47] caste[48] or ethnicity,[49] as well as class. All of these may play a role, in addition to poverty, class or socio-economic status. Although we include class in our analysis, we fully recognise the role of this wide range of social relations and do not dwell exclusively on class relations.

Chapter 3 adds to our alternative framework by focusing on patterns of access to livelihood resources. We expand the discussion there of 'underlying factors and root causes', identified in Chapter 2. In doing so we seek to shift the focus of our analytical method further in the social direction, without oversimplifying or producing a theory that is of little use to managers, planners and policy makers.

Part I concludes with a discussion of coping. We believe that too little attention has been given to the strategies and actions of vulnerable people themselves. In large part their 'normal' life is evidently (at least to outsiders) a continual struggle in which their conditions may resemble a disaster. People become braced to cope with extreme natural events through the stress of making ends meet, in avoiding the daily hazards of work and home, and of evading the predations of the more powerful. They form support networks, develop multiple sources of livelihood access and 'resist' official encroachments on livelihood systems in a variety of ways (Scott 1985, 1990, 1998). People learn rather cynically, yet realistically, not to rely on services provided by authorities (Robinson et al. 1986; O'Riordon 1986; Maskrey 1989; Oliver-Smith and Hoffman 1999). Our discussion of 'coping' will neither romanticise the self-protective behaviour of ordinary people, nor dismiss it.[50]

Having set out our alternative framework in Part I (Chapters 1–3), Part II presents case material organised by hazard type – those linked with drought, biological hazards, flood and landslide, cyclone, earthquake and volcano

(Chapters 4–8). In each chapter we follow a similar method in tracing the causes of vulnerability, making use of both PAR and Access models. It may appear to contradict our approach to deal with disasters through different natural hazard types. However, we have deliberately chosen to do this because users of this book may themselves be concerned with particular hazards, or may find it difficult to accept our approach without seeing it interpreted more concretely in the context of nature.

Part III (Chapter 9) draws out lessons for recovery and for preventive action. We provide a holistic view of recovery and review the mixed history of narrow relief and reconstruction efforts, paying special attention to whether and how 'dynamic pressures' and 'root causes' of disaster vulnerability can be addressed during what has been called the 'window of opportunity' for policy change created by disasters. We end the book with a series of objectives that link human development and vulnerability reduction, emphasising issues of governance and livelihood resilience and local capacity that have begun to be accepted as desiderata in mainstream development circles.

Limits and assumptions

Limitations of scale

There are logical grounds for limiting our book to certain sorts of disaster. Disasters cannot, of course, be neatly categorised either by type or scale. At one extreme, it seems that there have been five mass extinctions over the last 400 million years in which up to half of the life forms on the planet disappeared (Wilson 1989: 111). The best known of these is the disappearance of the dinosaurs. The scale of such disasters (and even the use of the term is perhaps inappropriate) is clearly so many orders of magnitude greater than those with which we are concerned that we exclude them. Such events are beyond the present scale of human systems.

More recently, there have been two or three occasions when a large proportion of the human inhabitants of this planet died with apparently little distinction in regard to the relative risk of different social groups. Many millions died during the pandemics of bubonic and pneumonic plague known as the Plague of Justinian (AD541–93) and the Black Death (1348–1353). More recently the influenza virus that swept the world during and after the First World War killed 22 million in less than two years (1918–1919). This was approximately four times the total of military casualties during that war. The demographic and socio-economic consequences of the first two events had epochal significance. The current HIV-AIDS pandemic could equal them in its widespread socio-economic consequences unless a vaccine is found or sexual practices change. Despite the great significance of biological disasters, we shall address such events only tangentially

(see Chapter 5), in part to illustrate the limits of the vulnerability approach. Catastrophic epidemics may be limiting cases that shed light on 'normal' disease disasters, such as outbreaks of cholera and malaria in Latin America and Africa, meningitis and Ebola in Africa, or plague in India.

Nuclear war is another type of disaster that we do not consider because it is produced directly by humans, although some research on the 'nuclear winter' has been inspired by threats from natural events such as massive volcanic explosions or asteroid impacts. There is also considerable climatological, astrophysical and palaeontological work on mass extinctions which links some of these to severe interference with received solar radiation. Atmospheric phenomena of a similar scale of magnitude, such as global warming, will be treated as part of the more remote 'dynamic pressures' of the PAR model, shaping patterns of vulnerability. We also consider war itself (in its non-nuclear form) to be a significant 'root cause' of disaster and will address it several times throughout the text.

We devote only a little attention to what might be called 'social hazards', especially to terrorism. The events of 11 September 2001 in New York City have caused disaster researchers to reflect upon the lessons that twenty-first century terrorism might have for their own work on other kinds of hazards (and vice versa). If the official US position is correct – that the attack on the World Trade Center constituted the beginning of a war (the 'war on terrorism') – then, in fact, such a disaster is not new.[51] Millions of civilian lives have been lost in wars during the twentieth century (Hewitt 1994, 1997). An alternative position is that the attack was not an act of war but a crime (albeit with a large number of victims). If this alternative view is correct, then there are also precedents, such as the gas attack on the Tokyo subway in 1995 and the bombing of the Murrah Federal Building in Oklahoma City. In either case, our book cannot expand to include such disasters, and we might simply offer the observation that those seeking to understand such 'acts of war' or 'crimes' should, as we do, look for root causes and not for quick (including massive military) fixes.

Technological hazards

Vulnerability assessment is also relevant to analysing disasters resulting from technological hazards. However, we restrict the scope of this book and exclude technological hazards, for the simple reason that they are not natural in origin. One of our purposes in this book is to deal with natural hazards, because of the inadequacy of explanations of disasters that blame nature. Our aim is to demonstrate the social processes that, through people's vulnerability, generate human causation of disasters from natural hazards. So there is little point in looking at specifically human-created hazards.

Failure of technology, such as that which occurred at the Chernobyl nuclear facility in Ukraine in 1986 and the chemical factory at Bhopal, India

in 1984, massive oil and toxic spills and the dumping of nuclear waste in polar regions (UNEP 2002: 297), fall outside the scope of our book because they are chiefly failures of techno-social systems.[52] Later, there will be some tangential discussion of the Bhopal disaster, which involved explosions and the release of toxins from a fertiliser and chemical factory. The same locational factors responsible for generating hillside slums already mentioned in other countries led to dense squatter settlement around the plant. Such a case is at the limits of our type of analysis, and overlaps with a related literature concerning technology and society (Perrow 1984; Weir 1987; Piller 1991) and environmental justice (see below).

What happens to poor and other vulnerable people who find themselves in the path of rapid industrialisation, de-industrialisation, industrial deregulation or the importation of toxic waste is clearly of concern to us. But it is not a central issue in this book. Some overlap with a critical appraisal of technological risk and what Beck calls 'ecological modernisation' will nevertheless occur in the chapters that follow. Flooding caused by the failure of a dam is a good example (Chapter 6). The web of cause and effect in the connections between society, nature and technology is often impossible to disentangle (Abramovitz 2001).

Another point of similarity between our approach to natural hazards and studies of technological and more pervasive environmental risks is a concern with bottom-up, grassroots activism. The environmental justice movement has grown rapidly since its origins in the study of racial disparities in the location of US hazardous waste facilities during the late 1980s (Bullard 1990; Hofrichter 1993; Shiva 1994; Heiman 1996; Johnston 1997; Faber 1998).[53] One question, to which we will return in Part III, is whether a similar worldwide movement is possible through which citizens assert their human right to protection from avoidable harm in extreme natural events.[54]

We will be concerned with the impact of technology on vulnerability, particularly technology in its apparently simplest and benign forms.[55] For example, a new road may link a previously isolated rural community with sources of food that may reduce vulnerability in times of drought. That same road may also lead away able-bodied youth in search of urban income, reducing the labour available to maintain traditional earth and stone works constructed to prevent erosion, or to build or repair houses adequately to withstand earthquake. The result may be a reduction of crop yield during drought years because of additional soil loss or deaths from an earthquake which otherwise would be preventable.

The same road may introduce mobile clinics that immunise children against life-threatening diseases, or it may provide the channel through which 'urban' diseases such as tuberculosis and sexually transmitted diseases arrive via the men who have gone to work in city, mine or plantation. It may also provoke landslides that kill people or reduce the available arable land. All these contradictory effects of technological change are

possible. The same may be said of the introduction of new water or energy sources, new seed varieties, construction of a dam or a new reinforced concrete building.

There are several ways in which such questions of technological change arise in relation to disaster vulnerability. One of the most frequent responses to disaster by outsiders is the provision of various technologies to the affected site during relief and rehabilitation activities. These include temporary housing, food supplies, alternative water supplies and sanitation facilities, seeds and tools to re-establish economic activities. In all such cases, the new or temporary technology may play a role in increasing or decreasing the vulnerability of a particular social group to a future hazard event. The controversy over the use of genetically modified maize when offering famine relief in southern Africa in 2002 is a dramatic example.[56]

Development planners sometimes introduce technology at the so-called 'leading edge' of whatever version of rapid, systemic change they define as 'development'. This may be irrigation technology in the form of a large dam that displaces thousands of families in what economists call 'the short run'. It might take the form of low-income housing or the development of an industrial complex. Such development initiatives can have a series of unintended, unforeseen consequences.

The people displaced following the flooding behind a large dam may not benefit from resettlement in the areas that are fed by the irrigation water. If they are included among settlers, they may end up at the bottom of the water distribution system, where water is scarce.[57] Women on such new schemes may lose conventional rights to land on which they used to grow food for their families (Rogers 1980) or their knowledge and skills may be rendered 'obsolete' (Shiva 1989). Nutritional levels among children may fall, paradoxically, as cash income from the marketed product of irrigation increases (Bryceson 1989).

The introduction of technology can modify and shift patterns of vulnerability to hazards. For example, the Green Revolution varieties of grain have shifted the risk of drought and flood from an emergent class of 'modern' farmers to the increasing number of landless and land-poor peasants. These latter have become more vulnerable because they are denied access to 'commons' that formerly provided livelihood resources and because they are highly dependent on wages earned in farm labour to purchase food and other necessities (Jodha 1991; Chambers et al. 1990; Shiva 1991). They are also vulnerable because they now depend for food and other basic necessities on wages from farm employment that can be interrupted by flood, hail, drought or outbreaks of pests and disease (Drèze and Sen 1989; see Chapter 4).

The change in technology brought about by the Green Revolution has affected the resource-poor in rural areas because the pre-existing social and economic structure has not been able to distribute benefits properly, and this has led to a realignment of assets and income. The losers may consequently

be subject to new hazards. For example, in order to find somewhere to farm, they may migrate into low-lying coastal land that is exposed to storms (see Chapter 7). They may have little choice but to live in poorly constructed housing as urban squatters. In Bhuj, Gujarat (India) many thousands of such people died in the earthquake of February 2001.[58] The literature on development is full of studies of such unintended consequences.[59] This book will focus on such technological developments and their consequences where they can be seen to impinge on people's vulnerability to extremes of nature, or where they affect the ability of groups to sustain their livelihoods in the aftermath of environmental extremes.

Notes

1 We use the term LDC for 'less developed country' (including such extremes as 'least developed' and 'highly indebted, least developed') in keeping with UN practice. LDCs are contrasted to 'more developed' countries (MDCs). In the first edition we used the term 'Third World' to refer to LDCs, but that term has a history. It connotes the historical process (usually one form of colonialism or another) by which a country was impoverished or 'underdeveloped' (as a transitive verb). We still find merit in this view, and our 'Pressure and Release' model often has processes set in motion during the colonial past as 'root causes' of vulnerability. However, the term 'Third World' also carries overtones of the logic of the Cold War, during which period there existed two opposing 'worlds' and a third, non-aligned world. But with the collapse of the Soviet Union, many of its constituent republics (which are now independent), and even some central and eastern European countries that were part of the Soviet bloc, are now clearly seen to be 'less developed' and have many people who share vulnerabilities in common with inhabitants of countries previously designated Third World. Since the first publication of this book, the changes that began in 1989 have so reshaped the geopolitical map that use of the term Third World may be confusing.

2 We used diverse sources in estimating these numbers, which, especially for the earlier part of the century and for specific kinds of conflicts, must be considered only the roughest approximations. *For estimates of deaths due to war and political violence* we are most grateful to Professor Kenneth Hewitt, Wilfred Laurier University, Canada, for time spent in personal communication with Ian Davis during July 2002. Hewitt's book, *Regions of Risk* (1997), and an earlier 1994 article, were also helpful sources as well as Sivard (2001) and White (1999). *Drought/famine death statistics* are based on the authors' approximate calculations that expand on the official reports that are regarded as gross underestimates, since entire famines, such as the 'Great Leap Forward Famine' in China (1958–1961), which may have killed 30 million people (Yang 1996; Becker 1996; Heilig 1999), are omitted from official databases. Discussions were held between Ian Davis and researchers at the CRED, Université Catholique de Louvain, Brussels and the US Office of Foreign Disaster Assistance (OFDA) in July 2002, who confirmed that they are only able to document statistics that governments provide to them. Famine is treated at length in Chapter 4. *For other disaster mortality statistics* we relied on the database maintained by CRED and OFDA called EM-DAT (available at www.cred.be/emdat, which we accessed for this purpose on 11 July 2002). For a critical note on the reliability of disaster statistics, including those for drought and famine, see Chapter 2, Box 2.3. *Traffic*

accident statistics came from the *World Disasters Report 1998* (IFRC 1998: 20–31). *Estimates of deaths due to HIV-AIDS* came from Barnett and Whiteside (2001). For more on HIV-AIDS, see Chapter 5.

3 For example, the World Health Organisation (WHO) estimates that 12 million children under five die *each year* (mostly in LDCs) from easily preventable illnesses such as diarrhoea, measles and malaria (Mihill 1996; Boseley 1999). This is ten times as many as the average deaths from natural hazards in an entire *decade* (see Chapter 5).

4 In our usage, 'social' refers to human-created systems, and so includes economic and political processes. For brevity, from here on when we refer to 'social framework' or 'social environment', we normally mean to include political and economic factors as well.

5 Hewitt (1983b) referred to the segregation of disasters from the normal functioning of society and policy making as creating a 'disaster archipelago'. He maintained and elaborated on this position in subsequent work (Hewitt 1997).

6 In April 2003, the International Rescue Committee reported that as many as 4.7 million people in the Republic of Congo had perished as the result of the combination of injuries sustained in the conflict, starvation and disease. Although there is a margin of error of 1.6 million lives in this estimate, the conflict in the Congo has, according to the report 'claimed far more lives than any other conflict since the second world war' (Astill and Chevallot 2003: 7).

7 Baxter and Kapila (1989); in recent years there have been attempts to prevent this happening again, with projects that have placed pipes in the lake which attempt to trap the carbon dioxide gas and vent it safely to the atmosphere (Jones 2001, 2003). For further background on the lake Nyos disaster, see Chapter 8, note 7.

8 A major watershed for relief agencies was the year 1970, when enormous disasters in Peru, East Pakistan (now Bangladesh) and Biafra (Nigeria) coincided. A new theory of disasters that focused on the vulnerability of 'marginal' groups was suggested by subsequent reflections on these events, plus the Sahel famine (1967–1973) and drought elsewhere in Africa, erosion in Nepal, an earthquake in Guatemala (1976) and a hurricane affecting Honduras (1976) (Meillassoux 1973, 1974; Baird et al. 1975; Blaikie et al. 1977; Davis 1978; Jacobs 1987).

9 In the second edition of the 1978 book *The Environment as Hazard*, the authors have made no fundamental change to their 'stages of development' model (Burton et al. 1993).

10 On the response of 'political economy' and 'political ecology' to both 'modernisation theory' and 'environmental determinism' see Meillassoux (1974); Baird et al. (1975); Wisner et al. (1977); Jeffrey (1980, 1982); Susman et al. (1983); Watts (1983b); Bush (1985); Spitz (1976). Work during this period was heavily influenced by Latin American dependency theory. For a summary of more recent rebuttals, see Adams (2001: chs 7 and 9).

11 For examples of the use of a too-general notion of vulnerability, see Anderson and Woodrow (1998); Parry and Carter (1987); Cuny (1983); Davis (1978). In such cases it is essential to specify the mechanisms by which one gets from generally widespread conditions (e.g. 'poverty' or 'crowded conditions') to particular vulnerabilities (e.g. loss due to mudslide, cyclone, earthquake, famine).

12 Such functionalist views of social system coping include work by sociologists and others influenced by Parsons and Durkheim – Mileti et al. (1975); Timmerman (1981); Pellanda (1981); Drabek (1986); Lewis (1987) – and also the work of self-defined 'sustainability scientists' who have emerged particularly as work on 'adaptation' to global climate change has been funded (Kasperson and Kasperson 2000). While there is some valuable work from these points of view,

on the whole we believe that one has to be more specific. *People* cope, not disembodied systems (see Chapter 3).

13 Since publication of the first edition of our book, development policy has become more concerned with wider notions of 'human security' that encompass reduced vulnerability to disaster as well as social protection from economic crisis and respect for people's human rights in war and violent conflict (see UNDP 1994a).

14 Readers who are familiar with the Sustainable Livelihoods approach of the Department for International Development (the UK foreign aid ministry) will see a parallel here with the five types of capital commonly used in that framework – natural (mainly land, forests, water sources); physical (infrastructure and production resources); financial; human (e.g. education level); and social (e.g. networks and family connections). See Chambers (1995b); Carney (1998); Moser (1998); Rakodi (1999); Sanderson (2000).

15 The World Commission on Environment and Development (the Brundtland Commission) linked the concept of livelihood to the ability of people to protect the environment, and stated that the goal of development should be 'sustainable livelihood security' (WCED 1987). In our view, vulnerability to hazards is likely to increase when livelihoods are pursued at the expense of environmental stability (Abramovitz 2001). So it is not a solution to vulnerability if people seek to increase their access to livelihood resources for short-term gains, even if it is necessary to cope with the immediate impact of hazards. We develop a more accurate view of livelihoods in relation to disasters in Chapters 3 and 4.

16 In 1991 and 1992 there were torrential rains and mudslides in southern California affecting two counties (Ventura and Los Angeles) where 10 million people live. Also in 1991 there was a fire storm that killed twenty-five people and left thousands homeless in the middle income, suburban hills above Oakland and Berkeley in northern California. This fire left the denuded, steep hills subject to landslides. During this same period there were a number of mudslides in Rio de Janeiro and Belo Horizonte in the industrial south of Brazil. More recently, in 1999, flash floods and landslides killed 30,000 poor urban residents on the extreme periphery of greater Caracas who lived in the coastal hills (IFRC 2001b: 82; Dartmouth College 1999; see also Chapter 6).

17 During a rainy night in 2000, a 100 m high pile of solid waste collapsed on hundreds of poor people in Payatas, to the north-east of Manila, the capital of the Philippines. They were permanent residents, some of perhaps 2,000 that make their living by sifting the rubbish and selling scrap metal and other recyclable items. Seven hundred people were confirmed killed or reported missing (Luna 2001; Westfall 2001).

18 As we write this second edition we acknowledge the fact that the term 'vulnerable' and 'vulnerability' are widely used in many disciplines and professions involved with disaster risk reduction. Somewhat quixotically, we believed in the early 1990s that we could reverse this linguistic trend. By now it is so well entrenched that we have put down our lance and sit under a tree with Sancho Panza enjoying the wine and landscape. However, for the sake of clarity, in our book at least we will maintain the convention of reserving the adjective 'vulnerable' for people.

19 Morrow (1999: 10) writes of the urban context of Miami, Florida, in the USA and provides a checklist which identifies the following categories: (1) residents of group living facilities, (2) elderly, particularly frail elderly, (3) physically or mentally disabled, (4) renters, (5) poor households, (6) women-headed households, (7) ethnic minorities (by language), (8) recent residents/immigrants/

migrants, (9) large households, (10) large concentrations of children/youth, (11) the homeless, (12) tourists and transients (homeless people).

20 It is additionally tragic that a year after the earthquake in Gujarat hatred between the two groups led to attacks by Hindus and Muslims on each others' communities (especially in the capital Ahmedabad), with the loss of perhaps 2,000 (mostly Muslim) lives (Harding 2002).

21 There is further discussion of the concept of the 'risk society' in Chapter 5.

22 We have no doubt that stereotypes and images, especially those arising in colonial relations, have profoundly influenced the way that LDCs are viewed today and the kinds of policies that are produced (Blaut 1993; Said 1988; Arnold 1999). We question only whether this kind of analysis is sufficient to provide a purchase on the nexus of economic and political relationships that constitute the root causes of disaster vulnerability.

23 See http://www.geohaz.org/radius.html.

24 In 2000, 47 per cent of the world's population was defined as urban, up from 38 per cent in 1990. In 1950 the world's urban population was only 30 per cent of the total (United Nations 1999: 2; Worldwatch Institute 1998: 33–34); see also Chapter 2, where urbanisation is discussed as a 'dynamic pressure'.

25 At the Johannesburg Summit in September 2002, Russia and Canada announced that they would sign the Kyoto Accord, thus bringing the number of signatories up to the required number for it to come into force. The USA, however, still refused to sign.

26 On the science behind the study of global climate change, see Chapters 2, 4, 5 and 7. Even the controversial author of *The Skeptical Environmentalist*, Bjorn Lomborg (2001), admits that warming of the atmosphere has taken place, but argues that the rate of change is toward the lower rather than higher range suggested by studies by the Intergovernmental Panel on Climate Change. For critiques of Lomborg and his answers, see http://www.lomborg.org.

27 This is the layer of the earth's mantle upon which the lithospheric plates sit. Convection currents in the asthenosphere allow heated material to rise, while cool material sinks, leading to movement of the plates. Understanding of biogeochemical cycling and plate tectonics (including earthquakes and volcanoes) would require study of the asthenosphere as well as the more accessible lithosphere.

28 Tobin has proposed a tax on international financial transfers in order to reduce the flows which are simply used to exploit price differentials (e.g. of currencies) for private benefit. For information see ATTAC, a worldwide network of citizens' organisations lobbying for this tax: http://attac.org/indexen/ and search on 'Tobin'.

29 See Petrella (2001); Barlow and Clarke (2002). The World Bank estimates that private water industry revenue approached $800 billion in 2000; 15 per cent of the water supplies in the USA have been privatised, 88 per cent of UK supplies and 73 per cent of water systems in France (Rothfeder 2001: 102; Petrella 2001: 72). African, Asian and Latin American municipal water systems are also being privatised rapidly, often at the insistence of the International Monetary Fund (IMF) as a condition of its loans, either as direct sales of municipal assets or, more commonly, long-term concessions, leases or management contracts. Large multinational corporations are the major bidders, including Vivendi, Suez Lyonnaise, Bectel-United Utilities, ENRON-Azurix, Bouygues-SAUR and RWE-Thames Water. Under new management, water prices have increased, putting more pressure on the livelihood systems of the poor (see Chapter 3). This has sometimes caused violent protests, as in Cochabamba, Bolivia in 2000 (Rothfeder 2001: 107–114). Although the terms of contracts are becoming more

precise and incorporating details as regards minimum standards and protection for the poor, municipalities are often working with limited information, technical and legal capacity against some of the largest corporations in the world (Lee 1999: 140–183).

30 See Middleton and O'Keefe (1998); Anderson (1999); Pirotte et al. (1999); Cuny and Hill (1999); Sphere Project (2000); Vaux (2001).

31 See Disaster Diplomacy, the website at Cambridge University maintained by Ilan Kelman since 2001: http://www.arct.cam.ac.uk/disasterdiplomacy/

32 The list for 2001 is sadly similar to those compiled by MSF for previous years (as, alas, is the list for 2003). In 2000 their list included displaced persons due to war in Angola, Chechnya, Indonesia, Burma (minority Rohingya Muslims who had fled across the border to Bangladesh), Democratic Republic of Congo, Afghanistan (not much of a story until 11 September 2001), Sierra Leone and Colombia (see MSF-USA 2001).

In 1999 the list included conflict, displacement, and acute vulnerability to environmentally linked disease on the part of hundreds of thousands of people running from conflict in Democratic Republic of Congo, Afghanistan, Angola, Colombia, Sri Lanka, Burundi and Somalia. In addition, MSF list a little-known severe outbreak of cholera in Mozambique (December 1998 to mid-May 1999) that infected 62,263 people and killed 2,063 (see MSF-USA 1999)

33 Kala Azar is caused by infestation by a protozoan transmitted by the bite of the sand fly. It causes fever, weight loss, swelling of the spleen and liver and anaemia. Untreated, it is almost always fatal. See World Health Organisation fact sheet: www.who.int/inf-fs/en/fact116.html.

34 We take up this critique again in more detail in Chapter 3.

35 The International Federation of Red Cross and Red Crescent Societies (IFRC) has its world headquarters in Geneva and member societies in many countries that are involved in hospitals, primary health care, training for public health, safety and emergency response. It is a federation of 178 national societies.

36 Early self-critical evaluations by voluntary agencies included one by a broad coalition that supported 'Operation Lifeline Sudan' (Minear 1991) and the group 'USA for Africa' (Scott and Mpanya 1991). More recent appraisals have been collected by Action Against Hunger (1999, 2001), Anderson (1999), Pirotte et al. (1999) and Vaux (2001).

37 For details go to http://www.proventionconsortium.org/.

38 On NGOs (private voluntary organisations, popular development organisations, development support organisations, etc.) see Conroy and Litvinoff (1988); Holloway (1989); During (1989); Wellard and Copestake (1993); Bebbington and Thiele (1993); Farrington and Lewis (1993); Riddell et al. (1995); Christoplos (2001).

39 The Network for Social Science Research for Disaster Reduction Latin America, headquartered in Panama City, Panama (La RED): www.desenredando.org/;Peri Peri, whose base is in Cape Town, South Africa: www.egs.uct.ac.za/dimp/; Duryog Nivaran, centred in Colombo, Sri Lanka: www.adpc.ait.ac.th/duryog/duryog.html.

40 This view has much in common with other attempts to reconcile an analysis of structural constraints on people's lives with an appreciation of the individual's agency and freedom (Mitchell 1990; Palm 1990; Kirby 1990a; Hewitt 1997; Alexander 2000; Wisner 2003a; Pelling 2003b).

41 The women's movement makes an enormous contribution to our understanding of vulnerability, environmental degradation and the possibilities for restoration, peace making and 'healing'. This often requires redefining what is meant by such terms as 'development' and 'progress'. See Sen and Grown (1987); Momsen and

Townsend (1987); Dankelman and Davidson (1988); Shiva (1989); Tinker (1990); Cliff (1991); Keller-Herzog (1996); WEDO (2002); Kerr (2002); on women and the politics of 'development' and vulnerability, as well as eco-feminist philosophers, see Merchant (1989) and Biehl (1991).

42 See also the Gender and Disaster Network website: http://online.northumbria. ac.uk/geography_research/gdn/.

43 Accounts of disaster that try to balance macro- and micro-perspectives include Hewitt (1983a); Oliver-Smith (1986b); R. Kent (1987); Maskrey (1989); Kirby (1990a, 1990b); Palm (1990); Hewitt (1997); Tobin and Montz (1997); Alexander (2000).

44 Studies emphasising the role of gender in structuring vulnerability include Jiggins (1986); Schroeder (1987); M. Ali (1987); Rivers (1982); Vaughan (1987); Drèze and Sen (1989: 55–59); Sen (1988, 1990); Agarwal (1990); Phillips (1990); Kerner and Cook (1991); O'Brien and Gruenbaum (1991); Walker (1994); Wiest et al. (1994); Cutter (1995); Fothergill (1996, 1999); Fernando and Fernando (1997); Fordham (1998, 1999, 2003); Morrow and Phillips (1999); Stehlik et al. (2000); Enarson and Morrow (2001); UN Economic and Social Department and ISDR (2001) and Cannon (2002).

45 The very young are highly vulnerable to nutritional and other health stresses during and after disasters and are vulnerable to emotional disturbance in the post-disaster period (Chen 1973; UNICEF 1989, 1999: 25–46; Goodfield 1991; Cutter 1995; La RED 1998; Harris 1998; Jabry 2003). Jabry (2003) states that 'an estimated 77 million children under 15, on average, had their lives disrupted by a natural disaster or an armed conflict, each year, between 1991 and 2000'. The old are often more vulnerable to extremes of heat and cold, are less mobile, and are therefore less capable of evacuation, and may have medical conditions that are complicated by injury or stress (Bell et al. 1978; Melnick and Logue 1985; O'Riordon 1986: 281; Tanida 1996; Klinenberg 2002; HelpAge International 2000), and are particularly vulnerable to recurrent disasters (Guillette 1991). The elderly can also suffer serious psychological harm following disasters (Bolin and Klenow 1983; Ticehurst et al. 1996). Widows in many parts of the world are especially vulnerable, as in southern Africa (Wilson and Ramphele 1989: 177–178; Murray 1981), and east Africa (Feierman 1985) or in the USA (Childers 1999).

46 Disabilities such as blindness, mental retardation, somatic hereditary defects and post-traumatic injury (such as spinal cord injuries) affect hundreds of millions of people worldwide (Noble 1981). People with disabilities have specific increased vulnerabilities in the face of hazards due to their impaired mobility or interruption of the special attention to their hygiene and continuous health care needs in disasters (UNDRO 1982b; Parr 1987, 1997; Tierney et al. 1988; Kailes 1996; Wallrich 1998; Wisner 2003c); they may also have particular needs when it comes to warnings and evacuation (Van Wilkligen 2001; Norman 2002, 2003).

47 The role of religion has not been as well studied, but consider recent events. The Burmese fleeing into Bangladesh during 1992 were a Muslim minority in their home country. The 400,000 people forced to leave squatter settlements around the city of Khartoum for an uncertain future in 'resettlement camps' in the desert were mostly a Christian or animist minority, refugees from war in the south, in the predominantly Muslim north of Sudan.

48 The role of caste has been most fully explored in studies of famine in India (see Chapter 4); however there is also a suggestion that caste-based locational segregation homes in rural and urban India may have a bearing on vulnerability to riverine flood and cyclone (see Chapters 6 and 7). The Burakumin 'caste' in

Japan is also subject to discrimination and may have suffered disproportionately in the Kobe earthquake (see Chapter 8).

49 Ethnicity and race emerge as an important factors in explaining vulnerability in studies by Regan (1983); Franke (1984); Perry and Mushkatel (1986); Bolin and Bolton (1986); Winchester (1986, 1992); Rubin and Palm (1987); Laird (1992); Miller and Simile (1992); Johnston and Schulte (1992); Bolton et al. (1993); Bolin and Stanford (1998b); Fothergill et al. (1999); Steinberg (2000).

50 Perception, experience and discourse about risk are never straightforward. For example, perceptions of risk are sometimes deeply rooted in cultural understandings of ritual purity and danger (Douglas and Wildavsky 1982) and claims of suffering (or their absence) can sometimes be gambits in games over local political power (Richards 1983; Laird 1992; Steinberg 2000: ch. 1).

51 We do not disregard or underestimate the intellectual challenge of dealing with the complexities and uncertainties vividly brought to mind by the attack on the World Trade Center. There are some who think that an enormously complex system such as a mega-city cannot possibly be fully understood, and hence cannot be protected properly (Mitchell 1999b; cf. Homer-Dixon 2001; Rubin 2000). Perrow (1984) put forward that argument some years ago regarding even 'simpler' systems such as single large jet aircraft or a nuclear power station – a view that was possibly reconfirmed by the 'surprising' destruction of the US space shuttle Columbia in early 2003. It also may be that when one adds the additional level of complexity and uncertainty of a global economy and the relations and histories that constitute 'international relations' among 191 nations, it is impossible to predict the consequences of actions. For example, in a case that falls more within the scope of our book, there was a deadly mudslide in Algiers in 2001 (Wisner 2001b). A key factor was heavy rain, to be sure. However, in addition, in their own 'war on terrorism' the Algerian authorities had cut and burned the forest on the mountain above Algiers and blocked up the storm water drainage system. Both actions were taken to deny 'terrorists' a hiding place. Both official acts exacerbated the flood.

52 Such technological hazards are discussed by other authors, including Ziegler et al. (1983); Perrow (1984); Weir (1987); Kirby (1990c); Shrivastava (1992); Button (1992); Jasanoff (1994); Dinham and Sarangi (2002).

53 A gateway to web sites dealing with environmental justice is: www.ejrc.cau.edu/.

54 See discussions and debates about the relationship between disaster and human rights: http://online.northumbria.ac.uk/geography_research/radix/.

55 For example, it is hard to disentangle risks associated with construction technologies (Chapter 8) or agricultural innovations (Chapter 4) with such hazards as earthquake and famine.

56 The USA offered Zimbabwe, Zambia and Malawi genetically modified maize as part of the international response to a famine in the region that affected 15 million people (see Chapter 4). These countries refused the maize because it was unmilled, and their scientific advisers were concerned that if planted (and not eaten), there might be contamination of local varieties of maize (a staple in the region) with unforeseen, but potentially grave, consequences for the future.

57 The social and ecological consequences of building high dams worldwide have been systematically reviewed by the World Commission on Dams (2000c).

58 There seems to be uncertainty in the figures for the number who died. The UK Disasters Emergency Committee report (DEC 2001a) accepts an official figure of 20,000 deaths as being accurate.

59 The unintended consequences of 'development' are documented by Trainer (1989); Shiva (1989); Wisner (1988a); Lipton and Longhurst (1989); Johnston

(1994, 1997); Adams (2001: ch. 8). Special note should be taken of a 'classic' early paper on disease and development by Hughes and Hunter (1970) and the contrast with the role of other kinds of 'development' in restoring the health of communities (Wisner 1976a).

2

THE DISASTER PRESSURE AND RELEASE MODEL

The nature of vulnerability

Two models

In evaluating disaster risk, the social production of vulnerability needs to be considered with at least the same degree of importance that is devoted to understanding and addressing natural hazards. Expressed schematically, our view is that the risk faced by people must be seen as a cross-cutting combination of vulnerability and hazard. Disasters are a result of the interaction of both; there cannot be a disaster if there are hazards but vulnerability is (theoretically) nil, or if there is a vulnerable population but no hazard event.[1]

'Hazard' refers to the natural events that may affect different places singly or in combination (coastlines, hillsides, earthquake faults, savannahs, rainforests, etc.) at different times (season of the year, time of day, over return periods of different duration). The hazard has varying degrees of intensity and severity.[2] Although our knowledge of physical causal mechanisms is incomplete, some long accumulations of records (for example of hurricanes, earthquakes, snow avalanches or droughts) allows us to specify the statistical likelihood of many hazards in time and space. But such knowledge, while necessary, is far from sufficient for calculating the actual level of risk.

What we are arguing is that the risk of disaster is a compound function of the natural hazard and the number of people, characterised by their varying degrees of vulnerability to that specific hazard, who occupy the space and time of exposure to the hazard event. There are three elements here: risk (disaster), vulnerability, and hazard, whose relations we find it convenient to schematise in a pseudo-equation:

$$R = H \times V.$$

Alexander (2000: 13) distinguished between risk and vulnerability, noting that 'vulnerability refers to the potential for casualty, destruction, damage, disruption or other form of loss in a particular element: risk combines this with the probable level of loss to be expected from a predictable magnitude of hazard (which can be considered as the manifestation of the agent that produces the loss).'

A disaster occurs when a significant number of vulnerable people experience a hazard and suffer severe damage and/or disruption of their livelihood system in such a way that recovery is unlikely without external aid.[3] By 'recovery' we mean the psychological and physical recovery of the victims, and the replacement of physical resources and the social relations required to use them (see Chapter 9).

In order to understand risk in terms of our vulnerability analysis in specific hazard situations, this book uses two related models of disaster. The Pressure and Release model (PAR model) is introduced in this chapter as a simple tool for showing how disasters occur when natural hazards affect vulnerable people. Their vulnerability is rooted in social processes and underlying causes which may ultimately be quite remote from the disaster event itself.

The basis for the PAR idea is that a disaster is the intersection of two opposing forces: those processes generating vulnerability on one side, and the natural hazard event (or sometimes a slowly unfolding natural process) on the other. The image resembles a nutcracker, with increasing pressure on people arising from either side – from their vulnerability and from the impact (and severity) of the hazard for those people. The 'release' idea is incorporated to conceptualise the reduction of disaster: to relieve the pressure, vulnerability has to be reduced. This chapter focuses on the pressure aspect of the PAR model, and the discussion of conditions for creating release are left mainly for Part III.

A second model, referred to as the 'Access model', is discussed in Chapter 3. In effect it is an expanded analysis of the principal factors in the PAR model that relate to human vulnerability and exposure to physical hazard, and focuses on the *process* by which the natural event impacts upon people and their responses. It is a more magnified analysis of how vulnerability is initially generated by economic, social and political processes, and what then happens as a disaster unfolds. The point of application of this second model is indicated on Figure 2.1 by means of a magnifying glass. Later in the book, the Access model indicates more specifically and in more detail how conditions need to change to reduce vulnerability and thereby improve protection and the capacity for recovery. It complements the PAR model, and unites the two sides of the PAR diagram in a detailed process model.

The PAR model might suggest (in its image of two separate sides in the diagram) that the hazard event is isolated and distinct from the conditions which create vulnerability. As will be seen in the Access model described in

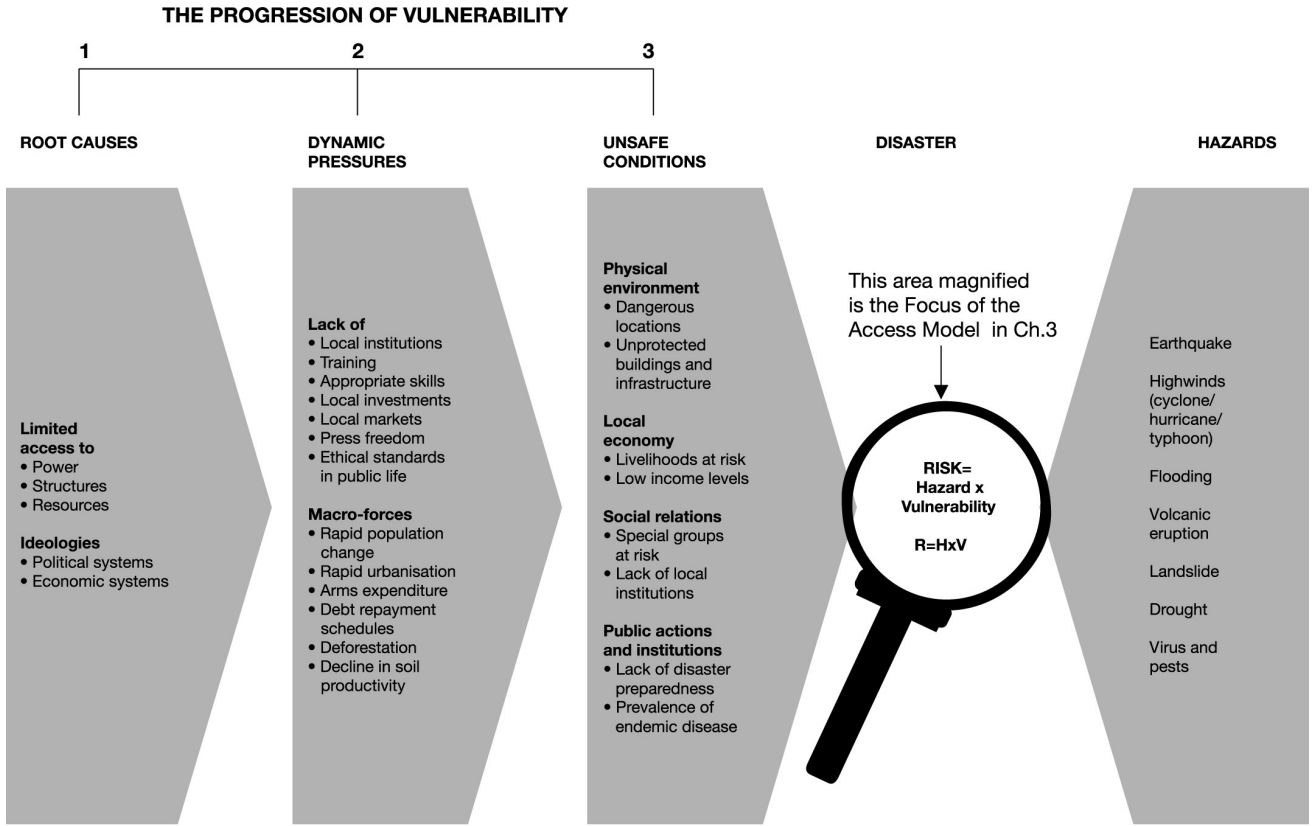

Figure 2.1 Pressure and Release (PAR) model: the progression of vulnerability

Chapter 3, hazard events themselves also change the set of resources available to households (e.g. through the destruction of crops or land by floods), and alter the patterns of recoverability of different groups of people. Hazards sometimes intensify some people's vulnerability, and the incorporation of this insight improves upon those interpretations that see disasters simply as the result of natural events detached from social systems. Conversely, Part II will also show that economic and political circumstances, and the specific situations affecting particular livelihood opportunities, often force or encourage people to engage in practices that worsen the impact of hazards. Such desperate measures, taken in order to survive in the short term, include rapid deforestation, farming inappropriately and speculatively on steep slopes which had hitherto been avoided, overgrazing, living on flood plains (Abramovitz 2001) or subdividing an already crowded apartment.

Cause and effect in the Disaster Pressure model

The following section anticipates Part II, where the chain of explanation of disasters will be related to a series of different types of hazard.

The chain of explanation

Figure 2.1 illustrates the PAR model,[4] and is based on the idea that an explanation of disasters requires us to trace the connections that link the impact of a hazard on people with a series of social factors and processes that generate vulnerability.[5] The explanation of vulnerability has three sets of links that connect the disaster to processes that are located at decreasing levels of specificity from the people impacted upon by a disaster. The most distant of these are *root causes* which are an interrelated set of widespread and general processes within a society and the world economy. They are 'distant' in one, two or all of the following senses: spatially distant (arising in a distant centre of economic or political power), temporally distant (in past history), and finally, distant in the sense of being so profoundly bound up with cultural assumptions, ideology, beliefs and social relations in the actual lived existence of the people concerned that they are 'invisible' and 'taken for granted'.

The most important root causes that give rise to vulnerability (and which reproduce vulnerability over time) are economic, demographic and political processes. These affect the allocation and distribution of resources, among different groups of people. They are a function of economic, social, and political structures, and also legal definitions and enforcement of rights, gender relations and other elements of the ideological order.

Root causes are also connected with the function (or dysfunction) of the state, and ultimately the nature of the control exercised by the police and military, and with good governance, the rule of law and the capabilities of

the administration. Military force sometimes has its own impact as an underlying cause of disasters such as famine, especially in prolonged, so-called low-intensity warfare (Clay and Holcomb 1985; Hansen 1987; Leaning 2000) or where denial of food to a civilian population is actually used as a weapon (Article 19 1990; de Waal 1997; Action Against Hunger 1999). The effects of past wars sometimes linger for a very long time, so we feel it appropriate to include them in the category of root causes of vulnerability, while in the next section current wars will appear as a 'dynamic pressure'. Examples are all too common and include Afghanistan, Somalia, Sudan, Ethiopia, Chad, Liberia, Angola, Mozambique, Sierra Leone and Congo, where long drawn-out war and famine have coincided, often exacerbated by an extreme natural event such as drought. Long civil wars may also undermine the ability of central or local governments to prevent or mitigate hazard events. They can also erode the trust between government and citizen that is required for prevention and mitigation to be effective. Here, examples may include Burma, Cambodia, El Salvador and Guatemala. We will return to war as a factor in disaster vulnerability later in this chapter. Wars, of course, are thankfully finite, but militarism and the use of armed force to control a domestic population is a long-standing practice.

Root causes reflect the exercise and distribution of power in a society. People who are economically marginal (such as urban squatters) or who live in environmentally 'marginal' environments (isolated, arid or semi-arid, flood-prone coastal or forest ecosystems; steep, flood-prone urban locations) tend also to be of marginal importance to those who hold economic and political power (Blaikie and Brookfield 1987: 21–23; Wisner 1976b, 1978b, 1980). This creates three often mutually reinforcing sources of vulnerability. Firstly, if people only have access to livelihoods and resources that are insecure and unrewarding, their activities are likely to generate higher levels of vulnerability. Secondly, they are likely to be a low priority for government interventions intended to deal with hazard mitigation. Thirdly, people who are economically and politically marginal are more likely to stop trusting their own methods for self-protection, and to lose confidence in their own local knowledge. Even if they still have confidence in their own abilities, the 'raw materials' needed or the labour time required may have disappeared as a result of their economic and political marginality and low or uncertain access to resources.

Dynamic pressures are processes and activities that 'translate' the effects of root causes both temporally and spatially into unsafe conditions.[6] These are more contemporary or immediate, conjunctural manifestations of general underlying economic, social and political patterns. For example, capitalism is an economic and ideological system that is at least 500 years old, while neo-liberalism is the particular form that capitalist relations have taken since the late 1970s and early 1980s. In the 1980s neo-liberal structural adjustment policies were imposed on many less developed

countries (LDCs). Some may have benefited, particularly in south-east Asia where they were able to apply these policies in ways that suited their national circumstances (Stiglitz 2002). But in many others, structural adjustment policies are widely regarded as being responsible for the decline of health and education services which in our parlance suggests they are a root cause of vulnerability.

Dynamic pressures channel the root causes into particular forms of unsafe conditions that then have to be considered in relation to the different types of hazards facing people. These dynamic pressures include epidemic disease, rapid urbanisation, current (as opposed to past) wars and other violent conflicts, foreign debt and certain structural adjustment programmes. Also on the list of dynamic pressures is export promotion, which in some circumstances can undermine food security. It can, for example, encourage mining that destroys local habitats and pollutes water and soil, hydro-electric power development that floods valuable agricultural lands without compensating those affected, and deforestation that can destroy the habitats of forest dwellers, damage farming systems that use the forest for nutrient transfers to agricultural land, and downstream can cause problems such as flooding or the silting of rivers and irrigation canals. It is important to note that these pressures are not labelled 'bad' and vulnerability-inducing *per se*. There is a tendency in neo-populist and 'radical' development writing to damn these pressures indiscriminately, without examining their particular historical and spatial specificities. In short, PAR needs thorough research that is locally- and historically based.

The ways in which these dynamic pressures operate to channel root causes into unsafe conditions lead us to specify how the pressures play themselves out 'on the ground', in a strong spatial and temporal sense. This will allow micro-mapping of unsafe conditions affecting households differentially (e.g. wealthy ones, or in distinction, those lacking crucial access to material and human resources) and subsequently groups across households (women, children, the aged, disabled, marginalised ethnic groups, etc.).

This process can be illustrated clearly by examples of endemic disease and malnutrition. People's basic health and nutritional status relates strongly to their ability to survive disruptions to their livelihood system and is an important measure of their 'resilience' in the face of external shock.[7] People who are undernourished and sick succumb sooner in times of famine than those who were previously well-nourished and healthy. There is an important relationship between nutrition and disease, which is often evident after a hazard impact (especially when people are forced to seek refuge and come into close contact with one another). Chronically malnourished people have weaker immune systems and contract illnesses such as measles or dysentery more easily (see Chapter 5). Age is also a significant factor in people's resilience, with children and the frail elderly likely to suffer much more from hunger and hazards such as extreme heat and cold.[8]

Rural–urban migration is another dynamic pressure that arises in many LDCs in response to the economic and social inequalities inherent in root causes. Such migration may follow the loss of land used by poor farmers and pastoralists, discriminatory pricing of crops produced in small quantities by poor farmers and by proletarianisation of the peasantry. Out-migration may lead to the erosion of local knowledge that might serve to prevent disasters and a loss of the skills required for coping in the aftermath of a disaster. An example is given in Box 2.1 below.

Unsafe conditions are the specific forms in which the vulnerability of a population is expressed in time and space in conjunction with a hazard. Examples include people having to live in hazardous locations, being unable to afford safe buildings, lacking effective protection by the state (for instance in terms of effective building codes), having to engage in dangerous livelihoods (such as ocean fishing in small boats, wildlife poaching, prostitution with its attendant health risks, small-scale gold mining in the Amazon and eastern Africa, or small-scale forestry), or having minimal food entitlements, or entitlements that are prone to rapid and severe disruption.[9] Also, unsafe conditions are dependent upon the initial level of well-being of the people, and how this level varies between regions, micro-regions, households and individuals. It is important to consider the pattern of access to tangible resources (e.g. cash, shelter, food stocks, agricultural equipment) and intangible resources (networks of support, knowledge regarding survival and sources of assistance, morale and the ability to function in a crisis) (Cannon 2000a). These aspects of unsafe conditions serve as a bridge between PAR and the Access model discussed in the next chapter.

We propose the following terminology when dealing with unsafe conditions. People, as should be apparent already, are *vulnerable* and live in or work under unsafe conditions ('unsafe' can refer to locations of work or habitation, wherever people spend their daily lives). As we said in Chapter 1, and it bears repeating, we avoid using the word vulnerable in regard to livelihoods, buildings, settlement locations or infrastructure, and instead use terms such as 'fragile', 'unsafe', 'hazardous' or their synonyms.

While all of these are components of people's vulnerability, a building should be regarded as unsafe, rather than vulnerable; a settlement's location is hazardous, not vulnerable. In this way, we retain the term vulnerability for people only. The reason for this is straightforward: already the term vulnerability (and its associate, *vulnerability analysis*) has been appropriated for use in such a wide range of situations that (like 'sustainability') it is in danger of losing its significance in relation to people and hazards. If 'vulnerability' becomes a catch-all term for any aspect of conditions related to disasters, then it will lose its analytical capacity. Moreover, it will lose the focus about which we are very explicit – that it is the *vulnerability of people* that is crucial to understanding disasters and disaster preparedness. It is, of course, absolutely right to be concerned about the condition of buildings, the places

where people have to live, crop yields and variability and so on. But if policy is directed at these alone, it is in danger of being compartmentalised (e.g. into issues of building codes, or land-use planning, or production-oriented agricultural programmes).

No single element, particularly the technical (and seemingly a-political) determinants of people's vulnerability, should be taken in isolation from the entire range of factors and processes that constitute this situation. The other danger is that a focus on the 'hardware' aspects of vulnerability will distract from the attention that needs to be given to the political and economic determinants of vulnerability: most people are vulnerable because they have inadequate livelihoods, which are not resilient in the face of shocks, and they are often poor. They are poor because they suffer specific relations of exploitation, unequal bargaining and discrimination within the political economy, and there may also be historical reasons why their homes and sources of livelihood are located in resource-poor areas.

In other words, in many cases reducing vulnerability is about dealing with the awkward issue of poverty in society. That is why there needs to be a clear link between disaster preparedness, vulnerability reduction and the process of development itself (the improvement of peoples' livelihoods, welfare and opportunities). This is illustrated in Figure 2.1, where the vulnerability that arises from unsafe conditions intersects with a physical hazard (trigger event) to create a disaster, but is itself only explained by an analysis of the dynamic processes and root causes which generate the unsafe conditions.

It is important to note that, throughout the causal chain of explanation from root causes to unsafe conditions, we do not imply by the phrase 'cause and effect' that single causes give rise to single effects. In their study of land degradation, Blaikie and Brookfield (1987) refer to such causal sequences as 'cascades'. There are many ways in which dynamic processes (some unique to particular societies, some nearly universal because of the pervasive influence of global forces) channel root causes into unsafe conditions and to specific time–space convergence with a natural hazard. This can be illustrated in the outcome of floods in Bangladesh (see Box 2.1) and landslide and earthquake impacts in part of north Pakistan (Box 2.2).

Box 2.1: Landless squatters in Dhaka

Dhaka, the capital of Bangladesh, is situated in the flood plain of a major river, the Buriganga, a tributary of an even larger river, the Meghna (see Figure 6.2). To the north-west is a large zone of low-lying, flood-prone land in the vicinity of Nagor Konda. Here, squatter settlements grew rapidly in the 1980s as they did in many areas around the capital (Shaker 1987). This area had been densely settled, particularly since 1970, mostly by poor landless families from the south and east of the country (Rashid 1977).

Box 2.1 continued

The former landless people who inhabit this depression are there because of its proximity to Dhaka's vegetable market. Already the chain of explanation of their vulnerability can be seen at work: rural people who are landless have few alternatives, and many seek the economic opportunity provided by the urban vegetable market. But this means living in an unsafe location. As newcomers, and extremely poor, the squatters in these low-lying areas had no access to the structures of power that control marketing. They also had insecure title to land in the depression, and therefore no access to credit to allow them to increase their productivity and compete with better-established market gardeners (A. Ali 1987). This situation meant that they had to grow rice rather than vegetables on their land, and thus the poor were forced into low-income pursuits.

On the eve of the massive floods of August 1988 (see Chapter 6), this relatively powerless group with few assets was living in an economically marginal situation close to the city, on low-lying land prone to flooding. Their children were frequently malnourished and chronically ill. This is precisely how the dynamic pressures arising out of landlessness and economic marginalisation are channelled into a particular form of vulnerability: a lack of resistance to diarrhoeal disease and hunger following the flooding in 1988. Factors involving power, access, location, livelihood and biology come together to create a particular situation of unsafe conditions and enhanced vulnerability. These social, economic and political causes constitute one side of the pressure model. The other – the floods themselves during August 1988 – constitutes the trigger event whose impact on vulnerable people created the disaster.

Box 2.2: Karakoram and house collapse

This case comes from an interdisciplinary study of housing safety in the Karakoram area of northern Pakistan (Davis 1984b; D'Souza 1984). We follow the chain of explanation that links vulnerability to the specific physical trigger that creates a disaster in reverse, starting with 'unsafe conditions'. The PAR model may be constructed equally well in either direction of causality, starting with unsafe conditions and working from the specific to the general or *vice versa* (see, for example, Blaikie's (1989) causal chain of land degradation from the specific site characteristics to more distant causes arising from the global political economy).

The research team carefully examined local dwellings and settlement patterns within the context of a rural economy. They found that the communities were at risk from a wide range of hazards. In this region

Box 2.2 continued

traditional dwellings were built with stone masonry walls. A series of timber bands were set at regular intervals in the height of each wall in order to hold the stones together, and the complex timber roofs were constructed with a very heavy covering of earth to provide much-needed insulation.

These traditional dwellings were built until around the 1960s or early 1970s, and provided some protection against earthquakes. But, subsequently, local building patterns changed in favour of concrete construction. The new houses were intended to be reinforced, but in reality they were built without any real understanding of how to connect steel to concrete or roofs to walls. The siting of most buildings was equally dangerous, since to avoid reducing their meagre land-holdings (all available flat land was used for agriculture), many houses were built on exceedingly steep slopes, putting them at risk from landslides.

The result was an extremely hazardous situation, with a number of factors together producing these unsafe conditions, including reduced concern about building safety and the diversion of money intended for dwellings to fulfil everyday needs. There was also a lack of knowledge of both concrete construction and aseismic (shock-proof) construction techniques, a shortage of skills and a change in the availability of building materials.

In turn, some of these factors (especially the lack of both skills and materials) could be directly attributed to 'dynamic pressures'. Firstly, the shortage of timber for building and other purposes in the region had arisen because of deforestation, mostly due to illegal felling and corrupt practice (Blaikie and Sadeque 2000). In addition, population growth over a long period undoubtedly increased the demand for fuelwood in such a cold climate and for building materials. This led to a rapid increase in tree-cutting and forest clearing to create additional fields for cultivation.

Secondly, there was a serious shortage of skilled carpenters and masons, so buildings were constructed and maintained by farmers and labourers who freely admitted that they knew very little about the task. In trying to piece together the reasons for the absence of knowledgeable builders another dynamic pressure emerged. During the 1970s the Chinese government had built the Karakoram Highway, a major access road into the area. This linked China with the Pakistani capital, Islamabad. The road was built for political and strategic reasons, but it was also intended to bring 'development' to the remote Northern Areas. Risk was 'imported' via the highway to the extent that heavy (unsafe) concrete buildings were developed and considered 'modern'

Box 2.2 continued

and their use increased (Coburn et al. 1984). The road also allowed a migration of carpenters out of the area to Karachi, Islamabad and even to the Gulf region (where earnings were twenty times higher). As so often happens, while the road was being used to bring in medical and educational resources, it also enabled loggers to enter the region for the first time and they had removed vast quantities of timber, a process that continues today in spite of logging bans imposed by government. It is likely that the resulting deforestation contributes to soil erosion and slope instability, which increases on-site hazards when earthquakes occur.

Furthermore, the Pakistani government encouraged their workforce to emigrate so as to attract the foreign currency remittances sent for family support by the workers abroad. This was a policy designed to boost the country's balance of payments deficit.[10] In this way we are led from proximate and specific cause to more remote 'root causes'. The net result was that the families were left to live in dangerous homes, often with a depleted and de-skilled labour force due to out-migration.

Time and the chain of explanation

Our two models function in a variety of time scales (see the section on time in Chapter 3). Root causes, dynamic pressures and unsafe conditions are all subject to change, and in many cases the processes involved are probably changing faster than they have done previously. The changes in building techniques and materials in Pakistan were rapid (see Box 2.2), as were the processes of out-migration and deforestation. This affected communities that had changed little for many years. Even large-scale processes, such as population growth, are rapid by comparison with changes in, say, values and beliefs or legal structures. For example, during the 1970s Kenya had an annual population increase of 4.2 per cent, giving a doubling time of 16 years. This rapid population growth was, at that time, one of the factors channelling the root causes of vulnerability into unsafe conditions during years that saw great suffering by vulnerable groups during droughts (Wisner 1988a). However, by 1995 the growth rate had fallen to 2.9 per cent (UNDP 1998: 177) In other words, even something such as population dynamics can change rapidly.

We should add, however, that we are not invoking a neo-Malthusian explanation for the impact of rapid population growth as a dynamic pressure leading to increased vulnerability. It is only when rapid population growth is combined with other dynamic conditions (such as rapid urbanisation, the need to adapt to rapid agricultural intensification in areas of low

resource potential, or incompetent economic management) that very rapid population growth can exacerbate vulnerability (see below).

The location of settlements and livelihoods can change even more rapidly. For example, between 1973 and 1976 about half of the then 12 million rural inhabitants of Tanzania were variously encouraged or coerced into nucleated villages (Coulson 1982). This completely altered settlement patterns and the resource basis of the affected people's livelihoods over a period of only three years.[11] Other instances of such disruptions are common as a result of war. Four million people, one-third of the Mozambican population, were forced by the civil war there in the 1980s and 1990s to flee to refugee camps in Zimbabwe and Malawi, while many lived as internally displaced persons (IDPs) near a few of Mozambique's major towns. The impact of such disruptions of access on the vulnerability of these peoples to drought and other hazards has not been studied; nor has the effect of such population movements on the environment, and thus on the creation of future hazards via land degradation (Black 1998).

Root causes often shift because of disputed power and claims to resources (financial, physical and informational) as well as identities (Platt et al. 1999; Oliver-Smith and Hoffman 1999; Caplan 2000), and vulnerability may therefore change as a result. The converse is also true. Mass suffering due to disaster may contribute to the overthrow of elites and lead to dramatic realignments of power. It can be argued that the cyclone and storm surge in East Pakistan in 1970 contributed to the development of the Bangladesh independence movement, and that governments in Niger and Ethiopia were overthrown as a result of their incompetent and malign behaviour in the 1970s Sahel famine. The revolutionary movement in Nicaragua from 1974 to 1979 derived some of its impetus from the effects of the Managua earthquake of 1972. Hurricane Mitch (1998) did not cause the overthrow of the national governments in the affected countries, but it did contribute to a widespread reassertion of local, municipal political power in Nicaragua and El Salvador, and a significant increase in the political assertiveness of citizen-based groups. We take up the counter-intuitive notion of disaster as opportunity in Chapter 9.

Limits to our knowledge

Vulnerability can be assessed reasonably precisely for a specific group of people living and working at a specific time and place, and the 'unsafe conditions' that contribute to it have been the subject of a great deal of research reviewed in this book. In much of the world, detailed knowledge has been obtained about which sites might be affected in a landslide, which buildings will survive or collapse in an earthquake and why, or about the outcomes of drought in terms of food production and possible shortfalls.

Similarly, dynamic pressures and root causes are reasonably well understood in many situations, although treatments may be highly polemical – indeed they are always political. However, as we move up the chain of explanation from unsafe conditions to root causes, the linkages (and therefore the level of precision in disaster explanation) become less definite. In analysing the linkages between root causes, dynamic pressures and unsafe conditions, it becomes increasingly difficult to have reliable evidence for causal connections, especially as we go further back in the chain of explanation.[12]

The uncertainties and gaps in knowledge concerning how vulnerability is demonstrably and causally linked to underlying causes or pressures have some quite serious implications.[13] The first is that the links can be dismissed as polemic and ideology, particularly by those who treat disasters as a technical issue alone. However, these uncertainties explain in part why policy makers and other important actors at the international and national levels have caused or allowed unsafe conditions to arise and allowed them to persist. At best, lack of understanding and uncertainties are likely to result in policy makers and decision takers, restricted by the scarce resources at their disposal, addressing immediate pressures and unsafe conditions while neglecting both the social causes of vulnerability as well as the more distant root causes.

Yet these gaps exist mainly because of a failure to ask the right sort of questions. It is imperative to accept that reducing vulnerability involves something very different from simply dealing with hazards by attempts to control nature (engineering measures and 'public works') or emergency preparedness, prediction or relief, important though these are. However, most government agencies charged with such responsibilities as 'environment', 'health and welfare' and 'public safety' generally still deal with disasters as though they are *equivalent to* the natural hazards that trigger them; the principal object is the hazard, and the range of underlying reasons for the dangerous situation may be regarded as peripheral, or even irrelevant and immaterial. The factors involved in linking root causes and dynamic processes to vulnerability are seen as too diffuse or deep-rooted to address. Those who suggest they are crucial may be labelled as unrealistic or over-political.[14] As Cannon (2000a: 48) puts it, '[V]ulnerability analysis is avoided as being "irrelevant to science" or "too difficult to get involved in".'

Our view is that there is little long-term value in confining attention mainly or exclusively to hazards, in isolation from vulnerability and its causes. Problems will recur again and again in different and increasingly costly forms unless the underlying causes are tackled. This perspective does not deny the importance of technical or planning measures to reduce physical risks. It simply insists on a concern for a deeper level of analysis which places moves to mitigate hazards within a comprehensive understanding of the vulnerabilities they are supposed to reduce. In this way,

efforts to mitigate hazards will be appropriate and will emerge within the supportive environment for implementation provided by the affected people themselves. Disaster research and policy must therefore account for the connections in society that cause vulnerability, as well as for the hazards themselves.

Global trends and dynamic pressures

Although there is still a serious lack of analysis of the linkages between vulnerability and major global processes, it is encouraging that during the last ten years many more authors and institutions have begun asking such questions. For example, it is now possible to identify more precisely how urbanisation increases hazard impact (Mitchell 1999a; Fernandez 1999; Velasquez et al. 1999) (see below).

There is a general consensus in research on disasters that the number of natural hazard events (earthquakes, eruptions, floods or cyclones) has not increased in recent decades.[15] If this is true, then we need to look at the social factors that increase vulnerability (including, but not only, rising population) to explain the apparent increases in the number of disasters (as opposed to hazard events) in terms of the value of losses and the numbers of victims.

Figure 2 2 shows the number of great disasters during the second half of the twentieth century. Some of the increase may be a result of better reporting and improved communications, or the incentive for governments to declare a disaster in an attempt to win foreign aid. But the rising trend seems to be too rapid for these explanations alone (see Box 2.3 below).

Disasters are also becoming more expensive. Economic losses, and especially the share composed of insured losses, are increasing (Figure 2.3).

At this stage, it is important to review in very broad terms how certain of these various dynamic pressures contribute to the increase in disasters. We have chosen seven global processes for further attention: population change, urbanisation, war, global economic pressures (especially foreign debt), natural resource degradation, global environmental change and adverse agrarian trends. These processes are not independent of each other. They are intricately connected in a series of mutually influencing relationships that obscure causes and consequences. Also, it should be remembered that some of these processes appear both as root causes and dynamic pressures: for example, past urbanisation and past war may set up patterns that influence vulnerability hundreds of years later (the decision by the Spanish in 1521 to locate what became Mexico City on the bed of a lake they had drained once their Aztec opponents were conquered; the Second World War that resulted in a new map of Europe). In these cases urbanisation and war can be considered root causes. However, recent or current urban growth and violent conflict should be seen as dynamic pressures.

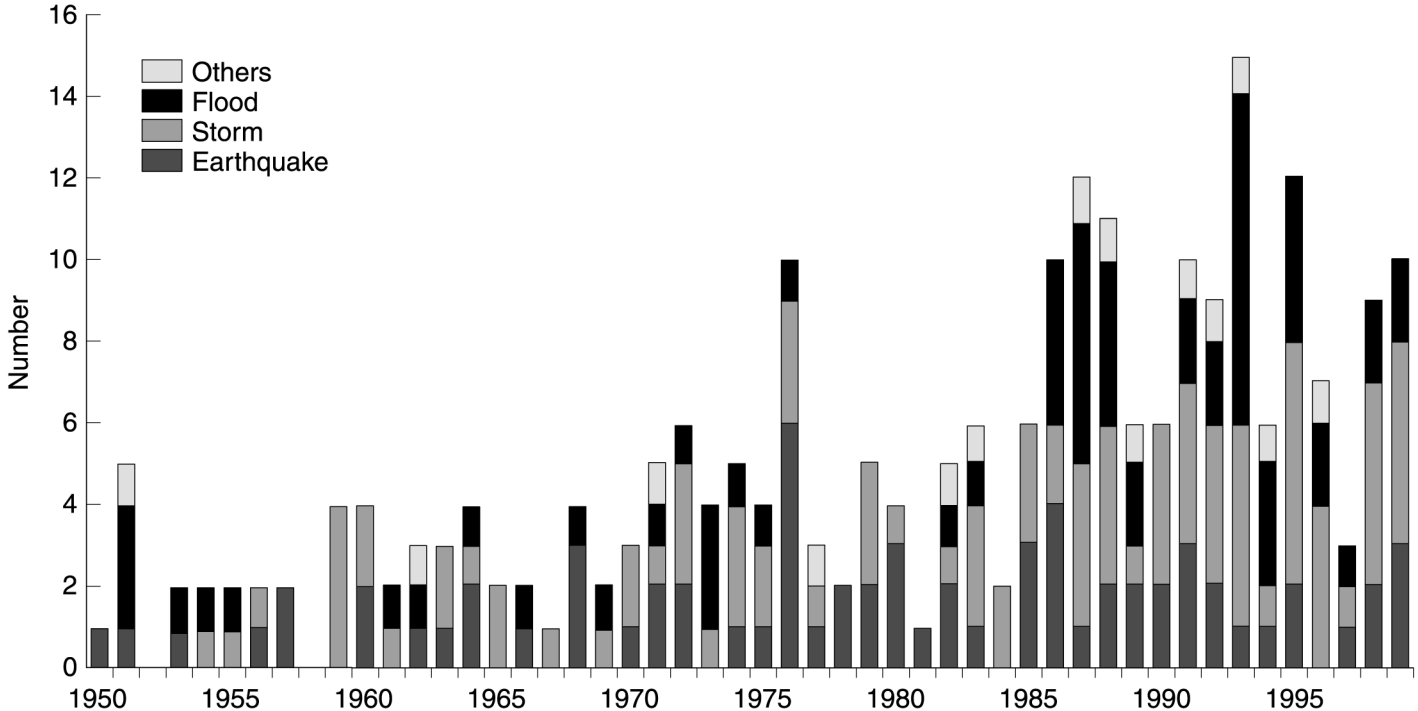

Figure 2.2 Numbers of great natural disasters 1950–1999

Note: The chart shows for each year the number of events defined as great natural catastrophes, divided up by type of event

Source: Munich Re. 2000. Great natural catastrophes – long-term statistics. Available online at http://www.munichre.com./pdf/pm_2000_02_29_anhang3_e.pdf Adapted by kind permission of Munich Re

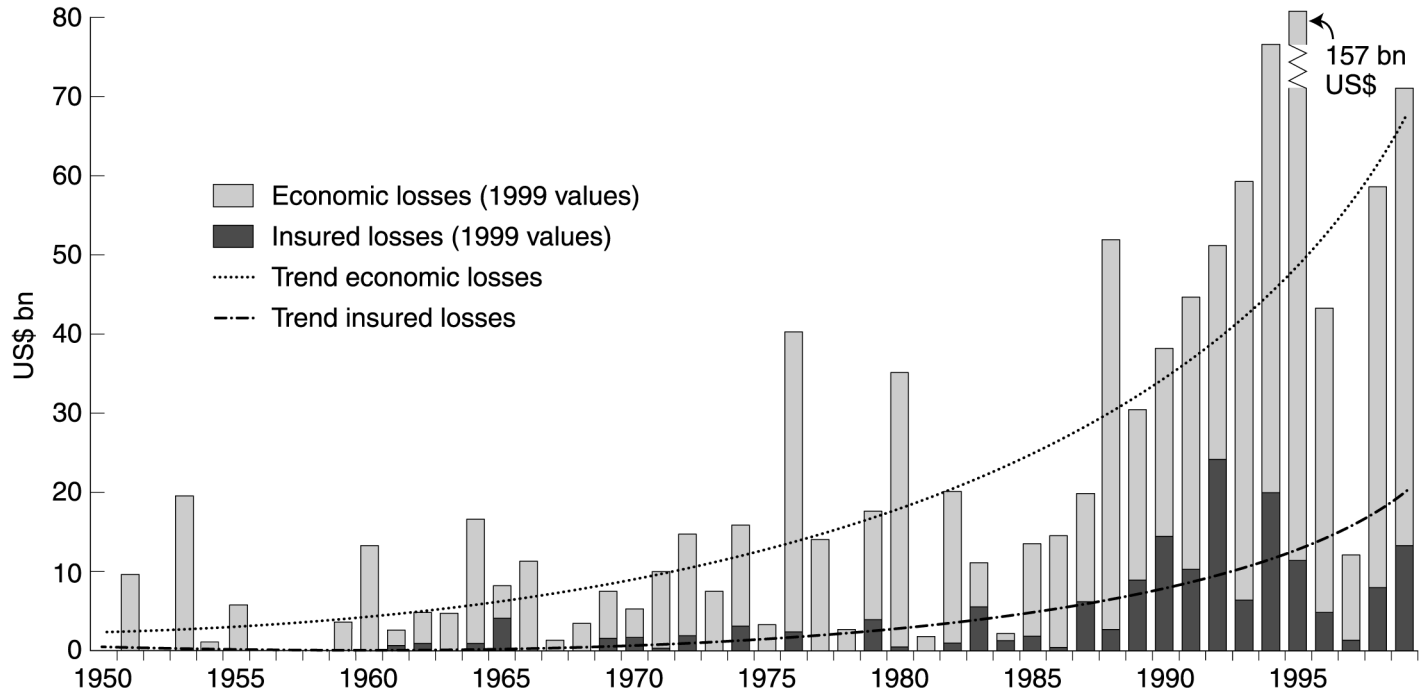

Figure 2.3 Economic and insured losses (with trends) for 1950–1999

Note: The chart presents the economic losses and insured losses – adjusted to 1999 values. The trend curves illustrate the alarming increase in catastrophic losses at the turn of the century

Source: Munich Re. 2000. Great natural catastrophes – long-term statistics. Available online at http://www.munichre.com./pdf/pm_2000_02_29_anhang3_e.pdf Adapted by kind permission of Munich Re

Box 2.3: Problems with disaster statistics

Where do disaster statistics come from?

As with world-wide health and population statistics, disaster statistics are reported by governments to United Nations agencies. These 'official' numbers are supplemented and cross-checked by some groups using the reports of non-governmental organisations (NGOs) and journalists. The pre-eminent of such institutions is the Centre for the Epidemiology of Disaster (CRED) in Belgium (http://www.cred.be). Large reinsurance companies such as Munich Re and Swiss Re also compile international statistics on disasters. The World Bank and some of the UN regional economic commissions, such as the Economic Commission for Latin America (ECLA), have conducted studies of disaster loss and costs. Regional banks such as the Inter American Development Bank (IADB) and Asian Development Bank also study disaster statistics, but from the point of view of economic loss. The World Health Organisation (WHO) and Pan American Health Organisation (PAHO) do not maintain permanent registers of death, injury and post-disaster health consequences, but they do, on occasion, analyse and interpret such numbers.

How good are disaster statistics?

Like all numbers, disaster statistics are as good or bad as the methods used to collect them. Also disaster statistics have other specific weaknesses. Firstly, despite a large academic literature on the subject, there are no universally agreed definitions of the word 'disaster' (Quarantelli 1998) or other critical terms. One of the imprecise statistics often used by governments and aid organisations is the number of people 'affected' by a disaster. Since definitions of what it is to be 'affected' can vary so much, we do not use the number 'affected' at all in our book. 'Injury' is also a term that can have many meanings (Shoaf 2002; Benson 2002). The term 'death', too, can be problematic. For example, in the USA the death toll of the Northridge earthquake varies from 33 to 150+ depending on who defines what an earthquake-related death is: 33 died of direct or indirect earthquake injuries, 57 were defined by the LA County Coroner as dying of causes either directly or indirectly related to the earthquake; FEMA paid death benefits to survivors of more than 150 (Shoaf 2002).

Also, many extreme events that take only a few lives and affect only a local economy go completely unreported. This is an issue that a regional network of disaster researchers in Latin America have recognised by producing free, bilingual (English and Spanish) accounting software to be used to keep track of these 'small' disasters that could well have a highly erosive effect on development (http://www.desinventar.org/desinventar.html). We recommend it highly.

Box 2.3 continued

Secondly, there may be deficiencies in the reporting system itself. Many injuries may go unreported or simply are not recorded by health workers who are too busy because of the volume of care demanded in an emergency. In some countries, or regions of a country, even in 'normal' times there may be poor coverage of vital statistics, with many births and deaths going unrecorded. This could happen in isolated rural areas as well as densely populated squatter settlements in cities. So, some people may die in an extreme natural event whose lives were not even officially recognised as existing. Others are never found, and are 'missing', but are never recorded as 'dead', even after a considerable period of time. There is also wide historical variability in disaster data. Davidson observes (2002), 'This is because of changes in the methods of reporting, the number of people in an affected place, systems and facilities for storing records. This all makes efforts to track historical trends in disasters even more problematic than trying to account for impacts in a single event today. Plus, of course, most records are short compared to the return period of events.'

Thirdly, there can be political pressures either to overstate or to understate casualties. If a government wishes to 'talk up' the level of relief assistance, it might exaggerate the lives lost, homes destroyed, people injured. On the other hand, if a government believes it will be criticised by its citizens for not protecting them, there may be a tendency to understate the impacts of a disaster, or to remain silent about it altogether (some examples of politically expedient silences about famine are given in Chapter 4). However, in fairness, it is very difficult to collect data on losses and damage in a timely way when undergoing the stress of the disaster itself, especially if a country has limited transport and communications. The sheer difficulty of drawing up reliable estimates should therefore be considered a fourth reason why disaster statistics should be handled with care.

Finally, when it comes to economic loss and long-term effects on development, the problem is even murkier (Benson 2003). The longer term 'knock on' effects of a disaster are conceptually difficult to model, and in most cases governments are not set up to study them (Benson and Clay 1998). Davidson (2002) puts the problem this way: '[W]ith economic effects it's difficult to assess which changes are caused by the disaster and which would have happened anyway. That is, there's always the problem that it's easier to compare before and after the disaster, but what we really should be comparing is with and without the disaster'.

Population change

During 2000 the world population passed the six billion mark, yet only 100 years ago it was under two billion. Despite this impressive growth, the predictions of even more rapid population growth forecast in the 1970s by the Club of Rome have not materialised. In fact, there is now evidence that birth rates and total fertility rates (the number of children a woman gives birth to) are declining in India, Indonesia, Iran, Brazil, Mexico and elsewhere (Naik et al. 2003). The UN prediction of two billion more people in the next 25 years, making a total of 8.2 billion by the year 2025, may be too high, and it is even possible that the world's population will stabilise at around nine billion by mid-century (ibid.).

Nevertheless, one thing is certain: populations in many LDCs will continue to grow – 90 per cent of population growth over the next few decades is predicted to occur within developing countries, many of which are subject to frequent extreme natural events (United Nations 2002c; Population Reference Bureau 2002). It is difficult to object to the idea that population growth is a significant global pressure contributing to increasing vulnerability, and yet the linkages remain uncharted except in rather simplistic terms (e.g. there are more people, therefore some have to live in dangerous places). There are difficulties in trying to explain demographic change more carefully. For instance, there is considerable debate about whether population growth is a cause or a consequence of poverty in LDCs (where, for instance, children are needed to provide labour and security). It is more likely a complex interaction of both.

So we still need an analysis of the consequences of growth in numbers. This requires a better understanding of the linkage of population growth to disasters, and of any causality involved (Clarke 1989; Dyson 1996). Demographic processes themselves are largely a reflection of people's (women's and men's) responses to the opportunities and uncertainties presented to them by broader economic processes. Some of the implications of population expansion relative to disaster risks can more easily be related to different age groups (see Box 2.4). Therefore we would not want to accept an overly-simplistic linking of population growth with vulnerability that suggests more people suffer more disasters simply because there are more of them in dangerous places. It is also necessary to explain why people put themselves at risk. This is a process not explained by the increase in numbers alone, but by the differential access to incomes and resources in society.

The apparently illogical behaviour of people who seem to have too many children in hazardous places can be seen to be more logical (if no less risky) in the context of the Access model used in Chapter 3. Is it significant that rapid population growth occurs in some countries with a long record of disasters? It is difficult to be certain about how to equate a rise in the number of vulnerable people with population growth: if population increases *because* people are poor, then in effect rising vulnerability is still a product of poverty and not of population growth.

As a dynamic pressure, population *growth* does not seem to us as important as *change* and *age structure* (see Box 2.4). In southern Africa as a result of the HIV-AIDS epidemic life expectancy and growth rates are falling, not increasing. This instability in population change is causing severe dislocation in the rural economy and complicating recovery from the drought of 2001–2002.

Box 2.4: Age structure and vulnerabilities

In Chapter 1 we reviewed studies which show that in some situations the young and the elderly are more vulnerable to the impacts of natural hazards. At the macro-scale, then, one indication of vulnerability may be provided by statistics on the age structure of national populations. How many and what proportion in a given population are children or elderly? On average, how many children and elderly people does each productive adult have to support (referred to as the 'dependency ratio')?

In many developing countries as much as 50 per cent of the total population is under 15 years of age (compared with 20 per cent in industrialised countries). Although a high proportion of these children and teenagers engage in productive economic activity, it will be increasingly difficult to cater for their basic needs since a relatively small percentage of the adult population has to carry the responsibility for feeding, clothing, housing and educating them. Under the political and economic conditions that create poverty, some households simply cannot support their children. These young people have no option other than to become 'street children', forced to fend for themselves in hostile urban environments where they are even more vulnerable (Ennew and Milne 1989; Hardoy and Satterthwaite 1989). Another implication of such an age structure is the need to focus on the critical importance of making all school buildings resistant to hazards (Wisner 2003d; Spence 2003; OAS/USDE 2000).

At the other end of the age spectrum there is also a growing challenge posed by the ageing populations of Japan, North America and Europe. Studies of disaster casualties have indicated that the young and the old are often most at risk. They are, for example, less mobile (capable of evacuation), more dependent, have less resistance to disease, and often command fewer resources. Increasing casualties in disasters can be anticipated in this age group. The implication is that specific risk-reduction policies will be needed to focus on the protection of the elderly (ICIHI 1988: 16; World Bank 1994). Also, as a population ages there is a smaller proportion of younger adults working and providing payments into social security systems. Social protection in various forms (pensions, health care, etc.) may deteriorate, thus increasing the vulnerability of the elderly.

Box 2.4 continued

> In southern Africa, the impact of HIV-AIDS has meant that some rural areas have lost many of their younger adults. The productivity of agriculture has suffered, as has the ability of households to engage in the variety of activities traditionally associated with coping with hazards such as drought (de Waal 2001, 2002).

Bangladesh had a population of 118 million in 1995 and a land area of only 144,836 sq. km. (UNDP 1998). Land shortage is often assumed to be a result of this ratio. But it is really a problem for the poor and powerless, created by inequality in access and ownership, a factor in many forms of vulnerability described in Part II. Of the population, 85 per cent depend on agriculture, and between 40 and 60 per cent own no land (Hartmann 1995; Boyce 1987). The landless and those with little land depend on wage labour and various non-farm activities to make a living. Being labour-intensive, this kind of livelihood strategy encourages large families whose members can work from an early age.

In Chapter 3 we show that livelihood strategies are the key to understanding the way people 'cope' with hazards. Unequal access to land and the resulting poverty and vulnerability of families is one of the factors that drives population growth (Hartmann and Standing 1989). Vulnerability can be the result. Brammer has noted:

> Growing population pressure has increased the number of landless families, … increased the rate of rural–urban migration and forced increased numbers of people to seek living space and subsistence on disaster-prone land within and alongside major rivers and in the Meghna estuary.
>
> (1990a: 13)

We would add that highly skewed land and income distribution has created many landless and land-poor households who migrate and seek a living space in hazardous locations. 'Population pressure' is, in our view, an effect, and not a cause, in this situation. The consequence of highly unequal access to land is that more and more hazardous land is being settled. This is particularly true of the low-lying islands (known locally as *char*) that emerge as a result of silt deposition in the river estuaries of the delta regions. This poses severe risks to the occupants from both cyclones and river flooding (see Chapters 6 and 7).

Whereas this situation is often considered hopeless from a 'technical' point of view, there are a range of *social* solutions that would both reduce the desire for large families and reduce disaster vulnerability. These solutions could include radical land reform, the empowerment of women, and the

provision of adequate public services (e.g. health, communications, education). China, Sri Lanka and Kerala State in India have all reduced population growth in this way (Hartmann 1995: 289–304; Franke and Chasin 1989).

Whilst Bangladesh might be considered an extreme case, it is hard to define the precise relationship between rural population density and well-being, ill-being or vulnerability (Cassen 1994). In other cases there is clear evidence that *higher* population density has triggered rural development that includes soil and water conservation measures, as in the Close Settled Zone of Kano, northern Nigeria, and Machakos District of Kenya (Adams 2001: 193–197).

Urbanisation

Urbanisation is a major factor in the growth of vulnerability, particularly of low-income families living within squatter settlements.[16] The urbanisation process results in land pressure as migrants from outside move into already overcrowded cities, so that the new arrivals have little alternative other than to occupy unsafe land, construct unsafe habitations or work in unsafe environments (Havlick 1986). But the risks from natural hazards are only a part of the dangers these people face in squatter settlements. There are often the far greater and more pressing 'normal' risks of malnutrition and poor health (Richards and Thomson 1984; Pryer and Crook 1988; Cairncross et al. 1990a; Wisner 1997).

Hewitt examined the literature on earthquake impacts and found that urbanisation was closely related to damage to once-new multi-storey constructions and in the concentrated poor housing of squatter settlements.

> [W]here older sections of cities are run-down, often they have become slums that modernisation passes by. Here, even once solid buildings are weakened by neglect and decay to become death traps in relatively moderate earthquakes.
>
> (1981/1982: 21–22)

This situation was typified in the earthquake that severely affected decaying inner-city tenements in Mexico City in 1985 (Cuny 1987) and is discussed in more detail in Chapter 8.

Maskrey has argued that the inhabitants of such critical areas:

> would not choose to live there if they had any alternative, nor do they deliberately neglect the maintenance of their overcrowded and deteriorated tenements. For them it is the best-of-the-worst of a

> number of disaster-prone scenarios such as having nowhere to live, having no way of earning a living and having nothing to eat.
>
> (1989: 12)

Slum residents often incur greater risks from natural hazards (flood, landslide and mudslide) as a result of having to live in very closely-built structures which can disturb natural land drainage patterns and water-courses (see Chapters 6 and 8). One example was the loss of life in flash flooding and mudslides in the outlying coastal, hillside suburbs of Caracas, Venezuela in 1999. Thirty thousand people died and 100,000 were displaced by this disaster in the densely populated coastal hills where 40 per cent of Venezuela's population of about 24 million is concentrated into less than 2 per cent of the national land area (IFRC 2001b: 82–85; Gunson 2000). Another tragic case, in 2001, was a mass movement of compacted garbage at an open-air solid waste dump that was triggered by heavy rainfall. This dump on the north-eastern edge of Manila is called Payatas, where 2,000 people lived in shacks, working as informal material recyclers – 700 were killed (Westfall 2001).

The rate of informal or unplanned urban growth can rapidly put large numbers of people at risk, as the example of Quito, Ecuador shows. Since the last destructive earthquake affecting Quito in 1949, the city has grown from 50,000 inhabitants to 1.3 million (1997). Many people have settled on steep slopes, where the Swedish Rescue Services Agency (1997) describes how 53 ravines have been filled in so that sewage or water pipes can cross them, or in order to build roads or houses. The vulnerability of the people living under such conditions is very high.

Currently nearly half of all humanity lives in cities – a proportion projected to be 60 per cent by 2030 (United Nations 1999: 2). Since a significant proportion of this urban population is poor and lives in informal urban settlements, the challenges of urbanisation are likely to grow, and with them the opportunities for disaster reduction. The most recent revision of the *World Urbanisation Prospects* makes several extremely important points related to this. In the period 2000–2030:

- virtually all the population growth in the world will be concentrated in urban areas (UN 1999: 2);
- most of the increase will be absorbed by urban areas of the less developed regions (UN 1999: 2);
- the proportion currently living in small cities is considerably greater than in large cities, although it is growing at a slower pace: in 2000, 29 per cent of the world population lived in cities of less than one million, while by 2015 this percentage is likely to grow only to 31 per cent (UN 1999: 6).

Thus, cities of all sizes are growing, but the very largest urban regions, those over 10 million, are of particular concern. There have been primate cities and metropoli for centuries; however, the new urban regions with more than 10 million inhabitants, the 'mega-cities', are relatively recent. The average size of the world's largest 100 cities increased from 2.1 million in 1950 to 5.1 million in 1990. In developing countries, the number of cities with over one million people jumped six-fold between 1950 and 1995. In the year 2000, worldwide, the number of cities larger than five million was 41, and the UN believes this number will rise to 59 by 2015. This will add another 14 million people to the streets and homes of large cities (accounting for 21 per cent of the world's urban growth) (UN 1999).

In the year 2000 there were 19 cities with more than 10 million residents, a number believed likely to increase to 23 by 2015. Of these, fifteen are in LDCs, and they are all prone to natural hazards of one kind or another (see Table 2.1 for similar rankings as of 1996). Eight of these large urban regions are within moderate-to-high seismic risk zones. These cities contain large numbers of buildings of variable quality, many of them poorly constructed or badly maintained. Since the vast majority of deaths and injuries from earthquakes result from building collapse, the vulnerability of people living or working in such structures is bound to be high. Among the list of 23 cities projected by the UN to be of 'mega-city' size by 2015, 19 will be in LDCs. The four additions to the list are Hyderabad (India), with a history of destructive floods and Tianjin (China) together with Istanbul and Bangkok.

In 2015, if these projections hold up, nine of the largest cities among the LDCs will have a combined population of 148 million people (about the total population of Russia, more than twice the population of Great Britain). Of these, Mexico City and Istanbul are probably at greatest risk (see Chapter 8).

Not only are mega-cities at risk, but smaller cities as well, such as the small coffee marketing centre Armenia in Colombia or Bhuj in Gujarat, India – both severely damaged by earthquakes. Another example is Goma, a city of 500,000 people in eastern Congo. It was cut in half and 40 per cent destroyed by an eruption of the nearby Nyiragongo volcano in January 2002. The vulnerability of the inhabitants was very high because of a history of conflict in this region that had drained their financial reserves and destroyed the local economy and because there was hardly any municipal governance provided by the rebel force that controlled the city in defiance of the national government in Kinshasa. Without a functioning city government, there was no warning of the eruption, no organised evacuation and no shelter plan (Wisner 2002b; see also Chapter 8).

The urbanisation process not only magnifies the dangers of hazard events; it is in itself partly a consequence of a desperate migrant response to rural disasters. There is evidence from Delhi, Khartoum and Dhaka

Table 2.1 Largest cities in hazard areas (ranked by population in 1996)

City/conurbation	Population 1996 (millions)	Projected population 2015 (millions)	Hazard(s) to which exposed
Tokyo-Yokohama	27.2	28.9	Earthquake, cyclone
Mexico City	16.9	19.2	Earthquake, flood, landslide
São Paolo	16.8	20.3	Landslide, flood
New York	16.4	17.6	Winter storm, cyclone
Mumbai/Bombay	15.7	26.2	Earthquake, flood
Shanghai	13.7	18.0	Flood; typhoon
Los Angeles	12.6	14.2	Earthquake; landslide, wildfire, flood
Calcutta	12.1	17.3	Cyclone, flood
Buenos Aires	11.9	13.9	Flood
Beijing	11.4	15.6	Earthquake
Lagos	10.9	24.6	Flood
Osaka	10.6	10.6	Earthquake, cyclone flood
Rio de Janeiro	10.3	11.9	Landslide, flood
Delhi	10.3	16.9	Flood, heat and cold waves
Karachi	10.1	19.4	Earthquake, flood
Cairo-Giza	9.9	14.4	Flood, earthquake
Manila	9.6	14.7	Flood, cyclone
Dhaka	9.0	19.5	Flood, cyclone
Jakarta	8.8	13.9	Earthquake, volcano
Tehran	6.9	10.3	Earthquake

Source: UN Department of Economic and Social Affairs, Population Division. http://www.un.org/esa/population/pubsarchive/urb/furb.htm

(Bangladesh) that rural families who have become destitute as a result of droughts or floods have moved to these cities in search of food and work. Shakur studied the urbanisation process in Dhaka. His household surveys revealed that:

> the overwhelming majority of Dhaka squatters are rural destitutes who migrated to the city mainly in response to poor economic conditions (37 per cent) (particularly landlessness) or were driven by the natural disasters (25.7 per cent) (floods, cyclones and famines).
>
> (1987: 1)

In a related way, cities have provided safe refuges in Africa and Central America from civil wars and rural warlordism, thus accelerating urban growth. For example, during the last few years of the civil war in Angola,

tens of thousands of IDPs risked malaria and other diseases, living in swampy conditions on the edges of Luanda, capital of Angola.

War as a dynamic pressure

There will unfortunately have to be frequent mention of war in the case study chapters in Part II. In 1985 van der Wusten (1985) counted more than 120 wars since the end of the Second World War. Another source that took a narrower definition than van der Wusten gives the total for the twentieth century to be 165 wars that have claimed 180 million lives (White 1999). Whether the definition used is narrow or broad, violent conflicts have had disastrous consequences in their own right for the people caught up in them, and they have also influenced vulnerability to extreme climatic and geological processes (Wisner 2002c). On a regional and local scale, war has disrupted and degraded the environment, for instance, in Vietnam and the Gulf (SIPRI 1976; Kemp 1991; Seager 1992; Austin and Bruch 2000). Bomb craters, burning of forest or wetlands or poisoning with herbicide (SIPRI 1980; Westing 1984a, 1984b, 1985) can either trigger extreme events (such as landslides) or remove people's protection from extremes (such as coastal mangroves as a screen against high winds). Unexploded mines deny people access to arable land, thus reducing food security. Rural people in Afghanistan, Angola, Mozambique, Eritrea and Cambodia have lost limbs trying to farm in heavily mined areas.

The economic impact of war, especially so-called 'low intensity' or 'counter-insurgency' warfare, is very high for isolated rural households, who may often be highly vulnerable to begin with (Stewart and Fitzgerald 2000). Contending forces ebb and flow over such peasant lands, extracting rations or tribute, making life insecure. The influx of refugees following war in a neighbouring territory can have an immediate and dramatic influence on vulnerability by suddenly raising the population density (Hansen and Oliver-Smith 1982; Jacobson 1988). Demands on local services and infrastructure increases, fuelwood and water needs must be met, sometimes with damaging consequences for the local environment (Black 1998). This local population pressure can also increase disaster vulnerability.

As we pointed out in Chapter 1, the interlinkages between conflict and disaster are numerous and complex. The case of the 50 years of civil war in Colombia illustrates such complexities; 2.1 million Colombians were internally displaced at the end of 2000. Many have sought refuge on the edges of cities, where they live in conditions that make them highly vulnerable to shack fires, earthquakes, landslides, floods and epidemic disease, not to mention violence, sexual abuse, hunger, unemployment and despair. Ninety per cent of these people have been displaced by violent conflict. The majority are children, Afro-Colombians and poor women. Only 20 per cent of these IDPs have received any aid from the Colombian state, and even that has been 'minimal and short term' (Lopez 2001: 7). This example shows how violent conflict can

affect some of the particular social and demographic groups we have already identified as being highly vulnerable to extreme natural events. It shows, too, how violent conflict increases the pressure of unplanned urbanisation.

Finally, in Colombia the connection between violent conflict, environmental degradation, loss of livelihood and vulnerability are vividly clear. Part of the enormously complex civil war in Colombia includes aerial spraying of pesticide onto coca crops (part of the US 'War on Drugs'). From August 2000 to May 2001 alone there were 1,158 reports of damage to human health, food crops, livestock and the environment (Lopez 2001: 8). Where food crop areas are located near to small plots of coca plants, a household's food has also been destroyed, as have grazing animals including horses, cattle, sheep, goats, rabbits, tortoises and fowl (Lopez 2001).

The manufacturer (Monsanto) of the main fumigation ingredient, Roundup, advises against aerial spraying and recommends that grazing animals do not enter areas where it has been applied for two weeks. Yet the US and Colombian military spray it directly onto small farmers, crops and livestock. In addition, the manufacturer advises against using Roundup near bodies of water because of potential harm to aquatic life. During 2000–2001 spraying was intense in the Putumayo region of Colombia, on the edge of the Amazonian basin. It is a region with intricate waterways and strong currents. Thus unintentional contamination, far from the coca-growing targets, is almost certain (Lopez 2001). In response to the aerial spraying some small farmers have abandoned the land and have joined the urban displaced persons discussed earlier. Others have gone even deeper into the rainforest where they hope they can farm in peace. In this way, the agricultural frontier is being extended, with accompanying deforestation and long-term reduction of biodiversity and forest cover. This, too, contributes in the long run to increased vulnerability to extreme natural events.

Global economic pressures

A further global pressure on vulnerability to disasters involves the workings of the world economy (Castells 1996; Stiglitz 2002; Cavanagh et al. 2002). Since the Second World War the global economic order has changed rapidly. In particular, the pattern of financial relationships between the industrialised MDCs and LDCs has altered following decolonisation. Globally, prices are falling for the agricultural and mineral exports on which LDCs have traditionally had to depend.

Meanwhile, the prices LDCs have to pay for their imported energy and technology have increased. This has created circumstances in which many LDCs face great difficulty in maintaining their balance of payments. In addition, the oil price rises of 1973 and 1979 led many countries to incur foreign debts. These were transformed into repayment crises, especially in light of rapid increases in interest rates in the late 1970s and early 1980s. In

many African countries, debt servicing alone (i.e. payments of interest and charges) amounts to 40–50 per cent of export earnings (George 1988; Onimode 1989; ROAPE 1990; Africa World Press 1997). The flow of financial aid into Africa (net of debt payment and repatriated profits) has declined steadily (Cheru 1989; Adedeji 1991; Mengisteab and Logan 1995; Mkandawire and Soludo 1999), and in some cases is exceeded by debt and interest repayments. In 1998, 31 of 48 African countries paid debt service in excess of 50 per cent of their GNP (TransAfrica Forum 2003). Foreign debt amounted to a very high percentage of annual GDP (gross domestic product) in many Latin American countries in 1985: 107 per cent in Bolivia, 99 per cent in Chile, 80 per cent in Uruguay, 77 per cent in Venezuela and 73 per cent in Peru. The Latin American average was 60 per cent of GDP (Branford and Kucinski 1988: 9). This percentage fell to 40 in the period 1996–2000, but this is still a significant burden (IMF 2002: 63).

The outcome of this pressure was to intensify the need to export at any cost. At the national level, this world economic situation added pressure to exploit natural resources to the fullest extent possible to maximise exports. As discussed below, such a 'growth mentality' has resulted in degraded forests and soil that increase vulnerability to disasters (Tierney 1992; Mander and Goldsmith 1996; Burbach et al. 1997; UNRISD 2000).

Since the 1980s many indebted countries have agreed to structural adjustment policies (including IMF 'stabilisation' and World Bank 'restructuring' policies), or initiated their own programmes that involve cutting public spending and a number of other measures discussed below. As a result, services such as education, health and sanitation are often reduced and state-owned enterprises privatised (both these measures leading to unemployment), while food subsidies are reduced. The early effects of these policies on welfare were analysed in studies by Cornia et al. (1987) and Onimode (1989), among others, but there was little discussion of the effect of such programmes on disaster vulnerability.[17] As a result of such studies, various 'safety nets' and other modifications of the structural adjustment policy design were built in, as described by Stewart (1987) and Haq and Kirdar (1987).

There is still controversy over whether these modifications were sufficient to protect vulnerable people and fragile environments. Because there have been a number of different phases of these programmes, with different impacts across time and between different countries, it is more difficult to make an evidence-based case for the impact of structural adjustment policies on vulnerability in a particular country. However, the fundamental characteristics of these programmes have remained, though the targets and means to reach them have changed.

The structural adjustment policies objective was to reduce the debt burden of the poorest countries by inducing them to export their way to economic growth and freedom from crippling debts (Panos Institute 2002: 6). Such policies first insisted on privatisation of the economy and a rolling back of the

state's control of sectors such as health, water and electricity supply, marketing and transportation. Secondly, capital market liberalisation was imposed, and any outflows of foreign capital which had invested in the newly privatised sectors had to be persuaded back by raising interest rates (sometimes to 60–80 per cent), with ensuing financial volatility. Thirdly, market-based pricing was insisted upon, which, for consumers, meant greatly increased prices for public utilities and some basic food staples which had hitherto been subsidised by the state. The result was social unrest in many countries during the 1980s. Lastly, conditions for free trade and the dismantling of barriers to foreign investment took place.

Despite the controversy surrounding the short- and long-term effectiveness and side effects of these IMF and World Bank policies, it is now widely recognised that these measures did not produce the desired effects and were particularly onerous for the poor (Rich 1994). Oxfam International estimated that the IMF-imposed cuts (in countries where structural adjustment policies had been implemented) had resulted in 29,000 deaths from malaria and had increased the number of untreated cases of tuberculosis by 90,000 (Brecher 1999). Health care, nutrition of the poorest, investment in human capital through education, all declined. Public infrastructure was neglected and public works programmes (upon which the poorest relied most heavily for safety and for employment) were cut back. Safety regulations at work and pollution standards were reduced to attract foreign investors, further increasing vulnerability. Wage levels were pared down in order to win export orders and attract investments by multinational corporations. This price war between the poorest countries has been described as 'a race to the bottom' (Madeley 1999). Child labour increased in sweatshops.

A new initiative for assisting Highly Indebted Poor Countries (HIPCs) was introduced in 1996 by the IMF. In 1999 an 'enhanced initiative' was introduced to decrease their debt to manageable and sustainable levels, and increased the number of eligible countries from 29 to 36 (22 of which were in Africa). A new condition was introduced for countries to comply with, which required them to prepare a Poverty Reduction Strategy Policy (PRSP). Although this exercise was supposed to be directed by national governments and shaped by widespread civic participation, it is claimed that this has not been the case. None the less, the enforced focus on poverty by the IMF and the World Bank cannot be detrimental to vulnerability, although whether it makes any long-term difference is open to question. The World Bank's *World Development Report 2000/2001* has a whole chapter devoted to 'Managing Economic Crises and Natural Disasters' (World Bank 2001), and there is an analysis of the impacts of natural disasters and their impact upon the poor. Prevention and mitigation measures are suggested which look quite similar in some respects to those we suggest in Chapter 9.

However, our main scepticism concerns whether these PRSPs will ever be implemented. There have been long delays in their acceptance because of the difficulties in complying with complex and stringent conditions (especially

over privatisation). To the extent that what is known as the 'decision point' or acceptance of the PRSP is hard to reach, debt relief and the implementation of the programme has been delayed. Furthermore, many of the PSRPs do not have clear policies to reduce poverty, and many of the more radical measures which would help (for example, improvement of labour rights, minimum wages, safety at work and land reform) seem to have been omitted (Marshall and Woodroffe 2001). Instead other, rather vaguer directions have developed such as good governance, careful monitoring, addressing corruption, improving access to education and health services (Panos Institute 2002). However, optimists point to encouraging rhetoric and real efforts to identify positive poverty-reducing policies, while pessimists see the latest reincarnation of structural adjustment policies as *plus ça change*…

In this debate, much of the discussion has been of global pressures on poverty rather than vulnerability, and as our book emphasises, poverty is not synonymous with vulnerability, although the two conditions are often highly correlated. It is difficult to provide hard evidence of such a relationship between structural adjustment policies and vulnerability, although it is much clearer regarding poverty. However, the majority of the deteriorating conditions in the living standards of the poor, as outlined here, can reasonably be assumed also to affect vulnerability adversely, and as such constitute a global pressure.

In some cases, however, it is possible to demonstrate clear links between vulnerability and the operation of the global economy, as exemplified by a case from Jamaica during the 1980s and 1990s (Ford 1989). In the 1980s, the government of Jamaica intervened in the financial sector to try and reduce inflation and stimulate production because of its large foreign debt. This policy was intended to attract foreign capital seeking high interest rates. Interest rates went up to over 20 per cent, and home mortgage rates ran between 14 and 25 per cent. These financial changes took place in a situation where the government enforced rent control and levied an import duty on construction material. As a result of this combination of policies, new residential construction declined rapidly.

Thus, the global economy – acting as a dynamic pressure – worked its way through to specific unsafe conditions in Jamaica. According to Ford there was an immediate increase in vulnerability of a significant proportion of the urban population to hurricanes and earthquakes. This results from the fact that property owners faced with such high mortgage interest rates and little hope of recouping this by increasing their rents (due to the rent restrictions) simply ignored maintenance (Ford 1989). Hurricane Gilbert damaged more than 100,000 low-income homes in 1988, producing costs of $558 million. More than 28,000 homes of the poor were either completely destroyed or had severe damage to roofs and structure (Government of Jamaica 2003).

In the early 1990s, external debt was more than 80 per cent of GDP. By 1997 that ratio had fallen to below 50 per cent (Government of Jamaica

2002). For instance, in 1989, service on external debt amounted to nearly one-third of export income; while by 1999 that had been reduced to 17 per cent (Jamaica at a Glance 1999). Nevertheless, interest rates continued to climb. The average lending rate reached a peak of 54 per cent in 1997. Although the lending rate declined gradually to 26 per cent in 2002 (PSOJ 2002), the pressure on new residential construction and maintenance of old structures described by Ford continued. Low-income housing would therefore still seem to be susceptible to the next big direct hit by a hurricane. The experience of Jamaica during the past 20 years illustrates the linkages that exist between the global economy, national economic policies and vulnerability. The impact of 'structural adjustment' on vulnerability went far beyond the issue of building maintenance. Because of the high cost of finance, builders tried to keep the cost of construction as low as possible so some small profit could be made. Again, safety suffered.

Health and education budgets suffered cuts under Jamaica's structural adjustment policies. Even more crucial is the fact that the government's own programmes to introduce preparedness or mitigation measures were also cut as a result of the economic constraints. It would be difficult to determine whether the severe damage to Jamaica from hurricanes Gilbert in 1988 and Hugo in 1989 were made worse by the economic policies described above, but such potential connections are clearly possible. An additional irony in the Jamaican situation is that part of the foreign debt burden that caused the government to launch its structural adjustment policy was due to loans used to pay for previous hurricane damage (see Chapter 7).

In the years preceeding hurricanes Gilbert and Hugo, an estimated 50,000 children under four years old suffered from malnutrition in Jamaica (Oxfam 1988). More than one-third of the labour force earned less than £5 ($7.50) per week, while four times this sum was needed to feed an average family. In Chapter 5 we argue that such a weak nutritional (and therefore health) status of a population contributes to other forms of vulnerability in the long run. If the Jamaican debt burden has had a negative impact on the poor, it is affecting an already impoverished people, a considerable proportion of whom are vulnerable to local hazards.

Adverse agrarian trends and livelihood diversification

It is becoming increasingly clear that sustainable livelihoods cannot be supported by natural resource-based activities (primarily agriculture) in many parts of the world, particularly in sub-Saharan Africa. Thus, there has been a reduction in the farming component of livelihoods, such that agriculture may provide only 50 per cent of family income, even in very rural areas (Reardon 1997; Bryceson 1999). This process has also acted as a 'dynamic pressure' affecting vulnerability both positively and negatively. Some of the pressures which have driven this adaptation are the following:

- Population growth without a concomitant increase in agricultural production, leading to the sub-division of land holdings and falling food security through local food production.
- Adverse environmental change, including global climate change (long-term desiccation, 'unseasonable' drought, or exceptional rainfall – see below).
- A decline in agricultural markets relative to non-farm wage levels.
- Rises in agricultural input costs due to the removal of subsidies following structural adjustment policies (see above).
- A general decline in access to rural public services due to economic mismanagement, protracted civil war and cost recovery programmes, and (again) under structural adjustment policies (Ellis 2000).

Some critics of structural adjustment policies argue that they have seriously undermined rural livelihoods and increased the risks of destitution and famine, but this is very difficult to verify without reliable longitudinal studies. According to Ellis (2001), a minority of authors such as Booth et al. (1993) have come to the opposite conclusion, namely that structural adjustment policies have enabled a positive diversification of livelihoods, with beneficial reductions in household risks.

There is also a growing literature on the decision-making aspects of diversification and the socio-economic characteristics of different households undertaking diversification. In poorer households, the decision to diversify may be driven by acute food insecurity and risk aversion, where agricultural yields are declining and their variability increasing. Increasing food security through the generation of cash from non-agricultural activities is one clear possibility. In better-off households, investments in education and other human capital has an effective, albeit longer term, benefit (Dercon and Krishnon 1996).

There are, however, marked gender, age and class differences (younger males migrating with a concomitant increase in the burden on the elderly and all women who have to stay at home). Resulting labour shortages on the farm are also a factor and intensify the feminisation of agricultural labour. For example, in Nepal the migration of significant numbers of people from the Middle Hills to the lower *terai* and to India resulted in remittances of cash which improved the food security of most households and brought the opportunity to change agricultural technology (Blaikie and Coppard 1998). The impacts of these pressures and adaptations on vulnerability are clearly diverse and often complex. Remaining a 'local' member of common pool management institutions becomes important, and temporary absence (particularly of males) may lead to a dispossession of rights and increasing insecurity.

Natural resource degradation

Another significant global dynamic pressure is destruction of forest, soil, wetlands and water sources. This is often closely linked with the debt question, since land degradation may result from national policies favouring export production, although this is difficult to prove since *ceteris paribus* conditions seldom exist and the policy effect is difficult to identify (Mearns 1991). In order to service debt, new lands have been cleared (e.g. in Brazil, the Philippines, Indonesia and many African countries) for ranching or commercial cropping, although there are usually other domestic factors at play here too. Coastal areas have been drained and mangrove forests cut in order to accommodate the expansion of tourist hotels and other foreign installations that offer the hope of hard currency earnings. Likewise, much forest has been destroyed by the timber industry in Asia and Africa, where uncontrolled cutting of high-value exportable hardwoods is another way debtor governments can pay.[18]

The connection between land degradation and unsafe conditions can be quite significant (Pryor 1982; Cuny 1983; Abramovitz 2001; ISDR 2002a; UNEP 2002). Deforestation, soil erosion and the mismanagement of water resources can increase hazard intensity or frequency in the long run. The connection between deforestation and slope stability, erosion and the risk of drought, and other issues, will be discussed at various points in Part II of this book. Loss of biodiversity can also affect patterns of vulnerability, and in Chapter 5 we will inquire into the link between the extinction of wild genes (sometimes called 'genetic erosion') and vulnerability to plant pests and diseases.

Deforestation, wetland destruction, over-fishing and destruction of coral reefs all contribute to genetic erosion, leading to the loss of many species, known and unknown (UNEP 2002). The physical growth of cities has caused the destruction of much coastal wetland. Swamps are drained for living space, for urban-fringe gardening, for fish ponds or salt works. Mangroves are cut for building material. Chapter 7 will emphasise the importance of these wetlands as buffers against coastal storms (Maltby 1986; H. John Heinz Center 2000). The growing demand for wood and charcoal in some south Asian and African cities means that fuels are being produced at ever-increasing distances, causing loss of vegetation (Leach and Mearns 1989). In other cities the demand for electricity is satisfied by more and more dams (often large-scale). These dams flood vast areas of forest and other lands, forcibly displacing the inhabitants (Little and Horowitz 1987; World Commission on Dams 2000b). Persons displaced by mega-projects of this sort (and others such as mining and oil extraction) often become more vulnerable to natural hazards because of their unfamiliarity with the environments to which they have been moved. Social and economic dislocation can also play a part in the vulnerability of people displaced in this manner (Watts and Peluso 2001; IIED 2002).

Another important aspect of loss of species and genetic variation is the changes in cropping systems and especially the increasing tendency for farmers to use fewer varieties of crops. Modernisation is accompanied by dietary change, with imported and processed food items replacing traditional varieties of grain, legumes, fruits and vegetables. Farmers grow a more limited number of commercial crop varieties and the traditional ones die out (Juma 1989). When biological hazards strike, there may be no resistant varieties (genetic ancestors of the affected crops) on which to fall back. The Irish 'Potato Famine' of 1845–1848 is a classic example. Irish peasants simply did not have access to (or knowledge of) the South American tubers that might have been imported to improve the disease resistance of the existing land race, which was derived from a very narrow genetic base (see Chapter 5). The destruction of habitats is wiping out the wild ancestors of many crops altogether. In the 1970s farmers in the USA were able to get hold of other seed sources when maize (corn) blight halved the yield of monocropped hybrids on which they had become reliant. In the future the insurance of older varieties of maize may not be available if they have become extinct (Fowler and Mooney 1990; Cooper et al. 1992).

The increasing use of genetically modified (GM) crops is highly controversial, and part of the debate bears directly on disaster vulnerability. The proponents of GM crops believe that in the future new varieties of disease and pest-resistant food crops, and those with other properties such as high levels of the precursors of vitamin A (so-called 'golden rice'), could significantly increase food security worldwide and help to wipe out nutritional deficiencies (Royal Society of London et al. 2000). Another example is the development of crops with a gene for salt tolerance added from mangroves that would allow food production on degraded lands. Opponents advise extreme caution in disseminating seed of this kind because of the fear of contaminating existing varieties – especially those that have been bred in conventional ways by generations of small farmers in Africa, Latin America and parts of Asia and the Pacific.

Recalling unanticipated and negative social and ecological side effects of the widespread use of so-called Green Revolution seeds from the 1960s onward, critics are concerned that premature release could destroy the existing stock of well-adapted staple grains and other food crops before a similar array of 'down-side' effects become evident. By then, critics believe, it might be too late to turn back. These anxieties were in the minds of the scientific advisers to the governments of Zimbabwe, Zambia and Malawi when, during a severe food shortage in southern Africa in 2002, they counselled their governments to reject the donation of GM maize from the USA. An additional line of criticism comes from those who believe that hunger, and in particular famine, is not caused by a shortage of food but by the *distribution* of food (see Chapter 4).

Global environmental change

There is by now little doubt that changes in the interacting systems of the atmosphere, hydrosphere, and biosphere have resulted in the build-up of 'greenhouse gases' (Liverman 1989; Watson et al. 1998; 1999). The dangers are that the changes will increase the intensity and frequency of climatic hazards and enlarge those areas affected by them (McGuire et al. 2002). It is not possible to blame the 'greenhouse effect' in a definitive way for the powerful hurricanes Gilbert, Joan and Hugo (1988 and 1989), Andrew (1992), Mitch (1998) or Georges (2000), or the record storms in Europe in the winter of 1989–1990, or the Australian floods of 1990 onwards. But global climatic change provoked by warming is predicted to increase the number and intensity of storms and cyclones and to amplify the variations in precipitation over much of the earth's surface.

The impact on livelihoods could be immense (especially for farming and fishing peoples), in addition to the dangers from any intensification of the hazards (Downing et al. 2001). Considerable work over the past ten years on the El Niño Southern Oscillation (ENSO) suggests that these cycles of exceptionally wet and exceptionally dry weather, associated with periods of warming of surface water in the Pacific, may be increasing in frequency. El Niño and La Niña episodes were associated in the 1980s and 1990s with failure of the monsoon in South Asia, spiking incidence of malaria and dengue, floods and landslides in the Andes, and wildfires in Australia (Glantz 2001; 2002).

Rising sea-level due to global warming is another dynamic pressure that will increase vulnerability. One result could be the destruction of livelihoods of six million farm workers living in the fertile delta regions of India (Watson et al. 1998). Low-lying areas of many islands, as well as the flood-prone delta regions of Bangladesh, India and Guyana are particularly at risk of a sea-level rise (Brammer 1989). In the Pacific, Tuvalu and Tonga may become uninhabitable (Lewis 1989; Wells and Edwards 1989; Pelling and Uitto 2002), and coral atolls which are home to many people in the Pacific and Indian oceans would experience submergence or destruction by storms. Low-lying parts of coastal cities are also at risk (O'Neill 1990 and see Chapter 7).

Uses of the PAR model

Since the first edition of *At Risk,* in addition to academic and policy applications (e.g. Watanabe 2002; Turner et al. 2003; Haque 1997) several NGOs have made use of the PAR (or 'crunch') model as the basis for community-based self-study of vulnerability and capability. In most of these pilot projects, communities and groups adopt the concept of vulnerability to inquire into their own exposure to damage and loss (Wisner 2003a).

The concept of vulnerability thus becomes a tool in the struggle for resources that are allocated politically. In some parts of Latin America and southern Africa such community-based vulnerability assessment has become

quite elaborate, utilising a range of techniques to map and make inventories, seasonal calendars and disaster chronologies.[19] Pilot projects have shown that lay people in citizen-based groups are capable of participating in environmental assessments that involve technology not previously accessible to them, such as geographical information systems (Pickles 1995; Levin and Weiner 1997; Liverman et al. 1998; Maskrey 1998).

In these applications of our PAR model and others like it, the community defines its own vulnerabilities and capabilities, not outsiders. They also decide what risks are acceptable to them and which are not. As Morrow remarks:

> The proposed identification and targeting of at-risk groups does not imply helplessness or lack of agency on their part. … Just because neighbourhoods have been disenfranchised in the past does not mean they are unwilling or unable to be an important part of the process. There are many notable examples of grassroots action on the part of poor, elderly and/or minority communities…, and of women making a difference in post-disaster decisions and outcomes…. Planners and managers who make full use of citizen expertise and energy will more effectively improve safety and survival chances of their communities.
>
> (1999: 11)

The employment of the concept of vulnerability as a tool in and by the community also involves a thorough analysis with and by the residents of their own resources and capacities. This is the 'other side' of the vulnerability coin. It is in the hands of local people that the logic of their situation, the phenomenology of their living with risks, forces them to be aware of and to discuss their strengths and capacities, as well as their weaknesses and needs (Wisner 1988a; Anderson and Woodrow 1998).[20]

Notes

1 'Risk' may still exist, however, since in the absence of an actual extreme natural event, natural process capable of generating such events may continue. The only point we are making here is that *given* a specific extreme natural event (e.g. an actual hurricane or landslide), if there is little or no vulnerability, there will be no disaster.

2 Good detailed discussion of the physical processes and extreme events themselves (the 'hazards') are available in Alexander (1993), Tobin and Montz (1997) and Smith (2000) as well as US Federal Emergency Management Agency (FEMA 1997) and Organisation of American States (OAS 1991).

3 There are many definitions of 'disaster', 'emergency', 'catastrophe', etc. We adopt our own, which shares much with the most common definitions in use. For more on questions of definition, see Oliver-Smith (1999b) and Quarantelli (1995, 1998).

4 For the sake of convenience, we will sometimes present the PAR model as a specific variation on Figure 2.1 in diagrammatic form, and sometimes in non-diagrammatic, list form. Such a list reads from top to bottom, beginning with 'root causes', proceeding through 'dynamic pressures', etc. For example, see the PAR lists for the Montserrat volcanic eruption or Kobe earthquake in Chapter 8.
5 This way of organising proximate and ultimate causes has been used elsewhere (e.g. in explaining land degradation by Blaikie and Brookfield 1987; Blaikie 1985a, 1985b, 1989).
6 Readers of the first edition of *At Risk* noticed that there is some ambiguity or overlap between processes we call 'root causes' and those we term 'dynamic pressures'. That is true, because a factor that can be considered a 'root cause' in one set of circumstances may be more of a 'dynamic pressure' under different conditions.
7 Smith (1992: 25) defines resilience as 'The measure of the rate of recovery from a stressful experience, reflecting the social capacity to absorb and recover from the occurrence of a hazardous event'.
8 For example, in May 2002, unusually hot, dry winds from the north pushed temperatures up in eastern and central India. More than a thousand people died from heat stress and dehydration, among whom were many children and the frail elderly (Kriner 2002). By January of the same year, temperatures had dropped to just above freezing in northern India, and at least another thousand people died of exposure and hypothermia (Rajalakshmi 2003). Klinenberg (2002) describes a heat wave in Chicago in 1995 that killed more than 700 persons, many of whom were low-income, elderly women.
9 'Entitlement' is a term for the access that people have to food from the sale of their labour, their own food producing activity, or via social networks, or some political claim on state resources (including moral claims on international food aid). Economist and Nobel laureate Amartya Sen introduced the term in a rigorous way in his 1981 book, *Poverty and Famines* (see Chapter 4).
10 In 1988 Pakistan had the second highest balance of payments deficit in the world at $3.5 billion.
11 This 'villagisation' policy in Tanzania had been intended to have a positive impact on livelihoods, by increasing the size of settlements so they could form the basis for providing health and educational services. It was also intended to create better economies of scale in agriculture and co-operatives for producers and marketing (Coulson 1982). Subsequent research has suggested that such radical, often forced, resettlement seriously disrupted patterns of coping with natural hazards such as flooding in the Rufiji river delta (Hoag 2002).
12 We would argue that the difficulty in providing direct evidence of the linkages between unsafe conditions, dynamic processes and root causes does not undermine this method of 'explaining' vulnerability. Quite clearly, if it is accepted that vulnerability is a function of socio-economic processes and not just the characteristics of the hazard itself, then there must be a chain of explanation for that vulnerability which can be traced back to root causes. This is no different from explaining any other social phenomenon: a 'housing shortage' in London cannot simply be explained by saying that there are not enough houses being built or too few people with enough cash: there are 'dynamic processes' and 'root causes' to be taken into account, even if there are political differences as to what these are in any given problem. Dovers et al. (2001) discuss the varieties of ignorance and uncertainty in environmental policy making in very much the same terms we do.
13 Here we focus on the political consequences of uncertainty. However we also recognise and certainly do not underestimate the philosophical consequences of opting for a meso-level theoretical position that spans such widely different

scales of time and space (historical and global affecting present and local). In brief, we do not believe that historical events and well-established social structures 'cause' unsafe conditions in any rigid, deterministic way. There is an interplay of structure and human agency. In much social science, as Abbott (2001: 98) puts it so nicely, 'action and contingency disappear into the magician's hat of variable-based causality, where they hide during the analysis, only to be reproduced with a flourish in the article's closing paragraphs'. We attempt to do justice to human action and agency – even, or especially, that of people who at first (viewed from the outside) appear as very weak and powerless – as well as contingency. That is one of the reasons why we have two models and complement the PAR model in this chapter with a model of household action (coping in adversity) in Chapter 3.

14 See, for example, Bryant (1991: 7–8), who labels those who might want to consider social processes as 'Marxist' as a way of dismissing them.

15 During the decade of the 1990s growing precision in the international study of global climate change now suggests that an increase in the frequency of intense storms could be one result of the warming of the atmosphere. This work emphasises that what one is dealing with is increasing variability in the ocean-atmosphere system, with complex results. One of these seems to be more frequent El Niño events. If correct, this research points to more floods and storms as extreme natural events. See McGuire et al. (2002).

16 See Maskrey and Romero (1983); Davis (1987); Hardoy and Satterthwaite (1989: 146–221); Fernandes and Varley (1998); Mitchell (1999a); Fernandez (1999); Wisner (2002a) and Pelling (2003b).

17 Related problems of environmental degradation have been raised. In a paper for a meeting of CIDIE (Committee of International Development Institutions on the Environment), hosted by the World Bank, Hansen noted that for a number of reasons structural adjustment policies

> often lead to a deterioration of the situation for those with the least resources to adapt to the changed economic circumstances. To the extent that poverty in many regions of the world is the primary cause for environmental degradation, increased poverty caused by structural adjustment policies can lead to further environmental damage.
>
> (1988: 7)

18 It is clear that many of these damaging activities pre-date the debt crisis. The argument is that the response of governments and entrepreneurs to the priority for exports has intensified them. However, it is possible that the intensification of deforestation, for example, does not earn foreign exchange for the government to repay debt. In some circumstances individuals and enterprises control foreign earnings and siphon them off out of the country ('capital flight') without any benefit to the economy. There is also a serious corollary of this: that reduction of the debt burden may not alleviate the destruction of forests or other resources, since the motivation for damage is not always to service the economic problems of the nation (see Little and Horowitz 1987; Faber 1993; Gadgil and Guha 1995).

19 Wisner et al. (1979); Cuny (1983); Maskrey (1989); Wisner et al. (1991); Geilfus (1997); Soto (1998); von Kotze and Holloway (1996); Anderson and Woodrow (1998); Carrasco and Garibay (2000); Plummer (2000); Turcios et al. (2000); Chiappe and Fernandez (2001); Wilches-Chaux and Wilches-Chaux (2001).

20 See an interesting discussion of 'poverty as capability deprivation' in Sen (2000: 87–110) and more on capability deprivation in Chapter 3.

3

ACCESS TO RESOURCES AND COPING IN ADVERSITY

Access to resources – an introduction

In the last chapter, we argued that disasters occur as the result of the impact of hazards on vulnerable people. We suggest two frameworks for explaining this relationship between natural events and the social processes that generate unsafe conditions. The first is the Pressure and Release (PAR) model, which shows in diagrammatic terms how the causes of vulnerability can be traced back from unsafe conditions, through economic and social ('dynamic') pressures, to underlying root causes. PAR is an organising framework outlining a hierarchy of causal factors that together constitute the pre-conditions for a disaster. We can also describe this as a pathway, 'progression of vulnerability' or 'chain of causation'. It is a sequence of factors and processes that leads us from the disaster event and its proximate causes back to ever more distant factors and processes that initially may seem to have little to do with causing the disaster. The 'Release' aspect arises from the realisation that to release the pressure that causes disasters, the entire chain of causation needs to be addressed right back to the root causes, and not just the proximate causes or triggers of the hazard itself or the unsafe conditions of vulnerability.

But the PAR model does not provide a detailed and theoretically informed analysis of the precise interactions of environment and society at the 'pressure point', at the point where and when the disaster starts to unfold. Firstly, any analysis of a disaster must explain differential vulnerability to, and the impacts of, a disaster – why wealthier people often suffer less, and why women and children may face different (and sometimes more damaging) outcomes than men and adults. Particular groups, defined by ethnicity, class, occupation, location of work or domicile may suffer differentially from others. In these senses, the Access model focuses on the precise detail of what happens at the pressure point between the natural event and longer-term social processes, and, to signify this in visual terms, a magnifying glass is drawn on the PAR model (Figure 2.1).

Secondly, the PAR framework is essentially static, and without a series of iterations through the trajectory of a disaster, it cannot suggest nor account

for change, either before the onset of a disaster, and more importantly, during and after it. In addition to the PAR model, what is required is a detailed account of 'normal life' before the disaster. We need a complementary model that details the progression of vulnerability to (and through) the pressure point and through the unfolding of the disaster. It must also show how normal life becomes abnormal, and how and when disjunctures between the normal and the exceptional take place. To achieve this, in this chapter we present the Access model, which deals with the amount of 'access' that people have to the capabilities, assets and livelihood opportunities that will enable them (or not) to reduce their vulnerability and avoid disaster.

The purpose of the Access model

The Access model is designed to understand complex and varied sets of social and environmental events and longer-term processes that may be associated with a specific event that is called a disaster. A disaster may be described and labelled according to the natural hazard that triggered it (for example, drought impacting upon vulnerable people leading to famine, or an earthquake impacting on unsafe buildings leading to destruction of life and property). Indeed, the chapter headings of Part II of this book adopt this categorisation, as we have responded to much received wisdom in order to undermine this type of approach. Much of the literature on disasters relates to each type of natural event trigger, and is specific to famines, biological hazards, floods, severe coastal storms and so on. On the other hand, there are generally shared characteristics in the way that vulnerability is generated, how the trigger event and the unfolding of the disaster has its impact, and various responses by different actors, both local, national and international. It is these that the PAR model – and now the Access model – seek to address.

In Figure 2.1 the reader will have noticed the magnifying glass in the diagrammatic representation of the PAR model. This is intended as a visual metaphor for the location of the Access model in the wider explanatory framework: the place within the PAR approach where it magnifies and clarifies the explanation of a disaster. The magnifying glass metaphor is appropriate since the Access model sets out to explain at a micro-level the establishment and trajectory of vulnerability and its variation between individuals and households. It deals with the impact of a disaster as it unfolds, the role and agency of people involved, what the impacts are on them, how they cope, develop recovery strategies and interact with other actors (e.g. humanitarian aid agencies, the police, the landlord and so on).

We first introduce the outline structure of the model, in which boxes are labelled in summary fashion but remain, if not 'black boxes', still somewhat opaque. Then later in the chapter each box will be opened up and explained in detail. There is a risk in this that some repetition will irritate the reader. However, it is hoped that clarity as well as detail can be captured by dealing

first with the overall structure and then the more theoretically informed and detailed aspects sequentially. The Access model picks up the state of 'normal life' and explains how people earn a livelihood with differential access to material, social and political resources.[1] This model is shown in Figure 3.1and can be identified in summary form in Box 1

The outline has eight boxes, each representing a set of closely related ideas, an event or distinct process. They are linked by arrows which denote cause and effect linkages. Although the linkages are shown by arrows (from cause to effect), they also iterate, and effects can also shape causes at a later period of time. In the briefest terms, hazards (Box 3) have specific time and space characteristics (Box 4), which can – and in this depiction do – result in a 'trigger event' (Box 5, for example an earthquake, a tropical storm or a

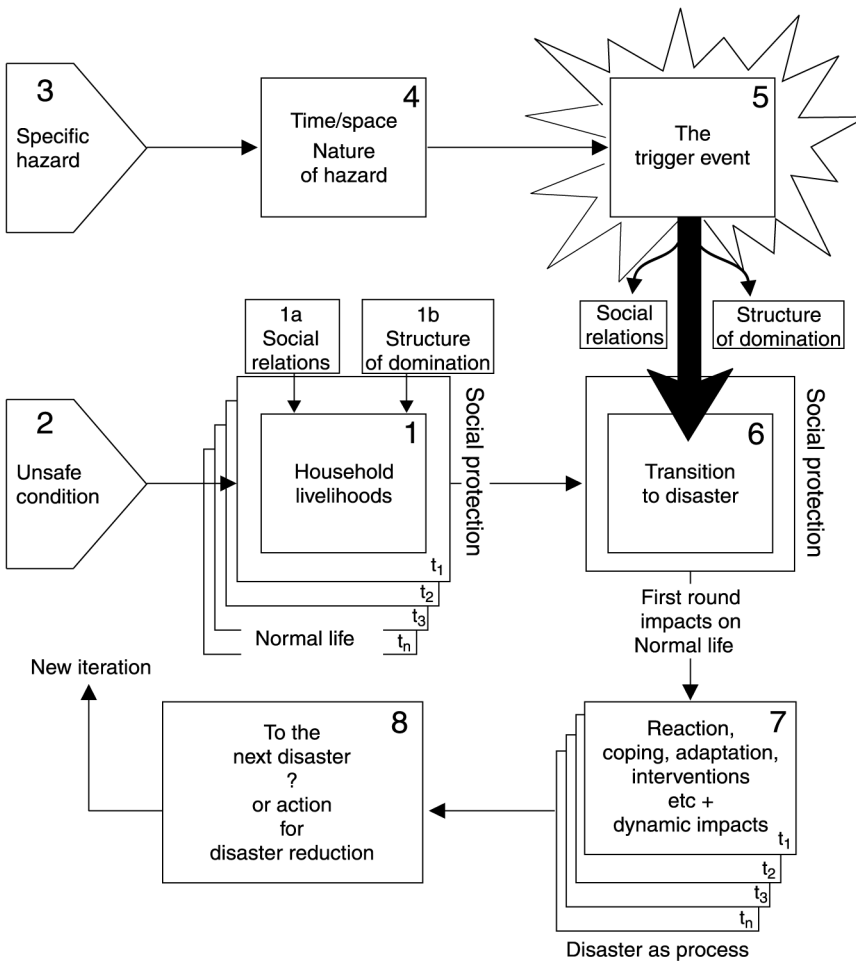

Figure 3.1 The Access model in outline

serious drought). Households earn their livelihoods in normal times (Box 1), and are subject to unsafe conditions (Box 2) and the political economy in which they all live is also shaped by social relations and structures of domination (Boxes 1a and 1b). The trigger event occurs and impacts upon social relations and structures of domination and upon households themselves (Box 6). The heavy black arrow is depicted as bursting through an outer layer, called 'social protection' (which, as will be explained below, is both individual, collective and public), and as impacting on different households in a process termed 'transition to disaster' (Box 6). Subsequent iterations of unfolding impacts and human responses occur through time (Box 7). Box 8 asks the question 'To the next disaster?', and indicates altered conditions of vulnerability, social protection and actions for preventing future disasters.

The model stylises the process of earning a living as a set of decisions made at the household level (as will be described below when this process in Box 1 is opened up and explained in Figures 3.2 and Figure 3.3), individual decisions are always made in a political-economic environment, and this is indicated by two boxes (1a and 1b) labelled 'social relations' and 'structures of domination'. Thus, life in normal times is characterised by repeated decisions about how to obtain a livelihood, decisions which are made every season in an agricultural setting (for example, a cropping strategy, investment in new inputs or agricultural equipment) and sometimes irregularly and more frequently in an urban setting (for example, changing the nature of employment, starting up a small shop or handicraft enterprise).

The iterative character of a livelihood is suggested by repeated cycles of livelihood decisions, each on one sheet, arranged in the diagram behind each other and labelled 't1', 't2', indicating subsequent iterations of decision making year by year. There is also an outer border to the household livelihood box called 'social protection'. This symbolises the presence (or absence) of hazard precautions and preparedness that is provided by the state and local collective action. It is the local expression of the more generalised 'unsafe (or safe) conditions' (shown here as Box 2, derived from the PAR model). This links the broader scale of disaster causes to the microcosm of normal life. The resources which define the quality of social protection at household level are varied in scope and may include flood protection embankments, concrete storm shelters, enforcement of building regulations as well as community coping mechanisms, self-help and communal charity. These are discussed below in more detail. It is also worth specifying how to choose the 'households' in the box. This matter (essentially one of scope and sample) must be defined by the local people and the researcher, planner or development professional according to their focus. This can be defined spatially (for example, an area threatened by a specific and severe natural hazard, a particular village or a quarter in a city), or defined by ethnic group, class or other characteristic which may render the chosen group of households more vulnerable.

Let us now turn out attention to the potential hazard in Box 3 in the top left-hand corner of the diagram. The arrow-shaped box should be recognisable from the PAR framework, and introduces the specific hazard(s). The time and place characteristics of the hazard (where, how often, when) are examined in more detail and illustrated in Box 4, labelled 'nature of the hazard'. The scene is now set for the disaster process to start, following the hazard strike (stylised as 'the trigger event', in Box 5). It must be noted here that some disasters occur without a clear-cut, single, natural hazard trigger, nor perhaps with an identifiable event in the political economy. Instead, there are multiple contributing events which together constitute a 'complex emergency', which then unfolds in all its intractable complexity over a long period of time. An example is the situation in 2001–2003 in Zimbabwe, which has gone from a country producing a surplus of food into one facing bankruptcy and impending famine, in a complex mix of drought and political conflict.[2]

The example to be used here involves a disaster that is triggered by a definite hazard event. It is a composite event, but not an unusual one, involving high winds, coastal storms, intense rainfall, landslides, flooding of urban and rural areas, contaminated water supplies and so on, and will be described in more detail later on. This event now attacks 'normal life', and the first round of impacts are shown in Box 6. Some of the immediate consequences are mediated or deflected by the safety measures in place, while other impacts penetrate these safety measures (depicted by the 'impact arrow' striking through the outer protective barrier) and fall upon different households with varying degrees of severity. The hazard event also alters existing social relations as well as structures of domination, as the more detailed explanation of these processes will show.

Within the microcosm of households, adaptations, coping strategies and access to safety become urgent as a potential disaster starts to overtake what is no longer 'normal life'. This is the transition from normal life in Box 1 to transitions from the first round of impacts in Box 6, labelled 'transition to disaster'. Thereafter, there may be interventions into the 'microcosm' of households from the outside, such as disaster relief, or in contra-distinction, a continuation of, for example, military activity and the disruption of relief supplies. Then, in subsequent iterations, the disaster unfolds in a series of 'time sheets' labelled 'disaster as process' in Box 7. The process of recovery, and return to normal life (or, in some cases, to a more vulnerable life, waiting, as it were, for the next disaster) is suggested in Box 8 and is examined in Chapter 9.

Access in more detail

The PAR model, which forms a 'chain of explanation', is an analytical tool, subject to a number of inadequacies which we have tried to illustrate. One of its weaknesses is that the generation of vulnerability is not

adequately integrated with the way in which hazards themselves affect people; it is a static model. It exaggerates the separation of the hazard from social processes in order to emphasise the social causation of disasters. In reality, nature forms a part of the social framework of society, as is most evident in the use of natural resources for economic activity. Hazards are also intertwined with human systems in affecting the pattern of assets and livelihoods among people (for instance, affecting land distribution and ownership after floods).

To avoid false separation of hazards from social system, we have proposed a second dynamic framework called the 'Access' model. This focuses on the way unsafe conditions arise in relation to the economic and political processes that allocate assets, income and other resources in a society. But it also allows us to integrate nature in the explanation of hazard impacts, because we can include nature itself, including its 'extremes' (as they are experienced by people with different characteristics, in the workings of social processes and social change). In short, we can show how social systems create the conditions in which hazards have a differential impact on various societies and different groups within society. Nature itself constitutes a part of the resources that are allocated by social processes, and under these conditions people become more or less vulnerable to hazard impacts. In this chapter, the concept of 'access' to resources is explored in a more formal way, and the model within which it can be understood is developed fully.

The notion of access can be illustrated using a narrative taken from the work of Winchester (1986, 1992), which analysed the impact of tropical cyclones in coastal Andhra Pradesh (south-east India) (see also Chapter 7).[3] Cyclones in the Bay of Bengal periodically move across the coast and strike low-lying ground in Andhra Pradesh. They sometimes cause serious loss of life and property, and disrupt agriculture for months or even years afterwards. The damage is done by very high winds, often causing a storm-surge, followed by prolonged torrential rain. Let us compare how the cyclone affects a wealthy and a poor family living only a 100 m apart.

The wealthy household has six members, with a brick house, six draught cattle and over a hectare of prime paddy land. The (male) head of household owns a small grain business for which he runs a truck. The poor family has a thatch and pole house, one draught ox and a calf, a quarter of a hectare of poor, non-irrigated land and sharecropping rights for another quarter hectare. The family consists of husband and wife, both of whom have to work as agricultural labourers for part of the year, and children aged five and two. The cyclone strikes, but the wealthy farmer has received warning on his radio and leaves the area with his valuables and family in the truck. The storm surge partly destroys his house, and the roof is taken off by the wind. Three cattle are drowned and his fields are flooded, their crops destroyed. The youngest child of the poor family is drowned, and

they lose their house completely. Both their animals also drown, and their fields are also flooded and the crop ruined.

The wealthy family returns and uses their savings from agriculture and trade to rebuild the house within a week. They replace the cattle and are able to plough and replant their fields after the flood has receded. The poor family, although having lost less in monetary and resource terms, have no savings with which to replace their house (although it would cost less than 5 per cent of the cost of the house of the rich family). The poor family have to borrow money for essential shelter from a private moneylender at exorbitant rates of interest. They cannot afford to replace their ox (essential for ploughing) but eventually manage to buy a calf. In the meantime they have to hire bullocks for ploughing their field, which they do too late, since many others are in the same position and draught animals are in short supply. As a result, the family suffers a hungry period eight months after the cyclone.

Although this story suggests a generalised negative association between wealth and damage, such a result is not automatic. In this area, in some locations that are less protected from tidal surge and are more hazardous to all social classes, higher mortality can occur across the local population, irrespective of the wealth of household. But this example serves to illustrate how access to resources varies between households and the significance this has for potential loss and rate of recovery. Those with better access to information, cash, rights to the means of production, tools and equipment, and the social networks to mobilise resources from outside the household, are less vulnerable to hazards, and may be in a position to avoid disaster. Their losses are frequently greater in absolute terms, since they may have more to lose in terms of monetary value, but they are generally able to recover more quickly. After a famine poor and disadvantaged households can recover but may compromise their resilience to the next famine (Rahmato 1988). In our illustration above, the seeds of further hardship, maybe starvation, have been sown for the household with poor access to resources, but this is not so for the other family.

This example helps to demonstrate the arguments of the first two chapters that variations in level of vulnerability to hazards are central in differentiating the severity of impact of a disaster on different groups of people. In general, rich people (and urban people of all wealth categories) almost never starve. Some avoid hazards completely and many recover more quickly from events that are disastrous for others. However, a major explanatory factor in the creation (and distribution of impacts) of disasters is the pattern of wealth and power, because these act as major determinants of the level of vulnerability across a range of people. We therefore need to understand how this distribution is structured in normal life before a disaster, explaining in detail the differential progression of vulnerability

through the triggers of natural and other events into disasters. The idea of 'access' (to resources of all kinds, material, social and political) is central to this task.

Access involves the ability of an individual, family, group, class or community to use resources which are directly required to secure a livelihood in normal, pre-disaster times, and their ability to adapt to new and threatening situations. Access to such resources is always based on social and economic relations, including the social relations of production, gender, ethnicity, status and age, meaning that rights and obligations are not distributed equally among all people. Therefore, it is essential that assets and the patterns of access to them remain central to this project and do not become detached from the underlying political economy which shapes them. For example, private property rights confer upon the owners of buildings and land their ability to control the uses to which they are put. This provides the conditions for the generation of surpluses of cash and food, and collateral for loans – all of which may become crucial in times of disaster. A careful analysis of political economy tends to blur the distinction between *access* and *resources*, because *access* can be understood to be the most critical resource of all (Bebbington and Perrault 1999).

In this Access model, the political economy is modelled in two related systems. The first is called *social relations* (Figure 3.1, Box 1a) and encompasses the flows of goods, money and surplus between different actors (for example, merchants, urban rentiers, capitalist producers of food, rural and urban households involved in various relations of production and endowed with a particular range and quality of access to resources, called an *access profile* [see below]). The second system is termed *structures of domination* (Figure 3.1, Box 1b), and refers to the politics of relations between people at different levels. These include relations within the household, between men and women, children and adults, seniors and juniors. These relations shape, and are shaped by, existing rights, obligations and expectations that exist within the household and which affect the allocation of work and rewards (particularly crucial in terms of shock and stress). The structures of domination also include the wider family and kinship ties of reciprocity and obligation at a more extended (and usually less intensive) level, and those between classes that are defined economically (such as employer and worker, patron and client) and between members of different ethnic groups.

Finally, the structures of domination involve, at the most extended and highest level, relations between individual citizens and the state. These are multifarious and become crucial in times of shocks and stress. They involve issues of law and order and how these are exercised – with partiality and personal discretion, with particular degrees of intensity and efficiency, with differing degrees of coercion, or sometimes with violence.

Relations at this level usually involve standards of governance and the capabilities of the civil service and the police. For example, as Chapter 8 will illustrate, the building codes and bylaws which are applied to the physical planning of a city may be called into question by an earthquake. The degree of administrative competence in disaster preparedness, as well as in disaster relief and recovery, is of great importance. Finally, the state (with its army, police force, and semi-official and sometimes encouraged vigilante groups) may be involved in civil war, systematic persecution or ethnic cleansing, in which case the resolution of what is known as a 'complex emergency' can become virtually intractable, and the state may block or divert international humanitarian assistance altogether (see Chapter 4 on famines).

Structures of domination may draw on dominant and shared ideologies, world views and beliefs for their legitimacy. Such ideologies and world views are often the 'root causes' of vulnerability and are present at the extreme left-hand side of the PAR model. This is one of many points of connection between our two models. The influence of ideology can be seen in the ways that different groups of people perceive risk. Earlier narrow, positivist comparative studies of 'the psychology of risk perception' were baffled by what it labelled 'fatalism' in the face of hazards such as drought in Nigeria (Dupree and Roder 1974). It is critically important for international and national initiatives to understand risk cultures in different contexts so as to be able to improve 'risk awareness', and we shall return to this in Chapter 9.

New thinking since 1994

Since the introduction of the Access model in the first edition of *At Risk*, there have been a number of other developments in this field and also some (mostly) constructive criticism of the model. The most important parallel innovation is the advent of the 'sustainable livelihoods (SL) approach' to development. This appeared in preliminary form in Chambers and Conway (1992) and was promoted by the UK aid ministry (Department for International Development) in Carney (1998), and by others including Drinkwater and McEwan (1994), Leach et al. (1997), Moser (1998), Scoones (1998) and Bellington (1999). This SL approach is very similar to the Access model in the first edition of *At Risk*, and earlier versions of the household Access model on which it was based (Blaikie et al. 1977; Blaikie 1985b).

A livelihood:

> comprises the capabilities, assets and activities required for a means of living: a livelihood is sustainable [when it can] cope and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihoods for the next generation;

> and which contributes net benefits to other livelihoods at local and global levels in the long and short term.
>
> (Chambers and Conway 1992: 7–8)

The SL approach was not developed specifically for the analysis of disasters, but more generally for a wide range of (usually agrarian) policies. None the less, it is implied that the occurrence of a disaster (or in livelihood terminology by 'shock' or 'stress') implies non-sustainability of the affected livelihoods. While the occurrence of a disaster is certainly evidence of non-sustainability, it cannot be treated as conclusive evidence. After all, disasters can be prevented or palliated, and recovery achieved, without necessarily reducing the reproduction of sustainable livelihoods.

Livelihood analysis seeks to explain how a person obtains a livelihood by drawing upon and combining five types of 'capital', which are similar to the assets that are involved in our Access model:

1 human capital (skills, knowledge, health and energy);
2 social capital (networks, groups, institutions);
3 physical capital (infrastructure, technology and equipment);
4 financial capital (savings, credit);
5 natural capital (natural resources, land, water, fauna and flora).

In some ways, the addition of the idea of 'capitals' being drawn down, built up or substituted is illuminating, and is handled in our original Access model in a different way (which the reader will be able to identify below). However, because the original Access model is so similar to the livelihood approach, as it was later developed, the authors decided not to adopt the livelihoods terminology, but to acknowledge it and its contribution separately, and to build upon it wherever it offers new insights.

It is worth emphasising that the Access model is essentially dynamic, and iterates through time to provide a precise understanding of how people are impacted by a hazard event and their trajectories through that event. It is a micro-level, disaggregated model which is shaped by (and shapes) overarching political processes at different levels (from the form of international intervention, the nature of the state, downwards). The Access model remains in this edition an economistic model, which can be as precise, deterministic and quantitative as the user wishes. The political-economic realm is acknowledged to be profoundly important but is not modelled directly, though its structural 'scaffolding' within which households take decisions has to be identified. The root causes, dynamic pressures and unsafe conditions which the PAR framework deals with are treated as qualitative inputs into the Access model and have to be specified in more detail through the dynamic operation of structures of domination and social relations.

Haghebaert (2001, cf. 2002) has made some constructive criticisms of the Access model. These are as follows: (1) the version of the model used in the first edition 'appears to be more designed to analyse general livelihood processes than to investigate specific disaster related processes' and issues of safety are not well defined; (2) non-tangible assets, such as creativity, experience and inventiveness (in short, human agency) are under-emphasised; and (3) the framework does not link up with political and socio-economic processes. Access to safety is important, and this has been strengthened in this version. Safety is partly a matter of what Cannon (2000a) has called 'social protection' and 'self-protection'. Social protection against hazards is (or should be) provided by entities that operate on levels above the household, especially the state, or community, or through collective action, while self-protection is provided by and for the household (to the extent that its assets make this possible, or its attitude makes it willing to do so; there may well also be an intra-household variation in self-protection between men and women, children and adults, and older and younger adults).

Households can to some extent 'buy' safety (e.g. strengthening their house, locating on a plot safe from rising floods, using drought-resistant seeds). Later in this chapter we refer to this self-protection also as 'individually generated safety'. Other aspects of safety – social protection – are possible only at a level above that of the household. They are a function of both non-monetary social relations (for example, mutual aid in a community, neighbourhood, or among extended kin: the equivalent of 'social capital' in the sustainable livelihood approach), and the provision of preventive measures by government and other institutions. The social protection component of safety is determined by the structures of domination: they are a function of the relationship between the members of the household as 'citizens' with 'rights', 'claims' and 'entitlements' in relation to the state (and civil society, which allows social networks to operate). The last mentioned extends to the citizens' 'right to know' (e.g. awareness of risks, warning systems) as well as enforcement of codes and standards, provision and maintenance of lifeline infrastructure, strategic, staple food reserves, etc.

The other two points made by Haghebaert (2001) are more difficult to accommodate. Firstly, our Access model is economistic, implicitly quantitative and structuralist, and, we maintain, there are considerable advantages because of this. It isolates important economic and political economic processes of normal life. It is very difficult to model, predict or find regularities in agency or inventiveness. Coping mechanisms in the face of disasters are discussed later on in this chapter, but these can usually be described in a qualitative manner only. Indeed, Part III of this book picks up this aspect and suggests ways of strengthening, rather than hampering and undermining, local ingenuity. In this sense, the Access model was never designed,

nor made claims, to explain all things about all disasters to all people. In similar vein, the political is also unpredictable, although the PAR framework, plus the analysis of structures of domination and social relations all specify the importance of the political, which qualify at different points the iterations of daily life and their outcomes. The Access model in isolation does not directly incorporate political factors, but used with the PAR model, which is much less precise but more holistic, both together provide a satisfactory analytical link with political and socio-economic processes.

'Normal life' – the formal Access model

Let us now turn to the central model, called the Access model. The following explanation will 'unpack' Box 1 of Figure 3.1. We will assume that the people we are concerned with in analysing vulnerability are members of economic decision-making units. These units can sometimes be called 'households', or 'hearth-holds' (Ekejuiba 1984; Guyer and Peters 1984), that is, those who share common eating arrangements which coincide with production units. Admittedly, there are cases where it is difficult to distinguish households at all.[4] There are squatter camps where remnants and fragments of households live together under one roof. There are 'hot bedders', or very poor immigrants who sequentially share a single bed, one sleeping there at night and working the day shift, and the next slipping into the warm bed before working the following night shift. There are hostels for short-stay workers and street populations which may not have much to do with the conventional household at all – indeed, some (abused children, battered wives, orphans living with distant relatives) may be refugees *from* the household.

All these people may also be as vulnerable to hazards as those living in – and, in terms of expectations, obligations and rights – part of a household. However, such examples apart, it is usually possible to identify units that share labour and other inputs and consume meals together under one roof (or compound). We shall label these units 'households', each having a range or profile of resources and assets that represents their particular access level (the boxes numbered 2a in Figure 3.2). Also, each individual has an initial 'state of well-being', primarily defined by physical abilities to withstand shocks, prolonged periods of stress and deprivation specific to the particular disaster being addressed. At later stages in the disaster process, well-being will be affected and is likely to be shifted negatively from the initial conditions, as subsequent discussion will show. Each individual in a household has a collective claim which may be termed as access to resources.

Access to resources may include land of various qualities, livestock, tools and equipment, capital and stock, reserves of food, jewellery, as well as labour-power and specialist knowledge and skills (Figure 3.2, Box 2b). Non-material 'resources' are also essential, such as knowledge and skills, the

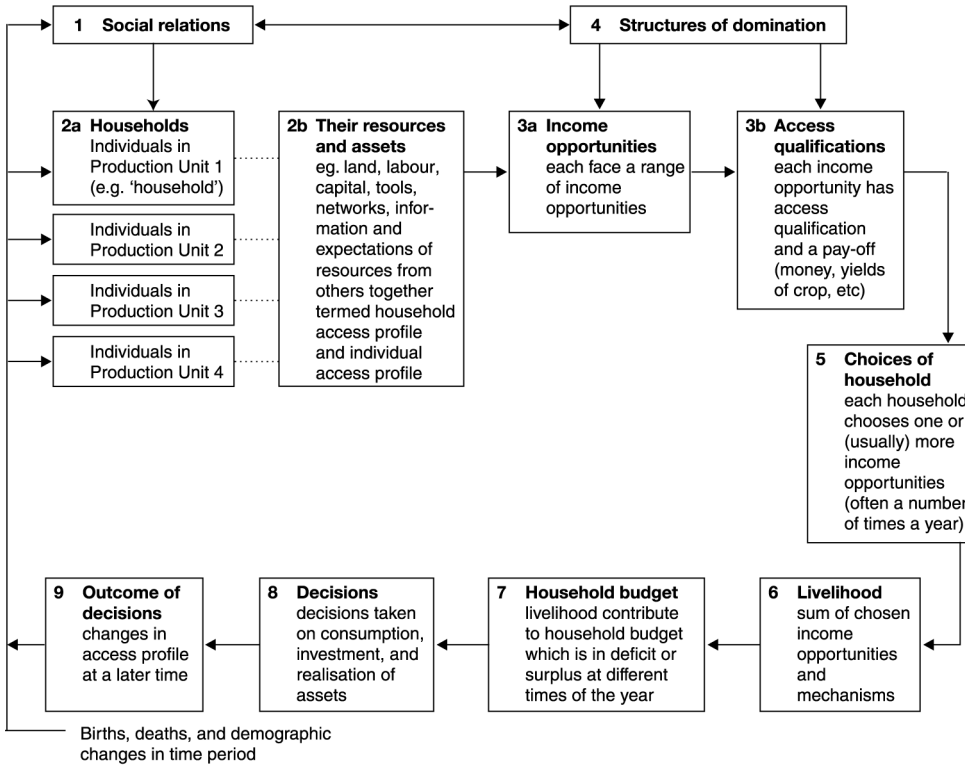

Figure 3.2 Access to resources: 'normal life'

structural position occupied in a society such as gender, or membership of a particular tribe or caste (which can either enable or exclude a person from networks of support, facilitate or prevent access to resources and their utilisation). These are personal attributes (social and human capital in terms of the SL approach) and not material resources. Access to material resources is secured through rights (e.g. property rights, rights accruing to women in marriage, as well as others sanctioned by law or custom) or sometimes criminality. Rights may change, of course, particularly after the shock of disaster, so that the physical resource may still exist, but some individuals may no longer have access to it, or others have greater access in post-disaster periods.

Each household makes choices, within constraints, to take up one or more livelihoods or *income opportunities* (Box 3a). In rural areas, most of these will be the growing of different crops, or pasturing animals, while in urban areas there will probably exist a wide range of opportunities including petty-trading, working in a factory, casual labour and domestic work.[5] Each

income opportunity has a set of *access qualifications* (Box 3b). This is defined as a set of resources and social attributes (skills, membership of a particular tribe or caste, gender, age) which are required in order to take up an income opportunity (Box 3a). The notion bears a close resemblance to Sen's idea of capability and to the livelihood lexicon of the five capitals. Here, access qualification describes a more precise and specific facility for a particular income-earning opportunity.

Some income opportunities have high access qualifications such as considerable capital, rare skills or costly physical infrastructure, and therefore bar most people from taking them up. As a result, they typically provide the highest returns. Others are much less demanding (e.g. casual labouring, which requires only an able-bodied person available at the point of employment), and these are usually over-subscribed and poorly paid. Each income opportunity has a payoff in terms of physical product, money or other services, and eventually in health and well-being (as well as affecting the initial or baseline state of well-being before the disaster).

In rural areas, payoffs are often determined by crop or animal yields multiplied by market price. Both yield and price may be particularly prone to large and adverse fluctuations. The mechanisms which set payoffs (the behaviour of markets in particular) for income opportunities of different households or groups or households (e.g. for agricultural food producers, labourers, artisans, fishermen, unskilled industrial workers, and so on) are of crucial importance. The labour market for casual, part-time and unskilled workers in urban areas also shows fluctuations, as do the conditions that determine the profitability of 'informal' activities such as street vending (where harassment and bribes by the police can be as unpredictable as the weather).

Access to all the resources that each individual or household possesses can collectively be called its *access profile* (see Box 2b). This is the level of access to resources and therefore to income opportunities, with some having a much wider choice of options than others (Box 5). Those who possess access qualifications for a large number of income opportunities have a wide choice and can choose those with high payoffs or low risks. Their flexibility also allows them choice in securing a livelihood under generally adverse conditions, to command considerable resources and have reserves of food. Such a household can be said to have a good-resource profile. On the other hand, those whose access profiles are limited usually have little choice in income opportunities, and have to seek the most over-subscribed and lowest paying options, and subsequently have the least flexibility during adverse conditions. Those with a limited access profile often have to combine a number of income opportunities at different times of year as some may provide a livelihood for only part of the year, be only seasonally available or be unreliable because other people are competing for a limited number of employment opportunities.

Each individual or household therefore makes choices, typically during key decision-making times in the agricultural calendar, or more irregularly under urban situations. The resulting bundle of income opportunities (both in kind and in cash), together with the satisfaction of such needs as water and shelter, can be said to constitute a '*livelihood*' (Box 6), which is the sum of the payoffs of the household's constituent income opportunities.

Some households structure their income opportunities in such a way as to avert the risk of threatening events such as drought, flood, loss of employment, failure of food crops or serious illness. They also employ survival strategies and coping mechanisms once a threatening event has occurred, although this usually involves an element of physical or institutional preparation. Grain must be stored and cattle numbers increased in good years to protect the reproductive capacity of the herd in bad years. A network of obligations and rights are also built up in the form of institutions (called social capital) that deal with these events and aim to prevent them from becoming disasters. These become crucial in the transition to disaster and are described in greater detail below.

The flows of income then enter the household as a range of goods and cash: wages, grain, remittances from absent household members, profits from commerce or business, and so on. A *household budget* can be constructed in which expenditures and income are listed, and the account accumulates, is in equilibrium or runs into deficit (Box 7). On this basis, decisions are made about how to cope with deficits, save or invest any surpluses, and what forms of consumption should occur, including 'one-off' arrangements for marrying adolescent offspring, festivals, investing in social capital, having babies, migrating (see Box 8, 'decisions'). If in surplus, the household may decide to invest and improve its access to resources in the future. If the account is in deficit, consumption will have to be reduced, assets disposed of, or the household will have to postpone equity and possibly increase the deficit in the long term by arranging a consumption loan (which may be inadequate in the short and/or longer term). A more detailed representation of the household budget is given in the case of famine in Chapter 4. The outcome of these decisions will result in a change in the access profile of each household in the next period (Box 9). These will in aggregate alter the flows of surplus between groups and households and may alter the social relations between groups (Box 1), so that in the next round the households are in a different set of relations to each other and larger scale structures, and enter Box 2b with different access profiles.

Households and access in a political economy

The outline of the 'household model' above may seem to some an overly mechanistic and economistic treatment of access to resources. We need to include further discussion of 'the rules of the game of the political

economy' or social transactions, and specifically of rights and social expectations which may give people access to resources. The dominant relations of production and flows of surpluses provide the main explanation of access to resources. Changes in the political economy at the level of 'root causes' in the PAR model are slow moving but can, as a result of revolution or major realignment in the balance of class forces, lead to fundamental shifts in access to resources and the character of disasters.

What is of more immediate and specific importance are the structures of domination and social relations at the local level (Boxes 1 and 4 in Figure 3.2), or the 'rules of the political economic game' for the microcosm of households selected in this model. Between individuals within a household, these involve the allocation of food, who eats first, who will have to absorb consumption cut-backs in times of dearth or who receives medical treatment. Gender politics within the household are of great importance here, and show how inadequate it is to treat the household as a homogeneous unit. As Rivers (1982) and Cutler (1984, 1985) amongst others have pointed out, women and children sometimes bear the brunt of disasters because of the power of male members of the household to allocate food while in refugee camps.[6]

Among family and kin, an important aspect of resource allocation is embodied in a range of expectations and obligations involving shelter, gifts, loans and employment. Often these linkages reflect and reproduce the structures of domination of households and society in general. Between classes and groups, transactions include patron–client relations, taboos, untouchability, gender division of labour outside the home, sharecropper–landlord relations, and rules about property and theft, amongst many others.[7]

Many of these transactions, we shall see, form an important basis for mutual help or individual survival in times of crisis, and therefore can be looked upon as additional elements in an individual's or household's access profile. However, the rules governing these transactions change (often very quickly) in the face of social upheaval such as war, famine or pandemic. Usually, this means a reduction in obligations and therefore in 'income opportunities' for the receivers of goods and services, and an increase in disposable income for those who forgo these obligations. In a few circumstances, new opportunities can open up. For example, upon occasions of extreme famishment, theft may be sanctioned, grain stores may be broken into and obligatory redistribution mechanisms from rich to poor set in motion.

Markets are another set of social transactions that allocate resources on the basis of price. Their behaviour is crucial in the relative worth of people's resources, and in governing their household budgets. There is a good deal of research into the behaviour of markets, particularly preceding and during famines. The prices of essential goods and services often rise after sudden disasters when the immediately available food, shelter, clothing and medical

supplies are destroyed and transport to bring in replacement supplies is disrupted. The behaviour of traders in essential commodities is crucial, as Chapter 4 will show. These rapid changes in the rules of resource allocation brings us to the issue of the time dimension in disasters.[8]

Access to common property resources (CPRs) is also of great importance to household livelihood and vulnerability. At various times, in various broader social and economic settings, a wide range of physical resources may have been excluded from private or state ownership and now exist as common pool resources. These resources might include trees, pasture, ground or surface water, wildlife, marine resources, famine foods and arable land, depending on the region and its history. In some places a proportion of these may be set aside for common management and use by a group larger than the household. Rules governing access to CPRs are highly localised and complex (Jodha 1991) and will be observed in many situations described in Part II of this book. Less is known about the rules governing the use of the urban equivalent of rural CPRs; however, it is clear that scavengers, recyclers and the poor who actually live at or near urban solid waste facilities in many countries follow complex rules of access.

Research on famine has led to the development of other concepts related to the idea of access. Most notable is Sen (1981), whose concept of 'entitlements' in relation to food and hunger has an affinity with the notion of access. This involves the set of resources or livelihood opportunities that may be used to produce food or procure it through various forms of exchange. His formulation is similar to the concept of access in many ways, though it is more specific; his ideas are discussed more fully in Chapter 4.

Transitions from 'normal life' to disaster

The outline structure of the Access model, and the details of 'normal life', are summarised in Figure 3.3 using a sample of households pursuing their livelihoods in conditions of unequal safety and livelihood opportunities. It remains to fill out the detail of the model in order to trace the transition of 'normal life' to disaster. Figure 3.3 repeats the structure of the model in Figure 3.1, but specifies the processes and events *in more detail* which appear only in summary form in Figures 3.1 and 3.2.

Time–space positioning of hazards

Turning attention to the hazard itself, Figure 3.3 depicts some key characteristics of the hazard, or multiple hazards, that threaten a particular area. A hazard has a time–space geography, involving the probabilities of events of significant magnitude to cause potential damage of differing magnitudes over geographical space. In Box 4a, a tide table shows the dates, timings and height above data for high tides and Spring tides, the probabilities of

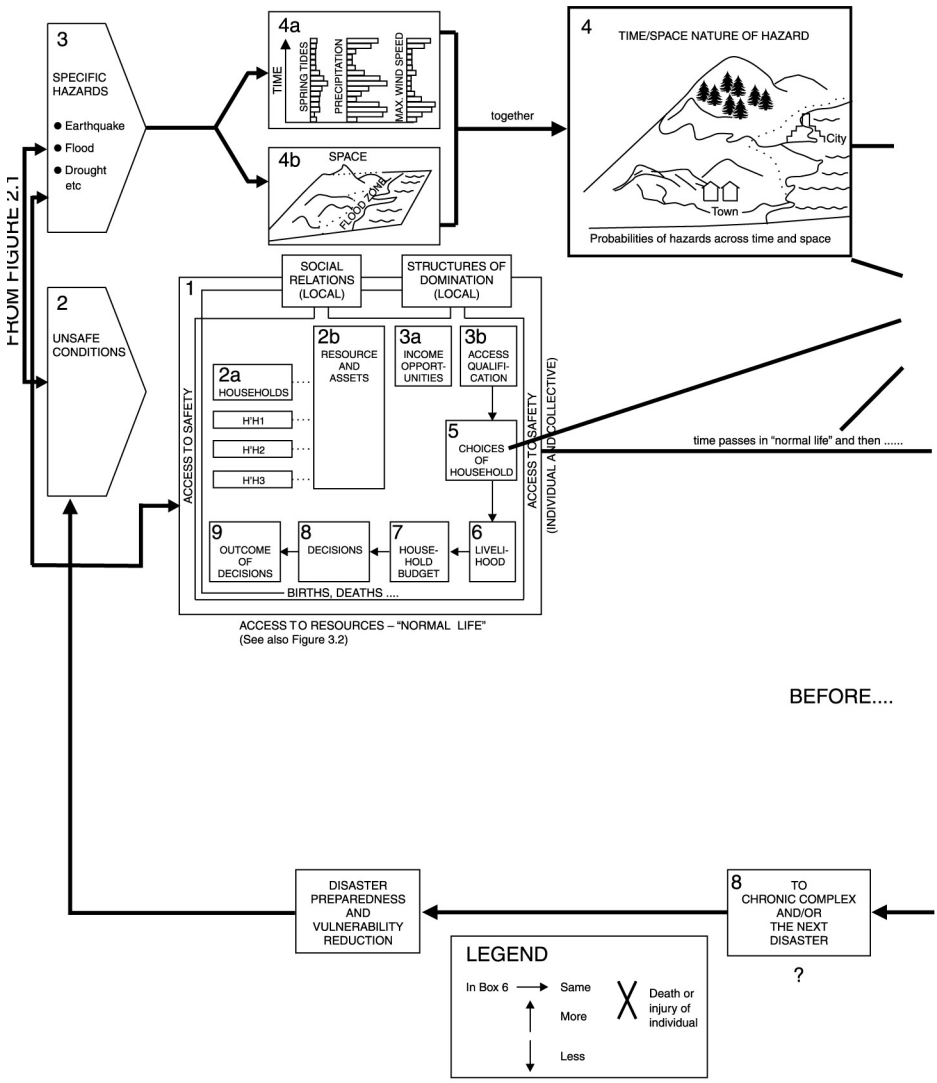

Figure 3.3 The Access model in the transition to disaster

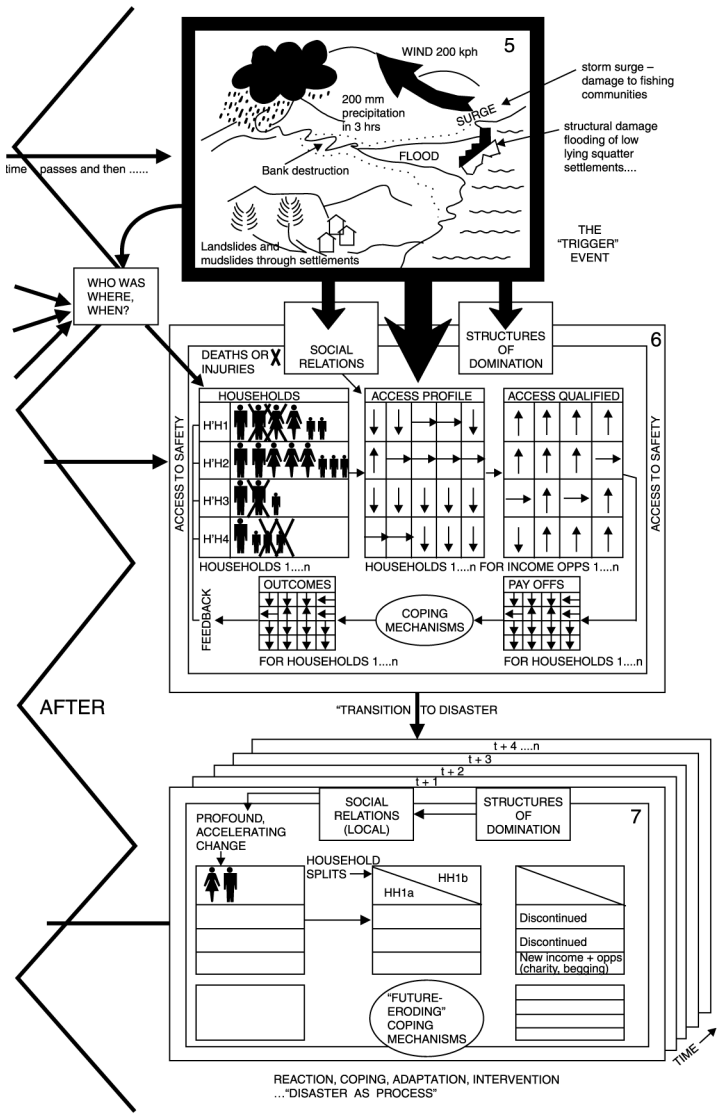

Figure 3.3 continued

tropical cyclones and associated rainfall intensities. Each of these hazards also incorporates a spatial dimension. In the hypothetical case of a tropical cyclone (see real cases discussed in Chapter 7), a number of linked threats are implied:

- fresh-water flooding from inundation of low-lying areas;
- fresh-water flooding following the breaking of river banks;
- sea surges and damage to coastal settlements, fishing boats and equipment;
- mudslides and landslides following exceptionally heavy rainfall;
- high winds causing structural damage to buildings and property, and injury to humans and livestock;
- salinisation of fresh-water supplies for humans and livestock.

These are shown in simplified pictorial form, and constitute part of the basis of conventional hazard assessment.

Below the details of the hazard threat in Figure 3.3, 'normal life' and in-built vulnerabilities continue (already described and shown in Box 1). As Figure 3.3 suggests ('time passes and then…' between Boxes 4 and 5), a hazard event occurs (dramatised in pictorial form in Box 5) and the various potential threats outlined in the list above materialise. The immediate impact can be explained largely by asking the question 'Who was where, when?' At the moment of impact of the event, people were to be found in co-ordinates of time–space as might be expected from their pursuit of 'normal life'. If the event occurred suddenly at night, most people would have been in bed and would have been slower to take avoidance action than during daylight hours. If the storm occurred during a season when fish stocks are to be found offshore, rather than inshore, then fishers will have been exposed to even more serious threat, as it would have been harder to find shelter inshore before the worst of the storm. If wood cutters and charcoal burners choose an income opportunity that takes them to mangrove swamps during a season when there is a high probability of coastal storms, then they occupy, as part of their livelihood strategy, a particular time–space co-ordinate that carries a higher risk.

A similar urban situation was seen on a night in 2000 when heavy rain brought a mountain of solid waste sliding down on the houses of rag pickers and scavengers who lived at the Payatas landfill on the north-east edge of Manila. Their livelihoods had a specific space–time structure that put these people in harm's way (see Chapter 6).

Time and disasters

Leaving aside the time–space element and focusing on the time dimension alone, time is 'of the essence' in an understanding of disasters. So far, time

has only been treated in the sense that the framework of 'normal life' permits the succession of events in a process to be analysed, allowing for people's decision-making actions (such as the timing of activities like planting crops, selling assets, migrating, and so on). The importance of time in understanding disasters lies in the frequency of the event, when the disaster occurs (time of day, season) and in the stages of the impact of the disaster after the hazard has occurred.

It may be said that disasters do not happen, they unfold. Our characterisation here chooses a hazard event that has a rapid onset (as do others, for example, *tsunami*, bush or forest fire, earthquake or some floods, and that accurately could be labelled a 'trigger'). However, in the case of 'slow-maturing' or slow-onset disasters such as famine, the even slower HIV-AIDS pandemic or climate change, processes which can unfold over a period as much as 30–80 years or more, this dramatic, time-dependent characterisation is less inappropriate. However, even in sudden-onset cases, the pre-conditions for disasters ('root causes' and 'dynamic pressures' in terms of our PAR model) may have been forming over a long period. Indeed, Oliver-Smith (1994) treats the Peruvian earthquake of 1970 as having 'root causes' that reach back 500 years to the Spanish conquest of the Inca Empire and the ensuing decay of Inca methods of coping with environmental risk. Our treatment of the 1985 earthquake in Mexico City in Chapter 8 follows a similar historical, time-based narrative.

It is therefore important to give a 'temporal frame' to our Access model and transition to disaster, so that the impact of its timing can be understood. The timing (and spatial expression) of hazards has therefore to be superimposed upon the 'temporal frame' of people earning their livelihoods and living out their daily lives. Thus, as we have said, for the shortest time frame, the time of day or night of the onset of a sudden hazard can be important. Ninety per cent of all people killed in earthquakes while occupying buildings die at night. The day of the week (particularly market days, rest, festival or holy days) is also relevant in terms of possible concentrations of people in space and time.

Seasonality is one of the most important rural time factors. Chambers (1983; Chambers et al. 1981) has highlighted the impact of seasonality on health, nutrition and people's capacity for hard work in the 'normal' annual cycle. The coincidence of a sudden hazard with the 'hungry' season (usually the wet season before crops have matured and are ready for consumption) when labour demands are highest, food reserves lowest and some major diseases most prevalent can produce a much more severe disaster impact. The build-up of famines may have a seasonal element, in that crop failures (or a number of successive failures) are sometimes involved. Food prices as well as wage rates for agricultural work have important seasonal dimensions that other factors can exacerbate and combine to precipitate famine (see Chapter 4).

The stages of the impact of a disaster after the hazard strikes are fundamental. The various elements in the vulnerability framework (class relations; household access profiles; income opportunities; household budget; and structures of domination and resource allocation) each iterate at a different speed. Table 3.1 summarises typical time periods of change and gives some examples.

There is a fundamental difference in time between sudden disasters and slow-developing disasters such as famine or pandemics (in which the most acute distress may extend over a period of months and years). In terms of their mortality and damage to homes and livelihoods, the onset of some

Table 3.1 Time periods for components of the Access model

Component of the access framework	*Typical time period of change after disaster*	*Examples*
Class relations	Months or years	Nicaragua (1972)
		Portugal (1755)
Change in political regime		Ethiopia (1974)
Household access profile	Sudden, immediate impact	Loss of life and house
	Weeks	Sale of livestock, jewellery
	Weeks or months	Other assets sold
Income opportunities	Sudden if urban employment is disrupted	Rural employment collapses due to drought, flood
	Usually over months	Taboo foods accepted
Household budget	Immediate impact in sudden-onset hazards	Cuts in consumption; reallocation by age, gende
	Months	Food price rises and famine
Structures of domination	Immediate impact in sudden disasters	Sharecroppers refuse to give up landlords' share
	Months or years, with episodic food shortages and high prices	Famine

sudden disasters can be measured in seconds or minutes in terms of earthquakes, in hours or a few days for floods. Affected populations may rearrange their accepted pattern of responsibilities and rights and combine into completely unfamiliar groupings, when strangers, refugees, those temporarily taking shelter, the traumatised and longer-term displaced turn up in a new social environment after a trigger hazard event. On the other hand, slow-onset disasters require careful analysis of social adaptation, the emergence of new rules of inclusion and exclusion regarding networks of support and changing access qualifications for new and existing income opportunities.

Post-event transition to disaster

Returning to the time- and space-bound narrative of a disaster outlined in Figure 3.3, the hazard event has other quick acting and profound impacts on the practice of 'normal life'. Box 6 is labelled 'transition to disaster' and identifies the trajectory to 'abnormal' life. The households in this diagram are represented by individual men, women and children, and some are shown to have suffered injury, become disabled or died (crossed out, in pictorial terms). Household access profiles are suddenly and profoundly altered. Paid employment may cease, and with it access to cash with which to purchase food, medical care, repair shelters or productive equipment such as ploughs, acquire livestock for ploughing and fishing equipment. Land may be inundated; brick factories remain under water; regular customers for haircuts, sweets and petty services in cities and small towns have their minds on other matters and have few funds available to spend on non-essential services. The access qualifications for many income opportunities are raised, sometimes to infinity – they simply are not viable choices any more. Thus the income opportunities chosen by different households in the period immediately after the event are usually drastically reduced for most (although for a few, such as merchants and the wholesalers of essential supplies, they are increased greatly).

The outcomes of these straitened circumstances, for the majority, are not (yet) disastrous. However, they feed back in an iterative manner to subsequent decisions and the asset profiles and access qualifications on which they are based (shown by the circular arrows, labelled 'feedback' in Box 6). There are still a wide range of adaptive strategies, both individual and community-based, coping mechanisms and outside interventions that can avert or palliate the transition to disaster for some or most people.

There are other important aspects of post-event crisis which are not reached by the Access model and which must be mentioned here. Crisis ill-being is increasingly being recognised as a common experience in the wake of disasters, and a concept of vulnerability must incorporate notions of ill-being. Definitions of vulnerability usually include a potential for ill-being

(often expressed as an objectively assessed statistical probability, as in this model) multiplied by the magnitude of the combined impacts of a particular trigger event. Thus, the conversion of risk into ill-being is turned into a common metric, which enables different hazards to be compared (Rosa 1998), but brushes out the cultural, psychosomatic and subjective constructions of disaster impact, and little work has yet been done on how these experiences map into post-crisis situations of chronic ill-being.

The disaster event itself alters capabilities and preferences both in the short term (e.g. grieving, trauma, acute deprivation) and also in the longer term, since the aftermath of a disaster sees a reappraisal of previous individual and collective commitments, the strength and nature of trust, and the intensity and diversity of social networks including rules of membership. Thus extreme events are frequently written into the history of social relations and well-being. It is important to complement the economistic and quantitative aspects of our Access model with an understanding of the ways in which the disaster event was experienced by different people, and how it altered their sense of well-being and their strategies to reconstitute that well-being in a new, post-disaster world.

Access, transition and safety

As the discussion in Chapters 1 and 2 demonstrated, vulnerability is a measure of a person's or group's exposure to the effects of a natural hazard, including the degree to which they can recover from the impact of that event. Thus, it is only possible to develop a quantitative measure of vulnerability in terms of a probability that a hazard of particular intensity, frequency and duration will occur. These variable characteristics of the hazard will affect the degree of loss within a household or group, in relation to their level of vulnerability to various specific hazards of differing intensities.

Thus, vulnerability is a hypothetical and predictive term, which can only be 'proved' by observing the impact of the event when, and if, it occurs. By constructing the household Access model for the people affected we can understand the causes and symptoms of vulnerability. This requires analysing the political-economic structures that produce the households' access profile, income opportunities and payoffs (these structures are labelled 'social relations' and 'structures of domination' in the framework). This implies that the question 'Vulnerable to what?' is answerable only in the context of an actual and specific hazard. This raises an important point. Different people will be vulnerable in differing degrees to different hazards, although there may well be households which, if they are vulnerable to one type of hazard, are likely to be vulnerable to others too. Typically, such people will have a poor access profile with little choice and flexibility in times of post-disaster stress.

None the less, in the following chapters, it is necessary to specify *to what hazards* people are vulnerable. Figure 3.3 identified a tropical storm, but the content of a disaster narrative as it unfolds will differ in many important ways even in the same location and with the same political economy with each different hazard. In other words, the conventional aspects of natural hazards (and the ways in which they are treated and monitored) are still essential, particularly the time–space and other technical issues of the hazard in question. In the case of earthquakes, for example, the indicators of vulnerability ('unsafe conditions') will concern housing materials, building standards, skills regarding aspects of building safety, income level, available spare time and the ability to keep habitations in good repair, type of tenure (owner-occupier or rented accommodation in urban areas), location of dwelling relative to zones of seismic activity, ground stability and degree of support networks which could be mobilised after the event (see Chapter 8). Alternatively, in the case of drought, the set of indicators of vulnerability will be quite different, and will concern food entitlement profiles, physical access to markets and market behaviour, and the prospects of earning enough money to buy food or the possibility of exchanging other goods for food. The time–space patterns of households in their 'normal life' will be as important as in the earthquake case, but will be related to the spatial structure of markets and to crop or pastoral production.

Much of the discussion so far has focused on the vulnerability of households earning a living under normal and transitional conditions, and some passing mention has been made of access to safety (or 'social protection' in Figure 3.1) depicted in Figure 3.3 as the protective barrier surrounding individual households' daily lives (Boxes 1 and 6). This barrier – when it is properly in place – may be considered as access to safe conditions that apply to all households collectively.

Many of the conditions of vulnerability are shaped by individual households. Their decisions about income opportunities (or ignorance of risk) may place them in dangerous time–space co-ordinates, facilitating further choice, building reserves, etc., as we have described. These may be considered as individually generated access to safety (self-protection), or as its reciprocal, individually generated vulnerability. However, there are other elements of collectively generated access to safety, and these link the individual household to its surrounding social relations, structures of domination and so on to the generation of unsafe conditions from the PAR framework, which refer to the provision of resources from the community or the state. Some of the large-scale, more generalised state provisions have been discussed in the progression of vulnerability of the PAR model (usually, a lack of appropriate training, relevant skills, press freedom, good governance), leading to unsafe conditions (unprotected buildings and infrastructure, suppression of information which could lead to relief measures). However, the focus on the specific and the micro-level in the Access model requires that access to safety is treated in a more detailed and dynamic way in the 'transition to disaster'.

A large part of this access to safety can be understood in terms of self-generated access, known as coping mechanisms, which are discussed below. Others, which are usually provided by outside institutions, are discussed in a subsequent section.

Coping and access to safety

The Access model provides a dynamic framework of socio-economic change, in which people of different identities (gender, age, seniority, class, caste, ethnic group) avail themselves of the means of securing their livelihoods and maintaining their expectations in life. The model implicitly, rather than explicitly, allows for people to develop strategies to try to achieve these ends. In this sense, the economic and social means to secure their livelihoods are not 'handed down' to them in an economistic and deterministic manner. People must not be assumed to be passive recipients of a profile of opportunities, hedged about by constraints of the political economy of which they are a part.

On the contrary, the pattern of access in any society is subject to (and the result of) agency, decision making under externally created constraints, struggles over resources and also co-operation. The pattern of access is the outcome of those decisions, co-operation and struggles by people of different gender, age, class, and so on. They are a part of daily life and are pursued with ingenuity and resourcefulness. In adverse or disastrous times people are stimulated by circumstances of threat, desperation and loss. As Rahmato (1988) put it, the measures which rural Ethiopian people have taken to enable them to live through the privations of the past two decades indicate ingenuity, strength of character, an effective use of natural resources and communalism.

It has been said that official perceptions of 'disaster victims' usually underestimate their resources and resourcefulness (Chapter 9). Perhaps one of the reasons for this is that indicators of vulnerability based on the measurement of resources are the more easily recognised by outside institutions. They are also more enduring and part of the observable socio-economic structure, while people's struggles and strategies to cope with adverse circumstances, particularly acute ones, are more ephemeral and change quickly (Corbett 1988). Therefore, they remain unnoticed and understudied. It is the purpose of this section to focus on these strategies. Without a proper understanding of them, policy makers are more likely to make stereotyped responses in both preventive measures of vulnerability reduction and relief work. Further, misdirected relief efforts may undermine rather than assist affected people in their attempts to help themselves towards recovery.

Coping defined

Coping is the manner in which people act within the limits of existing resources and range of expectations to achieve various ends. In general this involves no more than 'managing resources', but usually it means how it is done in unusual, abnormal and adverse situations. Thus coping can include defence mechanisms, active ways of solving problems and methods for handling stress (Murphy and Moriarty 1976). 'Resources' in this book have been defined as the physical and social means of gaining a livelihood and access to safety. Resources include labour power, or as Chambers (1989: 4) aptly puts it, able-bodiedness, or the ability to use labour power effectively. The more that poor people rely on physical work, the higher the potential costs of physical disability and ill health (see Chapter 5).

Resources also include land, tools, seed for crops, livestock, draught animals, cash, jewellery, other items of value which can be sold, storable food stocks as well as skills. In order for tangible resources to be mobilised, people must be entitled to command them, and this may be achieved in many ways. These include using the market, the exercise of rights, calling upon obligations (from other household members, kin, patrons, friends, from the general public by appeals to moral duty, as in alms-giving), through theft or even violence.

In many cases specialised knowledge is required for certain resources, for instance in finding wild foods or using timber for rebuilding, knowing the moisture capacity of certain soils, the likelihood of finding wage labour in a distant city or plantation, or finding water sources. This knowledge is similar to that which supports 'normal' rural or urban life, and is passed from generation to generation. However the 'ethnoscience' essential for some coping behaviour can disappear with disuse or be rendered useless by rapid change (O'Keefe and Wisner 1975).[9] We return to this point below.

Often it is assumed that the objective of coping strategies is survival in the face of adverse events. While this is indeed common, it masks other important purposes. These may be examined using Maslow's (1970) hierarchy of human needs. Such a hierarchy involves identifying distinct levels of needs, with each level incorporating and depending on the satisfaction of needs below them in the hierarchy. The need for self-realisation, involving the giving and receiving of love, affection and respect might be said to be the highest in the hierarchy. A lower one, on which the former is founded, may be an acceptable standard of living. Lower ones still may include adequate shelter and food for healthy survival, whilst other needs near the bottom of the hierarchy will include minimum security from violence and starvation. Reviewing 20 years of work since Maslow, Doyal and Gough (1991) conclude that a 'core' of basic human needs can be identified, and that failure to satisfy these means that other needs cannot be met (see also Wisner 1988a).

In adverse circumstances, a retreat to the defence of needs that are lower in the hierarchy implies the temporary denial of those needs higher up. For example, the experience of extreme poverty can cause a loss of self-respect and self-regard (de Waal 1989a). However, it is important not to oversimplify and over-generalise the expectations and priorities in the lives of vulnerable people or those affected by a disaster. Oliver-Smith (1986b) has described very complex motives and ideals among survivors of a dire earthquake tragedy. Scott (1990: 7) reminds us of that 'slights to human dignity' can fester and emerge in surprising demonstrations of 'resistance' against authority. This is certainly relevant for disaster relief and recovery (Chapter 9). Jodha (1991) surveyed people's own criteria for well-being (in this case a list of no fewer than 38) in Gujarat, which attest to a complex set of priorities. Raphael (1986) analysed the psychological trauma of disasters and the adjustments made to loss, grief and the impacts of dislocation (see above for our brief discussion of ill-being and non-measurable aspects of the impact of disasters). Coping in the face of adverse circumstances may, therefore, be seen as a series of adaptive strategies to preserve needs as high up the hierarchy as possible in the face of threat.

However it is common that what may be broadly termed 'disasters' force a retreat down the hierarchy. For example, it may become necessary to engage in demeaning activities (and therefore to lose respect) in order to secure a minimum food supply. Certain activities may be proscribed or discouraged by membership of a social group, caste or by gender. During the drought of 1971–1973, members of the Reddy caste in Medak District, India were reduced to selling vegetables to earn a living, an occupation that was considered below their dignity (Rao 1974); while women not of the shoemaker caste were found making shoes during the 1966–1967 Bihar drought (Singh 1975, quoted in Agarwal 1990). Despite the mutual economic and emotional support that it provides, families may break up to allow its individual members to survive. The survival of the individual in the short term may be the only attainable need and objective of coping.

Famine may be unique or at least extreme among disasters in often provoking social tension and breakdown of this kind. For many years, Quarantelli and his sociology colleagues have studied community responses to disasters such as earthquakes and floods. They find that emergent organisation is much more common than social chaos, and that altruism and stoicism are more common than selfishness and panic (Quarantelli and Dynes 1972, 1977; Quarantelli 1978, 1984; Dynes et al. 1987).

Types of coping strategies

Crisis events occur from time to time in people's lives, as well as in the lives of whole communities and societies, in which case they are often called

disasters. Such events call for the mobilisation of resources at various levels to cope with their impact. When people know an event may occur in the future because it has happened in the past, they often set up ways of coping with it (Douglas 1985). We return to these coping strategies as a reference point for building the policies we recommend in Chapter 9, especially in our discussion of the Fifth and Sixth Risk Reduction Objectives.

Such coping strategies depend on the assumption that the event itself will follow a familiar pattern, and that people's earlier actions will be a reasonable guide for similar events. Most disasters have such precedents, particularly in hazardous physical and social environments. However, some hazards have such a long return period that the precedents are imperfectly registered. There are also others which are unprecedented, such as the HIV-AIDS pandemic, and which therefore have no familiar pattern. If this is the case then coping strategies may not apply, and the decision framework (consisting of the social, economic and natural environments) will not be relevant.

The assumptions on which people make their decisions therefore rest on the knowledge that, sooner or later, a particular risk will occur of which people have some experience of how to cope. On the other hand, people do not like conditions of uncertainty where there are no known and familiar ways (such as explicit systems of rights and obligations, providing safety nets and support groups) of coping with a particular event. Thus the unprecedented or unknown event creates a situation of uncertainty. The HIV-AIDS pandemic in certain areas of Africa, or calamities of exceptional severity (for example, what is known in Bengali as *mananthor*, or 'epoch-ending' famines), are cases in point.

Almost all coping strategies for adverse events which *are* perceived to have precedents consist of actions before, during and after the event. Each type of coping strategy is discussed and illustrated below.

Preventive strategies

These are attempts to avoid the disaster happening at all, which are called preventive action elsewhere in this book. Many require successful political mobilisation at the level of the state. This is often easier in the immediate aftermath of a disaster, when public awareness is high and the political payoff for government action is significant. But preventive action at the individual and small group level is also important. It may involve avoiding dangerous time–spaces (such as fishing offshore in small open craft during the storm season), avoiding concentrations of disease vectors (e.g. malaria mosquito, tsetse fly) that have variability by season and/or altitude and choosing residence locations that are less exposed to wind, flood or mass movement of the earth.

Impact-minimising strategies

These are referred to elsewhere as 'mitigation', especially where they are the object of government policy. These strategies seek to minimise loss and facilitate recovery. The range of these strategies is enormous and varies significantly between people with different patterns of access. However, two generalisations may be made. Firstly, the objective of many strategies is to secure needs quite low down the hierarchy, particularly if the risk is perceived to be damaging and probable. It may be preferable to improve access to a minimum level of food, shelter and physical security rather than increase income. This further underscores the important distinction between poverty and vulnerability made earlier.

Secondly, maintaining command of these needs in a socially and/or environmentally risky situation usually implies diversification of access to resources. Under the terms of the Access model, this involves broadening the access profile and seeking new income opportunities. This can be attempted in agricultural and pastoral production by setting up non-agricultural income sources and by strengthening or multiplying social support networks.

Building up stores of food and saleable assets

For those rural people who have access to land, a store of grain or other staple food is a most important buffer against expected seasonal shortages, as well as more prolonged periods of hardship. An accumulation of small stock and chickens is another defensive strategy (Watts 1983a). Pastoralists may follow a strategy of increasing their herd size in years of good rains and grass availability (when calf birth rates rise and mortality falls), in order to maintain the herd size in the inevitable bad years with high mortality (Dahl and Hjort 1976; Thébaud 1988; Odegi-Awuondo 1990).

Diversifying production

Farming people are often regarded as being risk-averse (in the sense of avoiding chances in cultivation that may bring higher rewards but with greater exposure to dangers).[10] Usually their production involves mixed cropping, intercropping, the cultivation of non-staple root crops and use of kitchen gardens. This strategy often results in a 'normal surplus' in good years since it is planned on the basis of meeting subsistence needs even in bad (but not the worst conceivable) years (Allan 1965; Wisner 1978b; Porter 1979).

Planting a greater variety of crops has many advantages apart from providing the best chance of an optimum yield under all variations of weather, plant diseases and pest attack. It represents one of the most impor-

tant precautionary strategies for coping with food shortages (Klee 1980; Altieri 1987; Wilken 1988). Diversification strategies often make use of environmental variations, including farming at different altitudes, on different soils or utilising diverse ecosystems on the slopes of mountains.

Diversifying income sources

The entirely self-provisioning rural household is an ideal type, and is very rare in the world today. Even the most isolated people in the Amazon rainforest, the Andes or the Himalayas engage in production for sale. In addition, the remittance of income from wage earners who have moved to distant cities, mining camps or plantations is very important to rural livelihoods in many parts of the world. This is sometimes graphically demonstrated by the economic disruption and hardship caused when crises interrupt such systems, as with the hundreds of thousands of guest workers from Egypt, Bangladesh, Nepal and the Philippines who were obliged to leave Iraq in 1991 as a result of war.

Non-farm income becomes even more important following disasters that temporarily disrupt farm and livestock production. Crafts, extractive enterprises such as charcoal making, honey and gum arabic collection have often been noted in studies of drought coping in Africa. Brewing beer is also an important source of income, especially for women, and drought reduction of the grain ingredients can affect their income and nutrition (Kerner and Cook 1991; Murray 1981; Mbithi and Wisner 1973). For urban dwellers a series of 'sidelines', sometimes illegal or quasi-legal (such as hawking on the streets without a licence, waste recycling, pilfering, looting ruined and abandoned shops and buildings), may become a temporary mainstay of post-disaster life. Both production and income diversification strategies can be effective as coping mechanisms in the short run, while they undermine the basis of livelihood in the long run. Cannon (1991) discusses de-vegetation of the landscape in order to provide fodder for livestock in a drought. Charcoal production as an income source is another example. Both can lead to long-term erosion and desertification (A. Grainger 1990; O'Brien and Gruenbaum 1991).

Development of social support networks

These include a wide variety of rights and obligations between members of the same household (e.g. wives and husbands, children and parents), with the extended family and with other wider groups with a shared identity such as clan, tribe and caste. Parents may try to make a strategic choice of marriage partner for their daughter or son into a comparatively wealthy family. This may increase their ability to call on resources in difficult times (Caldwell et al. 1986).

Within the household and family, successfully securing resources in potentially disastrous times depends upon the implicit bargaining strength of its members and of their 'fall-back' position (Agarwal 1990: 343), or 'break-down' position as Sen (1988, 1990) terms it, if co-operation in this bargaining process should fail. Women tend to lose these conflicts for scarce resources and are affected by who eats first, the share of available food and the lack of access to cash earned by other family members (e.g. cash from casual male labour). The range of resources controlled by women, and the employment opportunities open to them, tends to be more limited.[11] The disintegration of the family and abandonment of women, children and old people is the expression of the breakdown of such obligations.[12]

There are other forms of support based mainly on non-economic relations. Some writers term these the 'moral economy' (Scott 1976); examples are between patrons and clients, or between rich and poor in times of hardship. These offer a minimum subsistence and a margin of security and constitute what Scott calls 'a subsistence ethic', based on the norm of reciprocity – but at a price of the reproduction and even the deepening of inequality. Examples are legion, but it is widely reported that such obligations are being eroded.[13]

On the other hand, Caldwell et al. (1986: 667) state that, at least for the elderly in a period of extreme food scarcity in south India, 'the support system still worked well'. But it can also be argued that the continued existence of such support systems is responsible for the retention of people in the countryside and for discouraging them from abandoning such local systems. In other cases these obligations of the wealthy are still upheld. For example, a case study in Nepal found that the wealthy were prevailed on not to reduce daily wages for agricultural work, nor to sell grain outside the village at a profit, and to secure a loan from shopkeepers in the nearby bazaar for re-lending to the most needy villagers (Prindle 1979). In another village that is tribal (the village in the previous example being multi-caste), there was an expectation of gifts in times of hardship combined with a powerful ethic of equality, with surpluses being shared. Although reported to be in a state of subtle change, this system was still largely operational.

There are also wider obligations for the whole community to assist and provide for those facing acute adversity. These include alms, for example the giving of a grain tithe in some Muslim societies (Longhurst 1986: 30). *Meskel* is a form of community redistribution in parts of Ethiopia, where credit is given to the needy to celebrate the festival of this name, thereby enabling them to acquire food. Neighbourly assistance, such as rescuing trapped individuals from collapsed buildings and rendering medical assistance, are other examples. These are 'claims' as Swift (1989) calls them, alongside the other two broad categories of assets ('investments', both human and productive, and 'stores' of food, money and 'stores of real value' such as jewellery).

It is probable that throughout the LDCs such networks and moral obligations are in decline. In some areas more exploitative systems are superseding the 'moral economy' of the peasant, where a low-level safety net against starvation and complete destitution operated in some form, albeit a highly exploitative one. Instead, even these safety networks tend to break down. This may involve the provision of food on credit at usurious rates of interest, which exacerbate the 'ratchet effect' and increase the vulnerability of deprived groups in the longer term (Chambers 1983). Unfortunately, given the demise of traditional systems, there is rarely any growth of state-run social security alternatives.

Post-event coping strategies

When there is a potential food shortage and possible famine, the period during which stress develops can be long, allowing for a succession of strategies. A number of studies have found similar sequences.[14] It is clear that a sequence of adaptations in consumption patterns is made very early when shortfalls in food are anticipated. These include the substitution of lower quality and wild foods (or 'famine foods') for more expensive staples. Here the significance of common property resources for allowing access to these is important.[15] Wild foods also feature as famine foods in almost all parts of Africa (de Waal 1989b; McGlothlen et al.1986).

The next step involves calling on resources from others (usually family and kin) that can be obtained without threatening future security. This usually involves reciprocal social interactions, and avoids usurious rates of interest, therefore preserving the longer-term access position of the individual or household. At the same stage, sources of household income other than the dominant one may be tapped, such as wage labour, petty commodity production or artisanal work. Sale of easily disposable items that do not undermine future productive capacity (e.g. small stock) may also take place. As the food crisis deepens, loans from money lenders and sale of important assets such as oxen for ploughing, agricultural implements and livestock may have to be arranged. Finally, when all the preceding strategies have failed to maintain minimum food levels, migration of the whole household to roadsides, towns and possible sources of food often ensues.

Coping and vulnerability analysis

Coping strategies are often complex and involve a number of sequenced mechanisms for obtaining resources in times of adversity and disaster. They grow out of a recognition of the risk of an event occurring and of established patterns of response. They seek not just survival, but also the maintenance of other human needs such as the receiving of respect, dignity and the maintenance of family, household and community cohesion.

Outsiders are often surprised by strategies that do not seem to try to maintain an adequate food intake for a household (or perhaps different amounts for various members), but which instead are aimed at preserving the means for continuing the household's livelihood after the difficult period has passed.[16] Many of these strategies have been highly resilient to social and economic changes and are reported to be functioning still throughout the world.

Throughout this book we try to signal the ways in which the 'people's science' or indigenous technical knowledge that provides the basis for much coping behaviour, and patterns of coping themselves, interact with 'official' attempts at disaster prevention and mitigation. Sometimes a sensitive administration or a non-governmental organisation has been able to build on such foundations. Many examples are provided by Maskrey (1989) and Anderson and Woodrow (1998) and others, and we will return to these in Chapter 9.[17] More often than not, however, 'official' relief and recovery practice pays little heed to what the ordinary people do. The result is wasted resources, squandered opportunities and a further erosion of vernacular coping skills.

Coping and transition to disaster

Coping strategies have been discussed at length in this chapter, and will receive more detailed attention in later chapters. Considerable importance is attached to coping since it points clearly to people's agency, ingenuity and abilities to help themselves individually and collectively. It suggests that outside agencies must understand these strategies, otherwise external humanitarian interventions will undermine them, creating aid dependency and all manner of unintended and detrimental outcomes. However, the term 'coping' is not without problems, and can serve to hide a situation in which people are destitute or even dying. As Seaman et al. (1993: 27) wrote, 'in current development jargon, Africans do not starve, they "cope" '. Coping in disaster transition and abnormal times also implies a graduated rack of dearth, difficulty, destitution and maybe, ultimately, death. To return to the final stages of our Access model as illustrated in Figure 3.3, coping is managing under stress, but coping is in essence a strategy reactive to events beyond the immediate control of the individual, household or 'community'. As circumstances deteriorate, these may prove insufficient. As will be seen in the case study of famine in the next chapter, informal support systems among the Dinka communities of south-western Sudan were well developed but they fell apart under extreme pressure. They could not resist the cumulative onslaught over a long period of war, drought, enslavement and displacement. Thus communal coping strategies broke down – and the event became known locally as the 'famine of breaking relationships' (*cok dakrua*) (Deng 1999).

Thereafter, unless outside assistance and disaster preparedness have not already averted the transition, the transition continues in an iterative and descending manner (Box 7, 'reaction, coping, adaptation, intervention … disaster as process'). The Access model continues to operate but under such dislocating conditions that many of the recognisable patterns of decision making, with associated rules of choice, allocation of work and rewards, break down completely. The mechanistic and predictable process of earning a livelihood, and also the structural conditions of normal life as shaping the initial conditions of vulnerability, become less operational, and less valuable as a way of understanding 'disaster as process'. As Niehof (2001) has noted, there is an important paradigm gap between the analysis of rural development in stable situations and those of disaster situations. The transition from 'normal life' to disaster here in the Access model demonstrates both this discontinuity as a disaster unfolds, but also a bridge between them. The Access model demonstrates well that conditions of vulnerability start with and are explained by the political economy of 'normal life' – that coping and access to safety also develop out of normal life. Niehof explicitly suggests that disasters linger and shape future 'normal life' for a more or less vulnerable future. The iteration of disaster as process to Box 8, the final one shown in Figure 3.3, asks the question 'To the next disaster?', a topic which is examined in Chapter 9.

The Access model as a research framework

The formal access framework has so far been presented as an explanatory and organisational device. It is not a theory, although theories of disaster can and should be inserted into, and therefore be allowed to shape, the general framework, as happens in subsequent chapters. For example, in Chapter 4 competing theories of famine are seen to deal with different parts of the framework.[18] It draws attention to the socio-economic relations that cause disasters or maps their outcomes. While it focuses on those at risk of disasters, it also includes the relations they have with others that keep them in that unfortunate state, independently from any disaster. It also allows for people's response to what is often a rapidly changing situation, either by coping or by more active and permanent efforts to change those relations.

The access framework therefore does not explicitly include national policies or world systems in the way that the PAR model does, although the impact of national and international actions can and should be incorporated in the model. Land reform, food policy, famine relief, food-for-work programmes, rural reconstruction programmes and laws governing urban property are all initiated exogenously to the Access model but their impacts in shaping access profiles, access qualifications, payoffs and a range of income opportunities should be incorporated into the modelling of the disaster process.

As a research framework, therefore, access is useful in charting impacts of policy, for identifying vulnerable populations and for predicting the probable outcomes of extreme natural events. However, the data requirements for using the framework as a research design are very large. After all, it provides a general outline of the material conditions of life for a population, and most aspects of society can potentially be included. Yet we believe that in use the number of factors to be incorporated would be restricted, because, in use, the framework would be informed by theory and *a priori* assumptions. This would lead to the ability to choose the most significant factors and permit selectivity in the use of the framework. The framework provides a dynamic and moving 'map' of a disaster. Readers will choose which aspect they need to visit, and will bring to it the theories they need.

Some of the main criteria for making the choices for readers of different structural and functional positions can be suggested. Firstly, the researcher's emphasis on certain theories and priorities will determine what has to be modelled in detail. For example, if gender relations are empirically an important element in disaster impact and policy, then the individual rather than the household would be the unit of study and the main focus. If a researcher believes that a supply-side theory of famine requires attention, then those income opportunities available in crop production would be emphasised with reference to drought or pest attack, along with other determinants of supply (e.g. the transport network).

Secondly, the scale of the investigation will also be determined in part by choice of theory. Individual, household, class or village, region and nation are not so much alternative objects of analysis, but rather a series of conceptual limits that nest inside each other (like Russian dolls or Chinese boxes), the smaller-scale enclosed by the next highest level and given context by it. None the less, the study will have to choose the major spatial frame appropriate to its purposes. If a seismic zone, a farming system or an administrative area is chosen as the principal scale of the study, other scales can be sketched in through secondary data, rapid rural appraisal and key informants.

Thirdly, the framework is principally an 'externalist' (or etic) approach, in that it imposes the researcher's own interpretation and perception of vulnerability, hazard and risk – or at least the researcher's interpretation of local people's interpretations. Those experiencing a disaster and other actors, such as aid professionals, members of the civil service in a country facing a disaster, have their own interpretations. As Chapter 4 will show, for example, 'famine' is perceived in a variety of ways which differ significantly between the world media, aid or relief agencies (de Waal 1987). Likewise in the urban context, residents in Alexandra Township, in metropolitan Johannesburg, put flash flooding far down their list of concerns, frustrating attempts by a

professor of hydrology to 'solve' the flood problem (Wisner 1997). There are many hazards which outsiders could never even imagine without intensive discussion and understanding of the society involved. The collection and study of indigenous interpretations of extreme events and processes can enrich and perhaps alter the framework.

Fourthly, most studies do not examine vulnerability for its own sake, but assist in the prevention or mitigation of disasters. Therefore, many variables mentioned here in the general framework will simply not apply to particular hazards or in particular situations. The Access model is used as a predictive and organising device for this book. Only parts of it, at the discretion of the researcher or policy maker, will be relevant in each case.

Notes

1 Hewitt (1983a) sees the potential for disaster 'prefigured' in 'normal life'; while Wisner (1993) refers to 'daily life'. We use the two phrases interchangeably.
2 See RADIX web site page on 2002 southern African food emergencies (RADIX 2002).
3 This type of hazard, and the Andhra Pradesh case, is dealt with at greater length in Chapter 7. Winchester's work (1986, 1992) is a valuable and rare example of a study of the actual operation of ideas of vulnerability in the analysis of a sudden-onset disaster.
4 For example, Richards (1986) likens the farming venture undertaken by the Mende of Sierra Leone with a ship, with a crew hired and paid off at each point during the voyage. Each voyage takes place over a catenary soil profile and through an agricultural calendar (i.e. through both space and time), involving the labour of women in some areas, senior women in others, men for certain agricultural activities, and it is only at one particular point in the agricultural calendar that anything approaching a 'farm household' appears at all. In cases where larger units are significant, such as production brigades in China from the 1950s–1980s, the household may not be an appropriate unit for all aspects of analysing access. The household may control some of its consumption, and small plots of land for production, but most resources and the accumulated surplus is outside their control.
5 For simplicity we refer to income opportunities, although a better term is probably livelihood, which implies the content of supporting life without the assumption that this is done through access to a cash 'income'. Livelihoods may include activities of self-provisioning (subsistence farming, fishing or pastoralism) in which cash may play an insignificant part.
6 It is the female children who tend to be withdrawn from school when illness with HIV-AIDS removes principal wage or food earners from Ugandan families (Barnett and Blaikie 1992).
7 The role of structures of domination in defining untouchability are highlighted in the bias in relief and recovery against outcaste victims of the 2001 earthquake in Gujarat (India). Also, in the Kobe (Japan) earthquake (1995) there were high losses suffered by the Burakumin ('untouchables'), whose traditional occupation of shoe making (which involves the use of flammable materials) and their densely populated and dilapidated housing resulted in severe fire damage and high mortality (see Chapter 8).

8 The 'rules of the game' can shift very rapidly, as in the new regimes that accompany the establishment of colonial rule or the sudden establishment of private ownership of land (or, conversely, by sudden collectivisation of land as in the Ukraine in the 1920s and 1930s). O'Keefe and Wisner (1975) show how changes to the 'rules of the game' rendered ineffective a number of indigenous African mechanisms for coping with drought, resulting in increased potential for famine during the colonial period.

9 'Ethnoscience' is the term often used for vernacular, local knowledge of the physical environment. Some have used the terms 'people's science' (Wisner et al. 1977), 'folk science', 'folk ecology' (Richards 1975, 1985), 'écologie populaire', 'people's knowledge' (Rau 1991) and 'indigenous knowledge' (Brokensha et al. 1980). Within environmental design and architecture the term 'community design' is common (Wisner et al. 1991). We will use the term 'local knowledge', connoting a broader knowledge base that includes social relations and not just taxonomy, mechanics, chemistry, etc. For a critical review of the use and misuse of local knowledge by outside development agents, see Wisner (1988a: 256–262).

10 Models of the risk-averse farmer abound: see Ellis (1988) for a review.

11 On women's access to resources, see Rogers (1980); Dey (1981); Agarwal (1986); Vaughan (1987); Sen and Grown (1987); Carney (1988); Wisner (1988a: 179–186); Shiva (1989); Downs et al. (1991); Schoepf (1992).

12 Examples are given by Cutler (1984); Greenough (1982), writing on the 1943–1944 Bengal famine; and Vaughan (1987) on Nyasaland in 1949.

13 For south Asia see Agarwal (1990: 367); Fernandes and Menon (1987). On Kenya 1971–1976, see Wisner (1980); Downing et al. (1989).

14 Corbett (1988) has reviewed four major studies of coping mechanisms in the face of famine: these are of northern Nigeria, 1973–1974 (Watts 1983a); Red Sea Province, Sudan, 1984 (Cutler 1986); Wollo Province, Ethiopia, 1984–1985 (Rahmato 1988); and Darfur, Sudan, 1984 (de Waal 1987). Brown (1991) presents another detailed account of the coping sequence in Chad, as do O'Brien and Gruenbaum (1991) from two contrasting sites in Sudan. Agarwal (1990) has also reviewed accounts of coping strategies in south Asia.

15 This is true even in more densely populated regions such as south Asia. On common property resources in Asia, see Blaikie et al. (1985); Agarwal (1990); Chambers et al. (1990).

16 This is especially true in drought onset, when it is impossible to know how long reduced or interrupted rainfall will persist and the initial coping strategy is to preserve the basis for continued existence at normal levels afterwards. See Cannon (1991) for a review of these approaches.

17 For other examples of disaster relief, prevention and mitigation in which vernacular coping and innovations from the outside are combined, see Wijkman and Timberlake (1984: 104–143); Timberlake (1988); Harrison (1987); Maskrey (1989); Anderson and Woodrow (1998); A. Grainger (1990: 276–321); Harley (1990); Pradervand (1989); Rau (1991: 145–205); Eade and Williams (1995).

18 These competing theories of famine causation discussed in Chapter 4 include Sen (1981) and Ravallion (1987), who emphasise the behaviour of markets and their impact on the population, Rangasami (1985, 1986) and Firth (1959), who deal with the structures of domination and the time–space aspects of disasters, and Hellden (1984) who studies the impact of drought upon famine in Ethiopia.