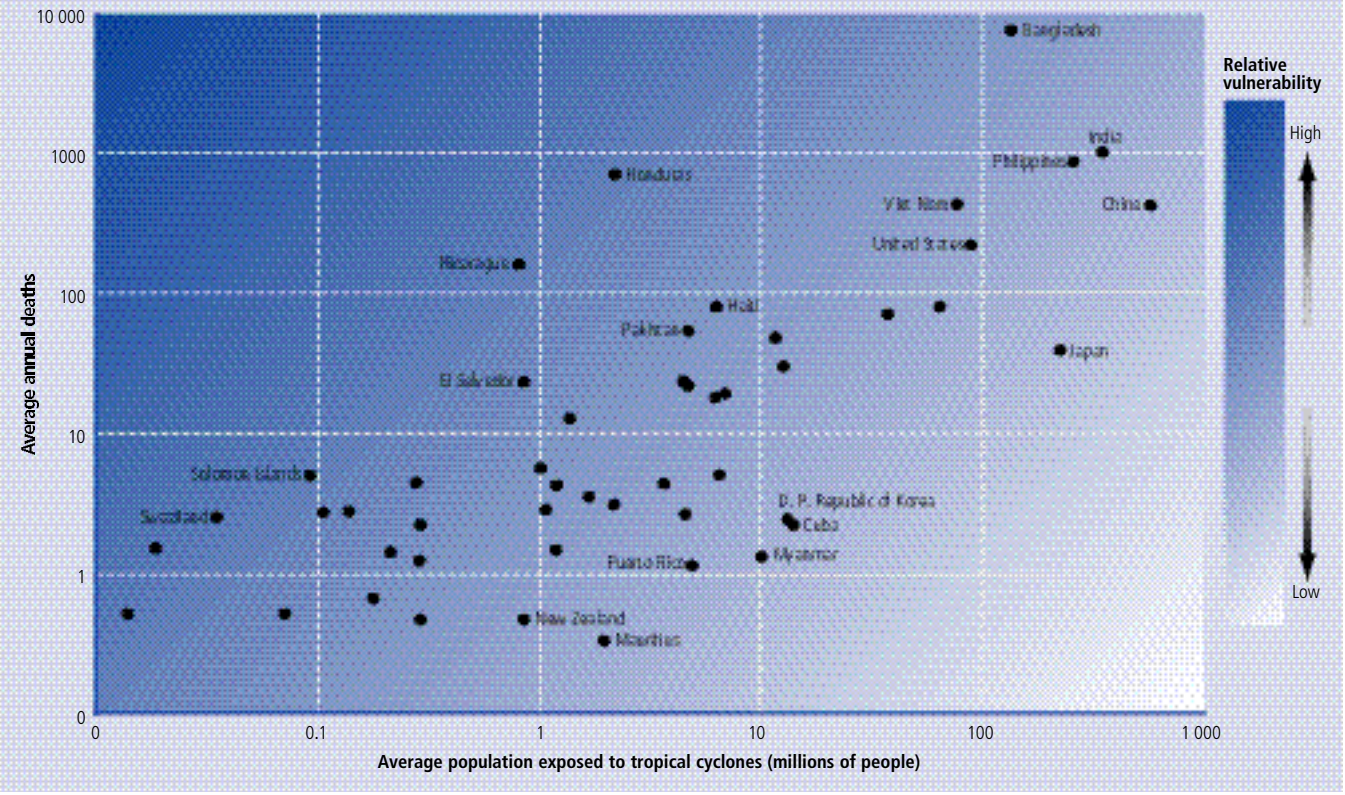
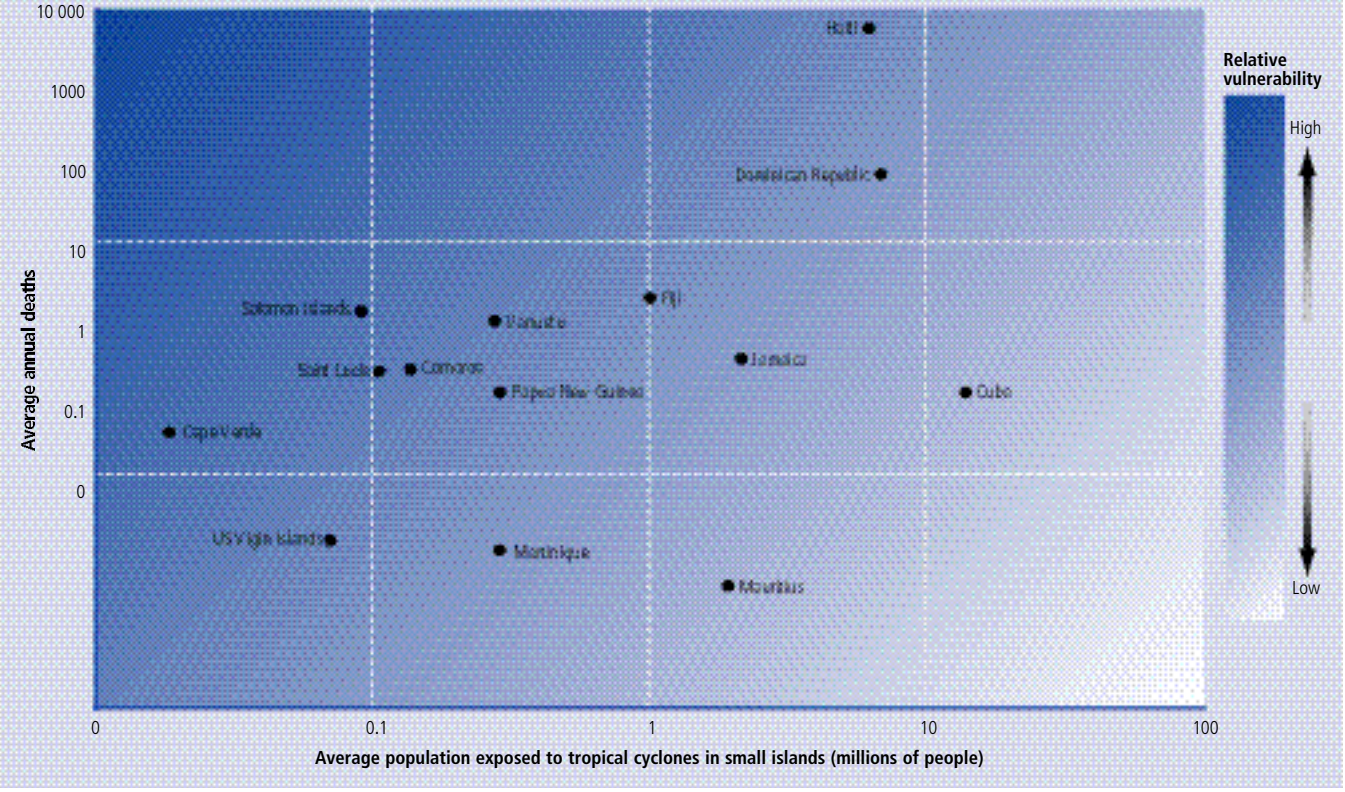
FIGURE 2.8 RELATIVE VULNERABILITY FOR TROPICAL CYCLONES, 1980–2000



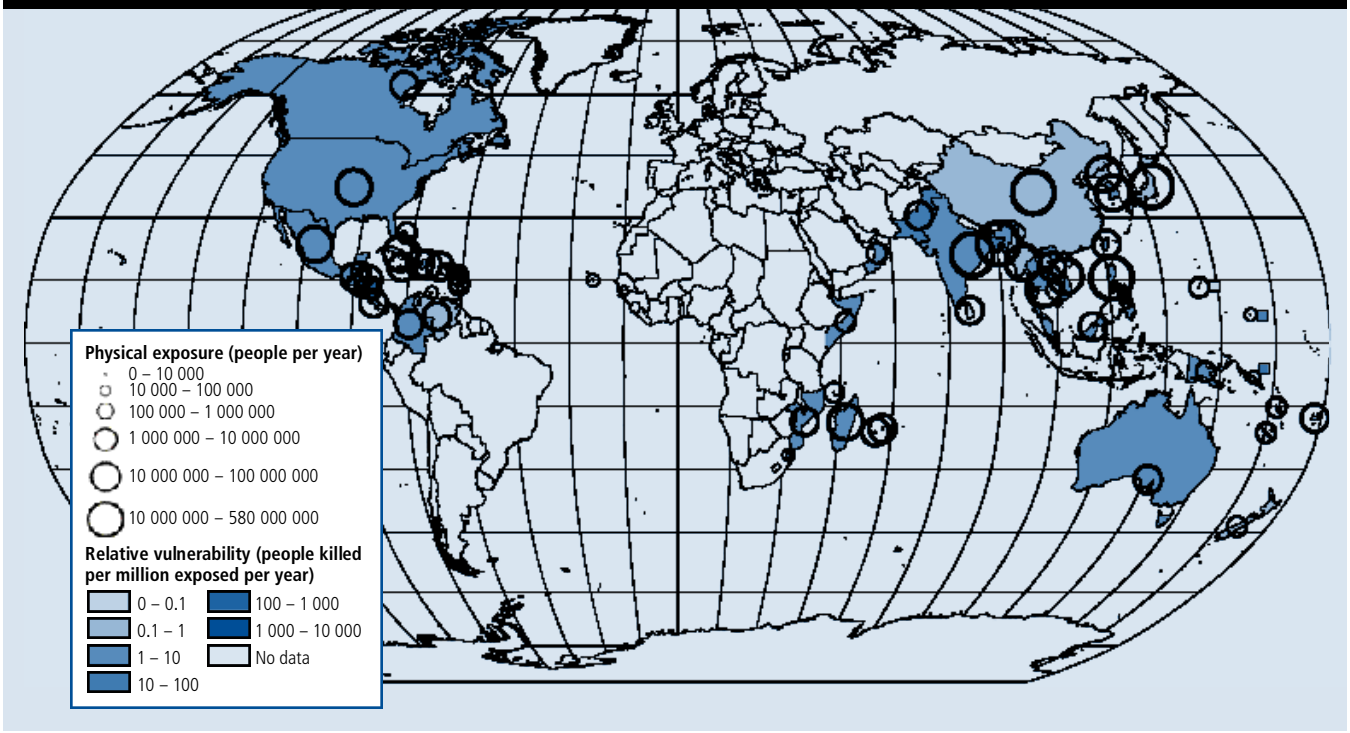
Source: The EM-DAT OFDA/CRED International Disaster Database and UNEP/GRID-Geneva

FIGURE 2.9 RELATIVE VULNERABILITY FOR TROPICAL CYCLONES IN SMALL ISLANDS, 1980–2000



Source: The EM-DAT OFDA/CRED International Disaster Database and UNEP/GRID-Geneva

FIGURE 2.10 PHYSICAL EXPOSURE AND RELATIVE VULNERABILITY TO TROPICAL CYCLONES, 1980–2000



Source: Université Catholique de Louvain: The EM-DAT The OFDA/CRED International Disaster Database (victims); Carbon Dioxyde Information Analysis Centre: A Global Geographic Information System Data Base of Storm Occurence and Other Climatic Phenomena Affecting Coastal Zones (tropical cyclone frequency); CIESIN, IFPRI, WRI: Gridded Population of the World (GPW), Version 2 (population); Compilation and computation by UNEP/GRID-Geneva

of the impact of Hurricane Mitch in Honduras and Nicaragua was not due to hurricane force winds *per se,* but to the large number of floods, flash floods, landslides and debris flows triggered by the hurricane. The severity of these secondary hazard events was magnified by the effects of processes of environmental degradation that occurred over several decades. These were possibly aggravated in turn by the drought and fires associated with an ENSO (El Niño Southern Oscillation) event the previous year. All these hazard events coincided with a highly vulnerable population in both social and economic terms and weaknesses in early warning and disaster preparedness that led to large losses of life.

Figure 2.9 shows differences in relative vulnerability between Small Island Development States. Haiti is shown to have the highest relative vulnerability, perhaps linked to its small economy, degraded environment and weak institutions of governance. Cuba and Mauritius are the least vulnerable, despite both islands having relatively large proportions of their populations exposed to tropical cyclones. In both cases, though from contrasting political and policy orientations, resources have been made available for early warning, disaster preparedness and evacuation. The positive results are evident.

Figure 2.9 also clearly illustrates the influence of human development status on risk.Haiti — the island state most at risk — has low human development, again contrasting with the higher human development countries of Cuba and Mauritius.This does not point to policy implications in itself, but does highlight the close link between development and disaster risk.

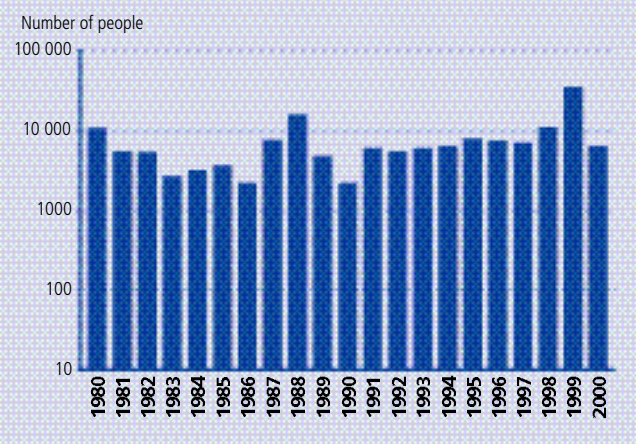
The regression analysis carried out for tropical cyclone risk showed a strong correlation between *physical exposure, percentage of arable land* and *Human Development Index* with observed risk. Countries with large, predominantly rural populations and with a low HDI rank will be most closely associated with tropical cyclone risk.

There are a number of reasons why this may be so. Rural housing in many countries will tend to be more vulnerable to high winds, flooding and landslides than urban housing and will generally be associated with higher mortality. Conversely, the weakness or non-existence of emergency and rescue services in rural areas of poor countries and lack of access to disaster preparedness and early warning are all other factors

that would help to explain mortality rates. The cyclone preparedness programme in Bangladesh is one of the few success stories in this area. By coupling cyclone shelters and community-based preparedness measures, the programme has managed to dramatically reduce vulnerability from the 1970s to the (still high) levels observed in the 1980-2000 reporting period.The relationship between rural livelihoods, vulnerability and disaster risk is a key issue for further discussion in Chapter 3.

Figure 2.10 (see previous page) shows a World Map of physical exposure and relative vulnerability for tropical cyclones.

FIGURE 2.11 PEOPLE KILLED BY FLOODS, 1980-2000



Source: The EM-DAT OFDA/CRED International Disaster Database

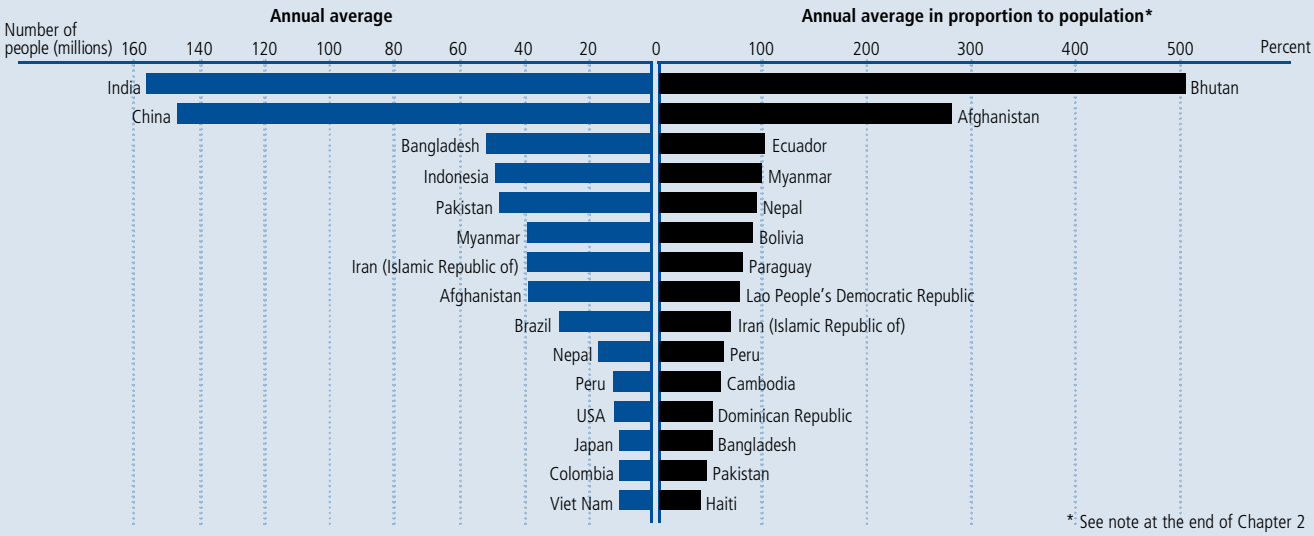
2.2.3 Flood hazard

About 196 million people in more than 90 countries were found to be exposed on average every year to catastrophic flooding. Some 170,010 deaths were associated with floods worldwide between 1980-2000 (see Figure 2.11).

The analysis of physical exposure to floods was weakened by the fact that no single global database was available. In addition, lack of information on duration and intensity of floods impeded the identification of different classes of flood hazard. In the absence of a worldwide floods database, floods registered on the EM-DAT database were used and mapped onto those watersheds where the flood occurred. The entire watershed was mapped as a flood prone area, despite the fact that only a small area of the watershed was usually flooded. This means the number of people identified as being exposed to flooding in the DRI (Figure 2.12) is likely to be greater than numbers observed on the ground. As a consequence, losses calculated as a proportion of exposed populations (Figure 2.13) may appear smaller and the relative vulnerability lower than observed.

The geospatial analysis carried out for the calculation of human exposure identified 147 countries with populations exposed to floods. Figure 2.12 shows those states with the largest exposed populations. Populous South Asian countries (India, Bangladesh, Pakistan) and China figure strongly at the top of the list, as absolute population and population exposed as

FIGURE 2.12 PHYSICAL EXPOSURE TO FLOODS, 1980–2000



Source: UNDP/BCPR; UNEP/GRID-Geneva

a proportion of national populations. This is tied to the large populations living in extensive river floodplains and low lying coasts in this world region. Less populous states with mountainous topography (Bhutan, Ecuador, Nepal), and Central American and Andean states are also flagged among those states as having large absolute and proportional populations exposed to flooding. While these countries are more mountainous than those in South Asia, they nevertheless contain many population centres located in river floodplains.

Comparing the size of exposed populations with the number of recorded deaths to flood events is used as a measure of relative vulnerability in Figure 2.13. Those states closest to the top left-hand corner of the graph show highest relative vulnerability.

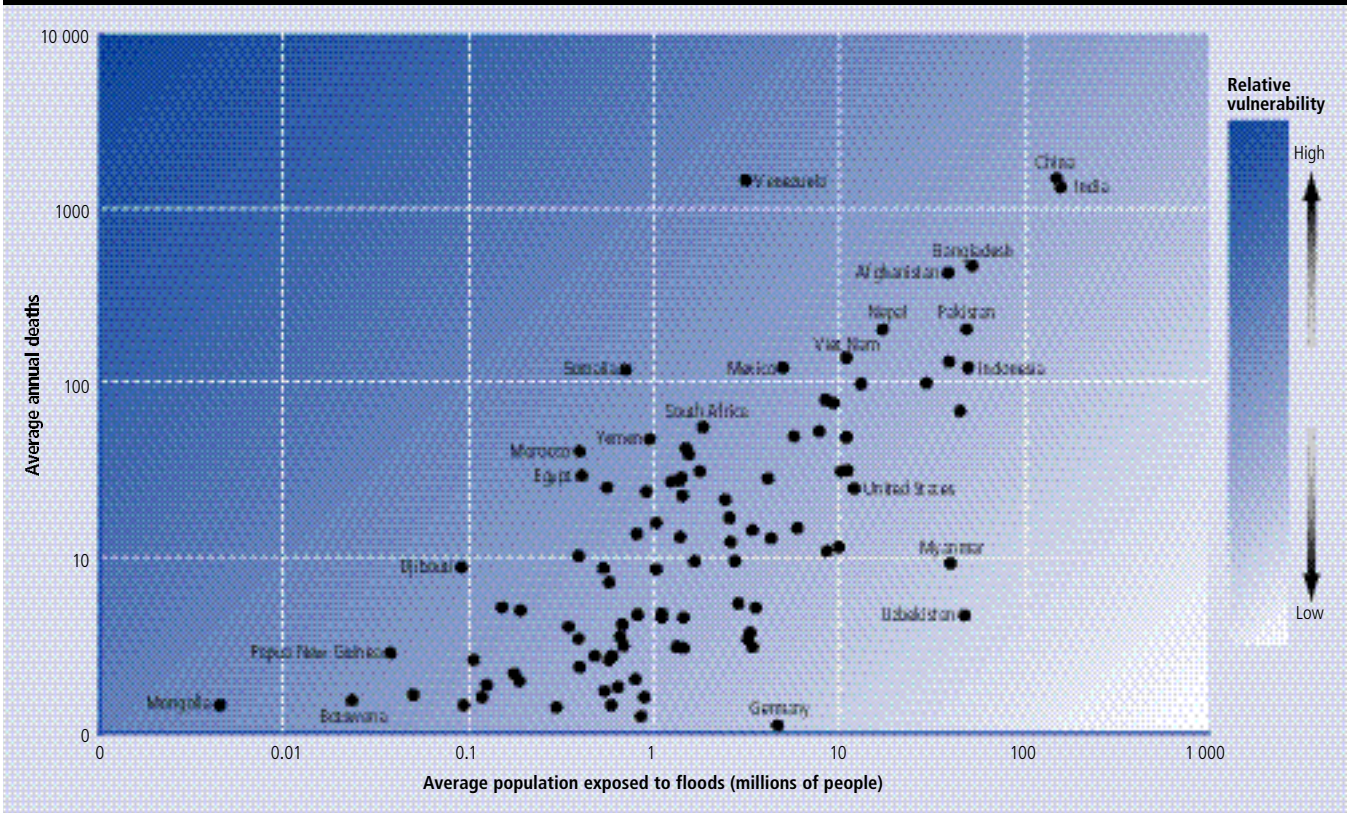
As in the case of earthquake and tropical cyclone hazard, the calculation of human vulnerability to floods clearly illustrates some of the limitations to the DRI model that were outlined in 2.1.2.

Venezuela appears to be the country with highest relative human vulnerability to flooding, based on recorded lives lost to flood events. Again this is due to a single exceptional event occurring in 1999. At the same time, while the event was described generically as a flood in the EM-DAT database, a large proportion of the deaths were associated with debris flows in dense urban communities not located in floodplains.

At the same time, given the fact that whole watersheds were considered when calculating the population exposed, the ratio of killed-to-exposed people (relative vulnerability) does not have the same analytical power that it has for the other hazards, although this does not affect the DRI itself. Floods are made to appear less deadly than in reality. This may explain the positioning of Myanmar and Uzbekistan as countries with apparently low relative vulnerability. Care should be taken in drawing conclusions from this analysis, as it may be that exposed populations are exaggerated or deaths have not been picked up in the recording process.

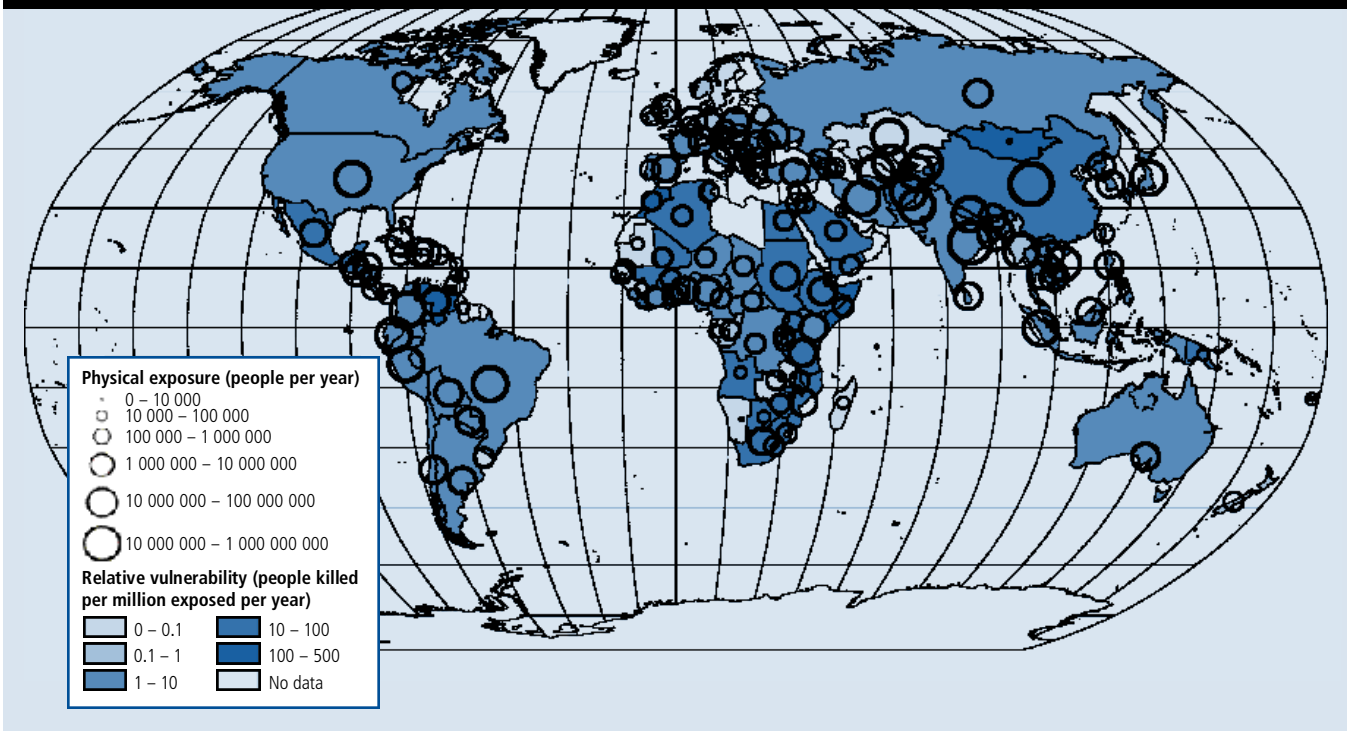
Many flood events are highly localised in character and result in losses that are either below the threshold required to be registered in EM-DAT database or are simply not recorded internationally.

FIGURE 2.13 RELATIVE VULNERABILITY FOR FLOODS, 1980–2000



Source: The EM-DAT OFDA/CRED International Disaster Database and UNEP/GRID-Geneva

FIGURE 2.14 PHYSICAL EXPOSURE AND RELATIVE VULNERABILITY TO FLOODS, 1980–2000



Source: Université Catholique de Louvain: The EM-DAT The OFDA/CRED International Disaster Database (victims); U. S. Geological Survey: HYDRO1k Elevation Derivative Database (flood affected watersheds); CIESIN, IFPRI, WRI: Gridded Population of the World (GPW), Version 2 (population); Compilation and computation by UNEP/GRID-Geneva

The use of mortality as an indicator of vulnerability to floods could be supported by case specific information on losses to agricultural production, to housing and to social and economic infrastructure, which might be incurred without necessarily causing a large loss of life.

Taking into account and clarifying these different limitations, Figure 2.13 does show a range of countries, particularly in Africa and Asia, with higher human vulnerability to floods than countries such as Germany and the United States of America.

As in the cases of earthquakes and cyclones, there was a strong association with *physical exposure*. With floods this variable was tied to GDP *per capita*, which was inversely correlated with recorded deaths.There was a negative correlation between deaths from flooding and *local density of population*

Countries with low GDP per capita, low densities of population and high numbers of exposed people were most at risk from flood.

These indicators identify pathways into vulnerability to floods. The next stage of assessment would be to explore the detailed relationships that allow this to take place. This is partly the aim of Chapter 3.

Intuitively, one could expect mortality from floods to be high in countries with sparsely populated, poor rural areas, where disaster preparedness and early warning is non-existent and where health coverage is weak and not easily accessible. In such areas people would have less possibility to evacuate from flood prone areas and would be more vulnerable to death through flood related diseases.

Figure 2.14 presents a map of physical exposure and relative vulnerability to floods.

2.3 Unpacking Global Risks

In the first section of this chapter, the DRI was used to demonstrate the ways in which development constructs differential and heterogeneous risk patterns between countries at the global level. At a national level of observation and a local level of resolution, risk and vulnerability exhibit similar patterns of variance and heterogeneity, meaning that different regions and localities within a country are more risk-prone than others.

As was emphasised in Chapter 1 and will be explored in more detail in Chapter 3, risk is configured historically

BOX 2.2 NATIONAL DISASTER DATABASES

This box presents three initiatives for national level data collection.

The Latin America DesInventar

This methodology was initiated by the Network for Social Studies on Disaster Prevention in Latin America (LA RED) in 1994. It seeks to record all discrete events that have resulted in adverse effects on life, property and infrastructure triggered by natural and man-made phenomena and geo-referenced to the smallest available political-administrative unit in a given country — usually the District or Municipality. By collecting disaggregated data, DesInventar enables the recording of individual localised small-scale disasters as well as the impacts of large-scale hazard events at the local level.

National level DesInventar disaster databases, with up to 30 years of data, have been developed to date in 17 countries in the Americas. These are Argentina, Chile, Peru, Ecuador, Venezuela, Colombia, Panama, Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala, Mexico, Dominican Republic, Trinidad and Tobago, Jamaica and Guyana. Sub-national databases have been developed for the Departments of Antioquia and Valle del Cauca and for the city of Pereira in Colombia and for the State of Florida in the USA.

Local disasters with very limited direct impacts are included (e.g. the destruction of one house or a household affected by the loss of their harvest as a result of a frost), as well as those with more widespread impacts (e.g. earthquakes affecting metropolitan districts). These databases have been developed by national governments, international organisations, universities, scientific organisations and Non Governmental Organisations (NGOs). Data is obtained from the media and government agencies and existing databases. Once collected, data is verified nationally for consistency. Shared definitions are used for some key hazards, while for others local specificity is more important. The challenge of uniformity between the databases remains, limiting the capacity for international comparisons.

The Orissa Experience

In 2002, UNDP set about producing a database including an inventory of disaster events with a natural trigger for Orissa. The aim of the project was to develop a tool to help decision-makers prioritise expenditure in an objective manner. Orissa is to act as a pilot with the next stage, including replication in an additional four Indian states and integration into a national Government of India Integrated Disaster Resource Network. The methodology was modified from the experience of the Latin America DesInventar.

News media and government sources of information are used to build up the disaster events database. A historical database going back to 1970 has been collated and is updated weekly. Before data is entered, it has to be cleaned to enable a comparable analysis. For example, when a source measures disaster impacts in the number of families, this is recorded in the database as 'people impacted' by including six people for every family. Events are standardised so that similar events like cyclones and hurricanes are classified as cyclones, with whirlwind and tornado being recorded as gales. A new event 'boat capsize' was created.

Different data sources were given different data categories to enable reviews on structural differences in the reporting format used by the press (where there is much variation between individual reporting styles and events) and government sources (which are very comprehensive but formally structured). A particular constraint has been the unequal coverage of Orissa by data sources. The media, for example, does not cover Western Orissa as thoroughly as Coastal Orisa.

MANDISA: South Africa

The programme for Monitoring, Mapping and Analysis of Disaster Incidents in South Africa (MANDISA) is a core activity for the Disaster Mitigation for Sustainable Livelihoods Programme of the University of Cape Town (DiMP). MANDISA was initiated as a pilot study in the CMA (Cape Town Metropolitan Area) in the Western Province of South Africa from 1990-1999. The methodology was inspired by DesInventar, but has been adapted for the South African context.

MANDISA focuses on South African-relevant losses including large urban 'non-drainage' floods, wildfires and extreme wind events, as well as highly frequent 'small' and 'medium' fires. Socio-economic and environmental risk factors that affect disaster impact are included where possible, allowing the potential for tracking the developmental conditions that prefigure disaster. While newspapers formed one source of information for tracking disaster events, the South African experience indicated that these provided limited insight into the highly recurrent 'small' events that occur in informal settlements reflecting only 649 of the 12,300 total incidents tracked through a thorough review of twelve different data sources, including incident reports from Fire Services, Social Services, the South African Red Cross Society and Disaster Management agencies.

MANDISA is viewed as an approach rather than a disaster tracking IT tool. This requires multi-agency cooperation, consultation and feedback, active sourcing of emergency and disaster information, strategic consolidation of information across agencies and robust geo-referencing. MANDISA is an internet-accessible database. This is intended to encourage local ownership as well as provide on-line information for schools, researchers, planners and disaster management personnel.

Source: Latin America DesInventar: http://www.desinventar.org/desinventar.html; Orissa: http://www.undp.org.in/orissa/; Mandisa: http://www.egs.uct.ac.za/dimp/

through the linked processes of economic development and environmental change, such as urbanisation and global climate change. Each risk scenario at the local level represents a unique configuration of hazards and vulnerabilities in the context of broader processes of development at the national and global levels. But ultimately, vulnerability and risk are manifested at the local level.

It is hoped and expected that the DRI is useful to illustrate global level risk and vulnerability patterns and to advocate for development policies and practices that contribute to disaster risk reduction.

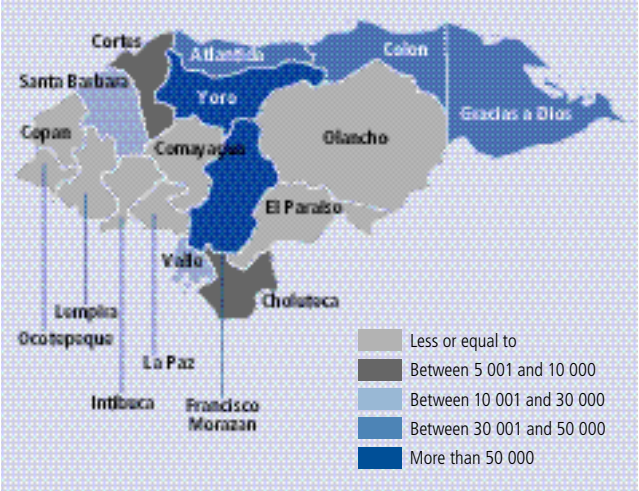
However, for this sea change in development culture to take root, national governments have to adopt appropriate development policies in the context of the more detailed and complex patterns of risk and vulnerability that exist within each country.

In this section of the Report, we will illustrate some of the complexities of risk at the sub-national level through a number of examples.

FIGURE 2.15 NUMBER OF HOUSES DESTROYED BY HURRICANE MITCH IN HONDURAS (GLOBAL OBSERVATION AND NATIONAL RESOLUTION)

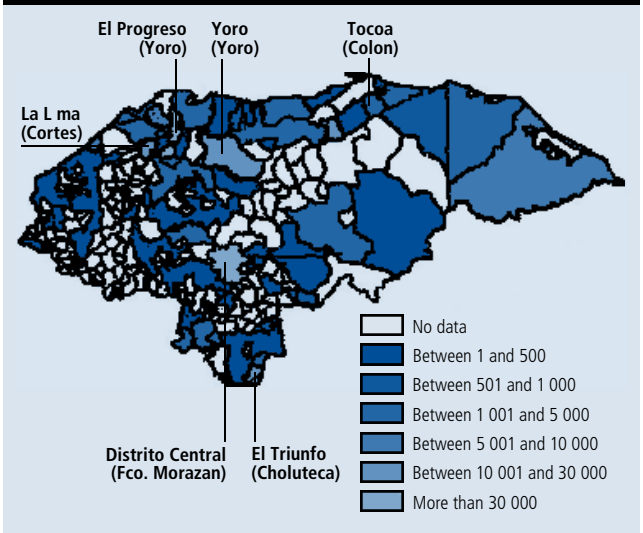
Source:COPECO-La Red, DesInventar-Mitch[5]

FIGURE 2.16 NUMBER OF HOUSES DESTROYED BY HURRICANE MITCH IN HONDURAS (NATIONAL OBSERVATION AND DEPARTMENTAL RESOLUTION)



Source:COPECO-La Red, DesInventar-Mitch[5]

FIGURE 2.17 NUMBER OF HOUSES DESTROYED BY HURRICANE MITCH IN HONDURAS (NATIONAL OBSERVATION AND MUNICIPAL RESOLUTION)



Source:COPECO-La Red, DesInventar-Mitch[5]

2.3.1 Risk patterns at the national and local levels

The DRI has been developed with a global level of observation and a national level of resolution.It allows the analysis of comparative risk levels between countries. This perspective can be complimented by viewing risk from a national level of observation and a local scale of resolution. When this is done, complex local risk patterns become apparent that are hidden at the global level.

National disasters are composed of multiple local disasters

Examined at the national level, large-scale disasters have a complex and heterogeneous impact on both territory and social groups. In this case, large-scale, national disasters may appear represented as a large number of small-scale disasters associated with a particular hazardous event. Box 2.3 explores this issue further with data from Hurricane Mitch in Honduras. The data was collected using the Latin America DesInventar methodology (See Box 2.2 on the previous page) by the National Commission for Contingencies (COPECO) of the Government of Honduras. In this case, what appears from the global level as a single, national scale disaster, takes on completely different characteristics seen with a national level of observation and a local level of resolution. This *bottom up* vision of the impact of Hurricane Mitch in Honduras clearly illustrates that risk and vulnerability patterns are locally configured.

BOX 2.3 MITCH: ONE DISASTER OR MANY?

The nested quality of disaster, where large-scale events identified at the global scale can also be interpreted as a collection of localised and small- or medium-scale events, is illustrated by the experience of Hurricane Mitch in Honduras, 1998.

Figure 2.15 represents a vision of Mitch from a global level of observation and a national level of resolution. Simply, a large number of houses were destroyed by the hurricane at the national level. Figure 2.16 moves to a national level of observation and a departmental level of resolution. At this level of resolution, widely differing impacts can already be observed between different departments. While a large number of departments had less than 5,000 houses destroyed, two departments had more than 50,000 houses destroyed. In Figure 2.17, the resolution is increased to the municipal level revealing yet another pattern of impact. While two municipalities suffered more than 30,000 destroyed houses (El Progreso in the Sula Valley and the central district of Tegucigalpa), a large number of municipalities in the country did not report destroyed houses at all.

Source:COPECO-La Red, DesInventar-Mitch[5]

BOX 2.4 TRACKING RISK THROUGH TIME HIGHLIGHTS THE IMPORTANCE OF CONTEXT AND CULTURE

The Orissa database points to epidemics as the greatest cause of deaths and fire as the greatest cause of property destruction in the state (see Figures 2.18 and 2.19). It is possible that epidemics will follow floods and cyclones so that the picture is a little more complicated than it might first appear. However, the recording of high death counts as losses to epidemics, does show the importance of indirect losses, compared to direct losses recorded from drowning or injury from a flood or cyclone. Epidemics following floods or cyclones and house fires are preventable. Their occurrence indicates high human vulnerability and a lack of adequate planning.

From the Orissa database it became evident that despite an underlying increasing trend in the number of reported fire events for the state, damage to property due to fire was declining (Figure 2.20). It is thought that this is because of increasing urbanisation, which marks a change from traditional and flammable construction materials towards a preference for houses constructed from concrete.

Some preliminary data also suggest a higher level of risk in some highly populated coastal areas. The concentration of people and risk into a small number of coastal districts shows the importance of sub-national studies for building up accurate pictures of risk that are hidden at the national or regional level.

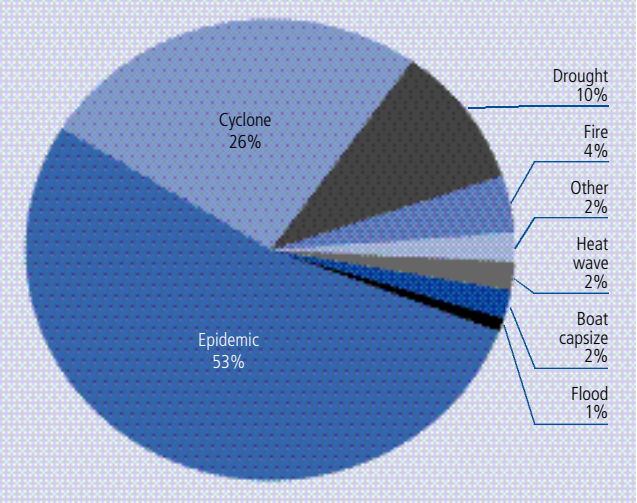
Source: UNDP India, preliminary results of Orissa DesInventar database

Each municipality in Honduras represented a particular configuration of hazards and vulnerabilities with respect to the housing sector, irrespective of the fact that the natural phenomenon itself (Hurricane Mitch) affected more or less the entire territory of Honduras. In other words, the disasters were associated with Mitch, but were related to a particular range of localised hazards and vulnerabilities, configured in the context of broader development processes at the global and national level.

Apart from the large-scale and medium-scale disasters that are represented in the DRI, the underlying local conditions of risk, hazard and vulnerability are manifested as frequently recurring small- and medium-scale disasters that are either individually too small to be included in global datasets, or else are not reported internationally.

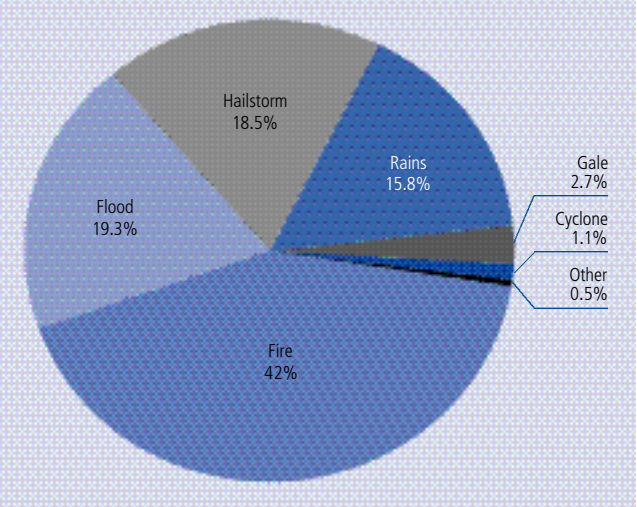
Such events represent a significant proportion of disaster loss in countries such as Panama, which is only rarely affected by major hurricanes and earthquakes. In Panama, the official national disaster database maintained by the National System for Civil Protection recorded 904 disaster events between 1996 and 2001.[6] These 904 events are associated with only 46 deaths, but involved considerable damage to livelihoods.

FIGURE 2.18 NUMBER OF DEATHS REPORTED DUE TO DIFFERENT DISASTER EVENTS IN ORISSA, 1970–2002



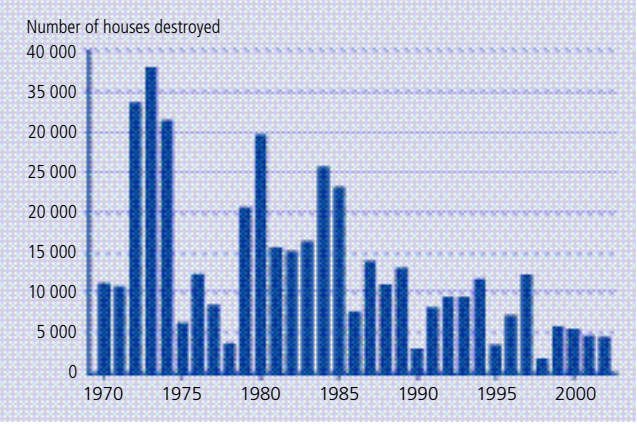
Source: UNDP India, preliminary results of Orissa DesInventar database

FIGURE 2.19 NUMBER OF HOUSES DESTROYED DUE TO DIFFERENT DISASTER EVENTS IN ORISSA, 1970–2002



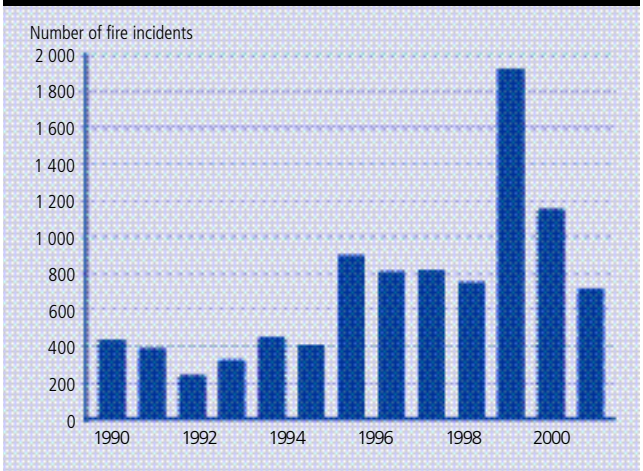
Source: UNDP India, preliminary results of Orissa DesInventar database

FIGURE 2.20 NUMBER OF HOUSES DESTROYED BY FIRE IN ORISSA, 1970–2002



Source: UNDP India, preliminary results of Orissa DesInventar database

FIGURE 2.21 NUMBER OF FIRE INCIDENTS FOR CAPE TOWN MUNICIPALITY, 1990 – 2002



Source: MANDISA Project

For example, 40,531 hectares of crops were lost in these disasters. In the case of small landowners and subsistence farmers without insurance, the loss of a few hectares of crops can represent a catastrophic blow to livelihood sustainability.

Opening the DRI analysis to data feeding in from sub-national databases would introduce a broader spectrum of hazard types. As was mentioned in the section on the DRI, the losses associated with *primary* hazards,such as earthquakes, cyclones and floods,seen at the local level are linked to other secondary hazards events, including fires, landslides and liquefaction.

An examination of disaster losses in the Orissa DesInventar shows that more houses have been destroyed by fire and more deaths are lost in epidemics than through cyclones.

Locally specific data can show the interaction of risk from an array of natural and anthropogenic hazards

Locally specific data can help refine disaster risk reduction policy. The links between disease epidemics and disaster events, particularly floods and tropical cyclones, has long been a focus for research. The dynamics between disaster and disease continue to require a strengthening of our understanding. The importance of fires at the local level and in urban areas points to the need for further work on the relative importance of multiple hazards interacting with development at different levels. Deaths and injuries to road traffic accidents are likely to have a similarly significant local impact.[7]

House fires were not considered in the global DRI, which is oriented towards natural hazards. But this form of anthropogenic hazard is clearly important at the local level. This points to the opportunity for understanding risk processes that could come from exploring the links between development processes and risk to local anthropogenic hazards and larger scale natural hazards.How does exposure to small local events affect individual and collective vulnerability to large-scale hazards and vice versa? What are the implications for local development planning and risk reduction?

Providing a local lens allows for the large number of small events to be catalogued, re-shaping perceptions on risk as a priority concern for development policy. In the MANDISA project, it was originally anticipated, based on expert opinion, that the database would identify about 600 events for the period 1990-1999 in Cape Town, South Africa. In the end, 12,300 events were logged. Preliminary analyses from 1990-1999 have indicated that of the 12,300 incidents, 97 percent were fire-related. The most vulnerable houses were those in the informal housing sector. In an analysis of fire in the poor suburb of Gugulethu from 1990-1999, fires in the informal housing sector constituted 88.5 percent, with only 11.5 percent in the formal housing sector.

2.4 Future Directions in Natural Disaster Risk Modelling

In this section of the Report, two exercises are presented that were undertaken within the DRI. Each pushes against the barriers imposed by data availability. The exploratory nature of these exercises limits the conclusions that can be drawn. But the processes involved are themselves illuminating, they point towards future directions in natural disaster risk modelling.

2.4.1 Can drought risk be modelled?

Compared to the development of the DRI for earthquake, tropical cyclone and flood, modelling drought risk presented a series of additional challenges, which were only partly overcome. These include:

The difficulties in modelling drought hazard *per se*. A model of meteorological drought was used, but meteorological drought does not necessarily lead to agricultural or hydrological drought.

Compared to the other hazard types, deaths are a limited representation of manifest drought risk. Severe livelihood attrition may occur with only few recorded deaths, as was the case in Southern Africa in 2002. It is possible that many of the deaths labelled as drought disasters in the EM DAT database are due to other factors such as armed conflict.

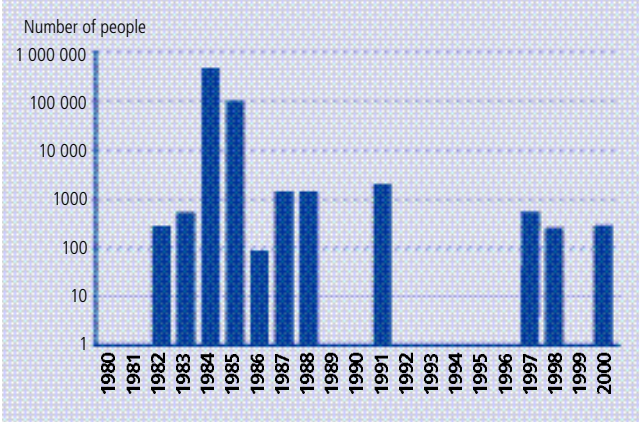
Given these uncertainties regarding both the hazard model as well as the use of deaths as a risk indicator, the results should be considered only as illustrative.

To explore the possibilities of modelling drought,hazard data was examined using the same methods employed for earthquake, tropical cyclone and flood hazards. Methodological detail can be found in the Technical Annex,where particular challenges and some interpretation of results are offered.

A total of 832,544 deaths were associated with the occurrence of droughts worldwide, 1980-2000.[8] The drought conditions affecting sub-Saharan African countries from 1984 to 1985 were associated with the highest drought-related casualties for the period considered in the analysis. Ethiopia, Somalia and Mozambique recorded the most deaths.

Frequency and intensity were the main characteristics helping to delimit rapid onset events and only events crossing certain minimum thresholds were considered as disaster. For drought this is not the case and it is the duration of each drought that plays the most important role in characterising its hazard level. Droughts develop slowly and may last over a period of many years.

FIGURE 2.22 PEOPLE KILLED BY DROUGHT AND FAMINE, 1980–2000



Source: The EM-DAT OFDA/CRED International Disaster Database

Given the length of time over which drought can be actively interacting with development processes, isolating deaths as a result of drought events is difficult. Deaths to drought are not direct, but rather the result of a complex interaction of drought and vulnerability as embedded in the economy. The link between drought and famine, for example, is full of intervening pressures.[9]

For the period 1980-2000, twenty countries are recorded in EM-DAT as having deaths associated with drought.

BOX 2.5 DEFINING AND MAPPING GLOBAL DROUGHT HAZARD

The methodology used to map exposure to meteorological droughts was developed and provided by the International Research Institute for Climate Prediction (IRI), Columbia University. Data was obtained from the US National Centres for Environmental Prediction (NCEP) and its Climate Prediction Centre accessed through the IRI Data Library (http://iridl.ldeo.columbia.edu/).

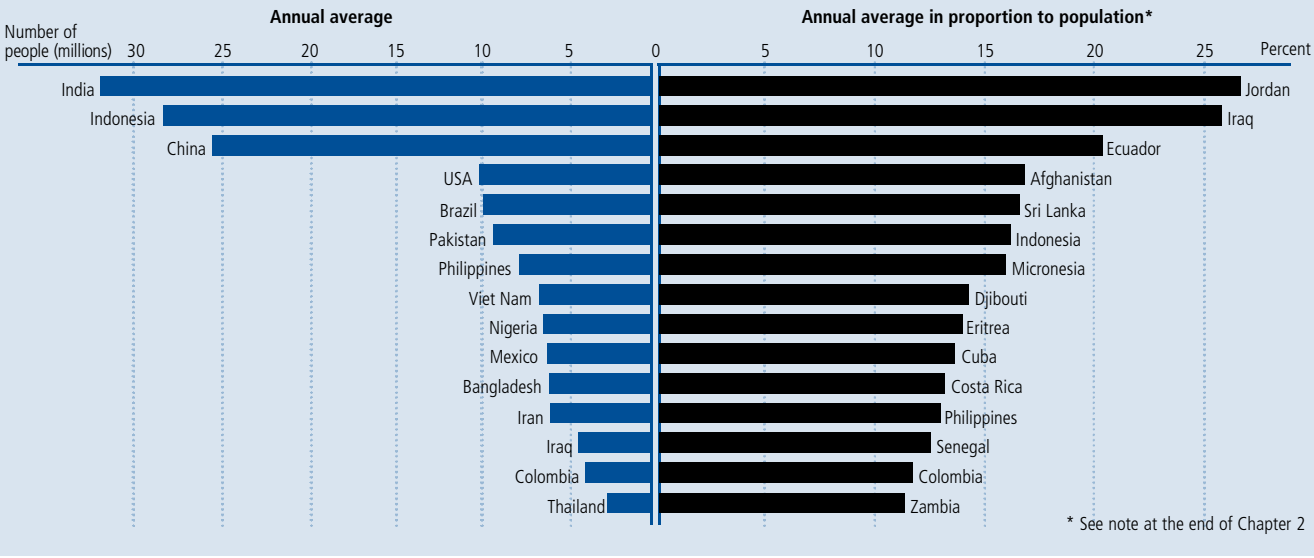
Meteorological drought was defined as a sustained period (three months or more) in which monthly precipitation at a given location is significantly below the long-term average (in this model, more than 23 years). By definition, desert regions are perpetually dry and therefore do not reflect the type of deficient precipitation we are considering. Three months of deficient precipitation in succession is generally considered the minimum duration required to define a drought. Many drought events persist for periods ranging from several months to several years.

The data used in the analysis consisted of monthly precipitation figures for the globe for the period 1979-2001. The dataset was based on a blend of surface station observations and precipitation estimates from satellite observations. Data was spatially organised in a 2.5 x 2.5 degree latitude/longitude grid.

The first step in assessing exposure to meteorological drought was to compute, for each calendar month, the median precipitation for all grid points between the latitudes of 60S and 70N over the base period 1979-2001. Next, for each grid point, the percent of the long-term median precipitation was computed for every month during the period January 1980 to December 2000. For a given month, grid points with a long-term median precipitation of less than 0.25 mm/day were excluded from the analysis. Such low median precipitation amounts can occur either during the dry season at a given location or in desert regions. In both cases our definition of drought does not apply. Finally, a drought event was defined as having occurred when the percent of median precipitation was at or below a given threshold for at least three consecutive months. The different thresholds considered were 50 percent, 75 percent and 90 percent of the long-term median precipitation with the lowest percentage indicative of the most severe drought according to this method. The total number of events during the period 1980-2000 were thus determined for each grid point and the results aggregated to country level.

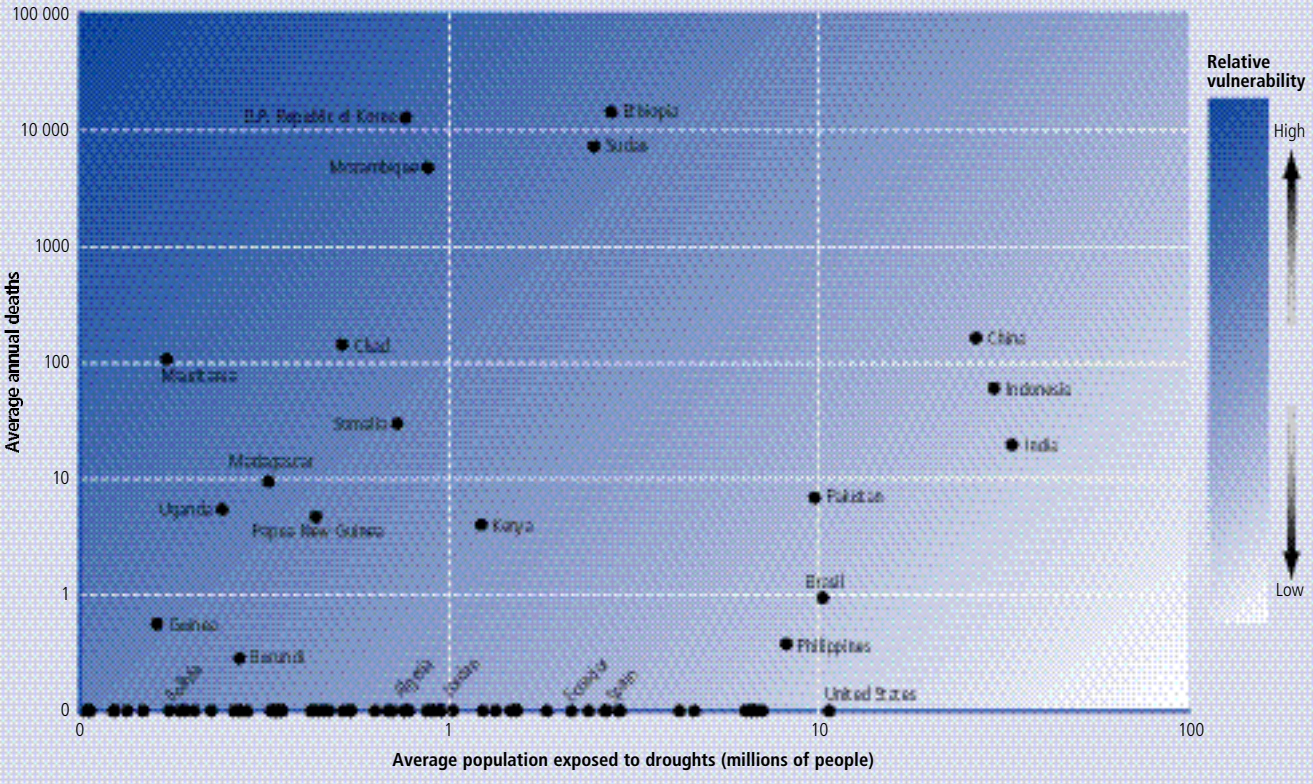
Data was from the US National Centres for Environmental Prediction (NCEP), Climate Prediction Centre (CPC), available through the IRI Data Library (http://iridl.ldeo.columbia.edu/).

FIGURE 2.23 PHYSICAL EXPOSURE TO DROUGHTS, 1980–2000



Source: UNDP/BCPR; UNEP/GRID-Geneva

FIGURE 2.24 RELATIVE VULNERABILITY FOR DROUGHTS, 1980–2000



Source: The EM-DAT OFDA/CRED International Disaster Database and UNEP/GRID-Geneva

The periodic and country specific nature of drought is indicated in Figure 2.24 (see previous page), which presents annual deaths attributed to drought by EM-DAT.

A basic approach to the mapping of meteorological droughts was achieved by using a simple index that applied a threshold-criteria to identify droughts. This took account of both shortfalls in precipitation and the duration of precipitation deficits. Box 2.5 (see previous page) describes the approach. The human exposure analysis, using a threshold of a 50 percent shortfall in precipitation over a three-

month period, was applied to 107 countries where data was available.

Using this approach, highly populated countries with large territories from Asia and the Americas are among those states with the largest exposed populations to meteorological droughts. When annual physical exposure is expressed per million inhabitants, less populated countries gain visibility.

Around 220 million people were found to be annually exposed to drought. An exploratory analysis of relative vulnerability was undertaken to investigate the relationship between drought (as defined as a 50 percent shortfall in rainfall over three months) and deaths attributed to drought at the international level. Figures 2.24 and 2.25 suggest that while few sub-Saharan African countries have large absolute or relative populations exposed to meteorological drought, seven of the 10 most vulnerable countries are located in sub-Saharan Africa.

Mozambique, despite being hit by flooding in 2000, presents a higher level of relative vulnerability to droughts. Ethiopia shows similar levels of vulnerability to drought and has recorded a higher number of drought-related casualties for the period of 1980-2000.

Most of the countries situated on the top left of the graphic (relatively more vulnerable) have suffered major armed conflicts[10] during the period under analysis. Ethiopia, Sudan, Mozambique, Chad, Uganda and Somalia suffered long armed conflicts for more than a decade during the period 1980-2000, often combined with other minor conflicts.[11] In addition,Mauritania and Papua New Guinea suffered more occasional conflicts (less than 1,000 deaths). North Korea, though not embroiled in a conflict, has been affected by its international isolation and this is reflected in very high relative vulnerability to drought. The role of political processes, and in particular armed conflict, in translating drought exposure into vulnerability and human loss of life is made all too clear by this analysis.

The national DRI model results contrast greatly with the other hazards studied in this Report. The socio-economic variables that had the greatest association with recorded drought deaths were the *percentage of population with access to improved water supply* and *physical exposure*.

Physical exposure is less important when associated with deaths to drought than when compared to earthquake, tropical cyclone and flood. This suggests that socio-economic factors play a greater role in generating drought risk than is the case with rapid-onset hazards. In fact, one of the conclusions of this DRI exercise is that it may be incorrect to label the deaths recorded as drought deaths at all.The deaths probably have much more to do with poor governance, conflict and internal displacement than with meteorological drought *per se*. While this implies that this DRI may not be a *drought* DRI, it does create great opportunities for risk reduction through development policy.

At the same time, however, the weak association between physical exposure and risk may also be due to the characteristics of the hazard model or to the use of deaths as an indicator of risk. If it were possible to model agricultural rather than meteorological drought and to use livelihood attrition rather than death as a proxy for risk, then the association between physical exposure and risk might be quite different.

It is important to note that the indirect connection between drought and mortality signifies that the selection of mortality as the outcome for which risks are evaluated affects the way drought losses should be interpreted. Drought impacts are widespread throughout economies with high dependence on primary sector activities. Their cumulative effect can be significant for people's livelihoods, even in situations where mortality attributable to the hazard event is not widespread. This may affect the placement of African countries in the rankings.

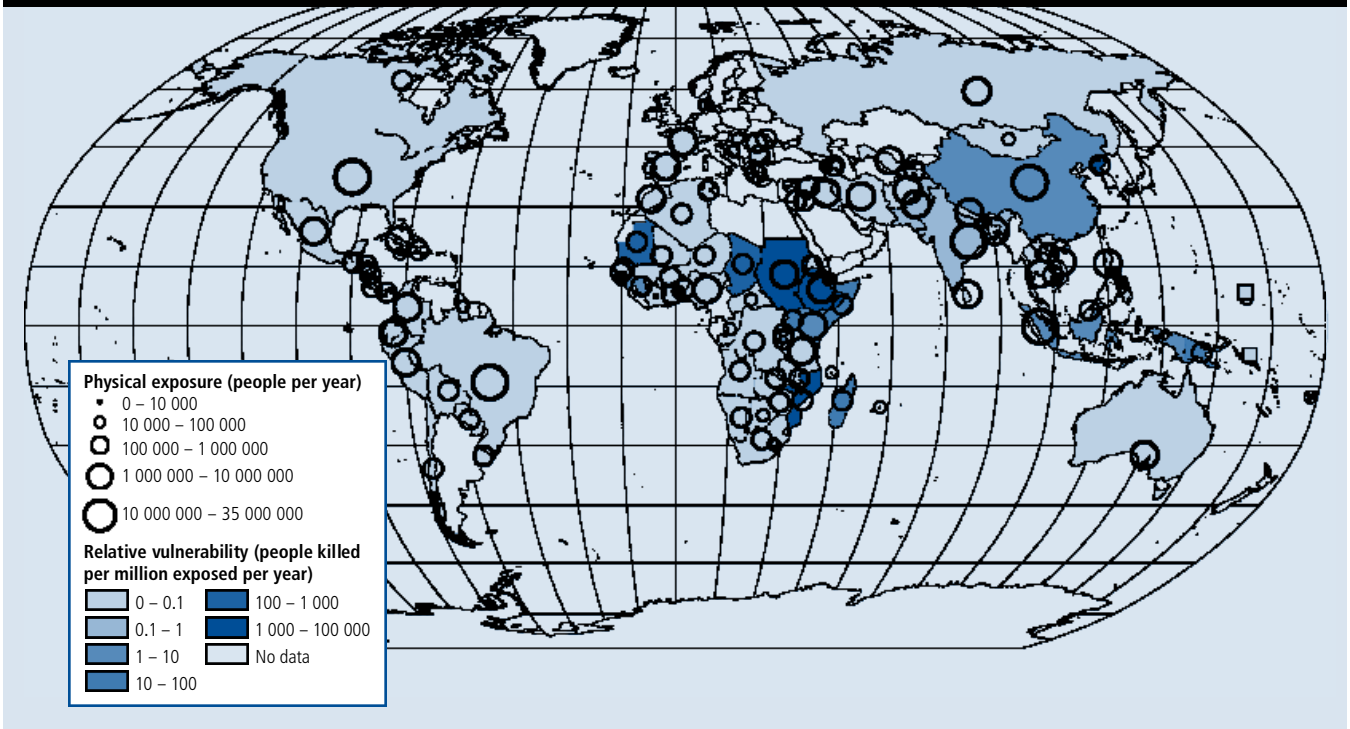
Relative vulnerability to drought and physical exposure are also presented as a world map in Figure 2.25 on the following page. Data for individual countries is in the Statistical Appendix.

2.4.2 Towards a multi-hazard disaster risk model

Is it possible to build on the individual hazard indices for earthquake, tropical cyclone, flood and drought to form a multi-hazard DRI? In this section, initial steps towards the development of such a tool are presented. The Technical Annex records the methodology and results.

Developing a multi-hazard DRI model serves two purposes. First, it is an opportunity to break with the

FIGURE 2.25 PHYSICAL EXPOSURE AND RELATIVE VULNERABILITY TO DROUGHTS, 1980–2000



Source: Université Catholique de Louvain: The EM-DAT OFDA/CRED International Disaster Database (victims); International Research Institute for Climate Prediction (droughts extent); CIESIN, IFPRI, WRI: Gridded Population of the World (GPW), Version 2 (population); Compilation and computation by UNEP/GRID-Geneva

use of disaster impacts (deaths) to indicate disaster risk. The multi-hazard DRI models risk based on socio-economic variables associated with past disaster losses. This opens the way for a concrete analysis of the interaction of development processes with disaster risk. Individual social processes can be examined in relation to disaster risk. Through time it will be possible to track changes in development policy, changing socio-economic status and disaster risk. Second, in combining risk associated with four hazard types, the multi-hazard DRI is working towards providing a sharp tool for policy advocacy.

From hazard to disaster risk

The multi-hazard model is built from the socio-economic variables associated with individual hazards and identified in Sections 2.2 and 2.4.

The socio-economic variables used were: for earthquake, physical exposure and urban growth; for tropical cyclone, physical exposure, percentage of arable land and HDI score; for flood, physical exposure, GDP per capita and local density of population; for drought, physical exposure and percentage of population with access to improved water supply.

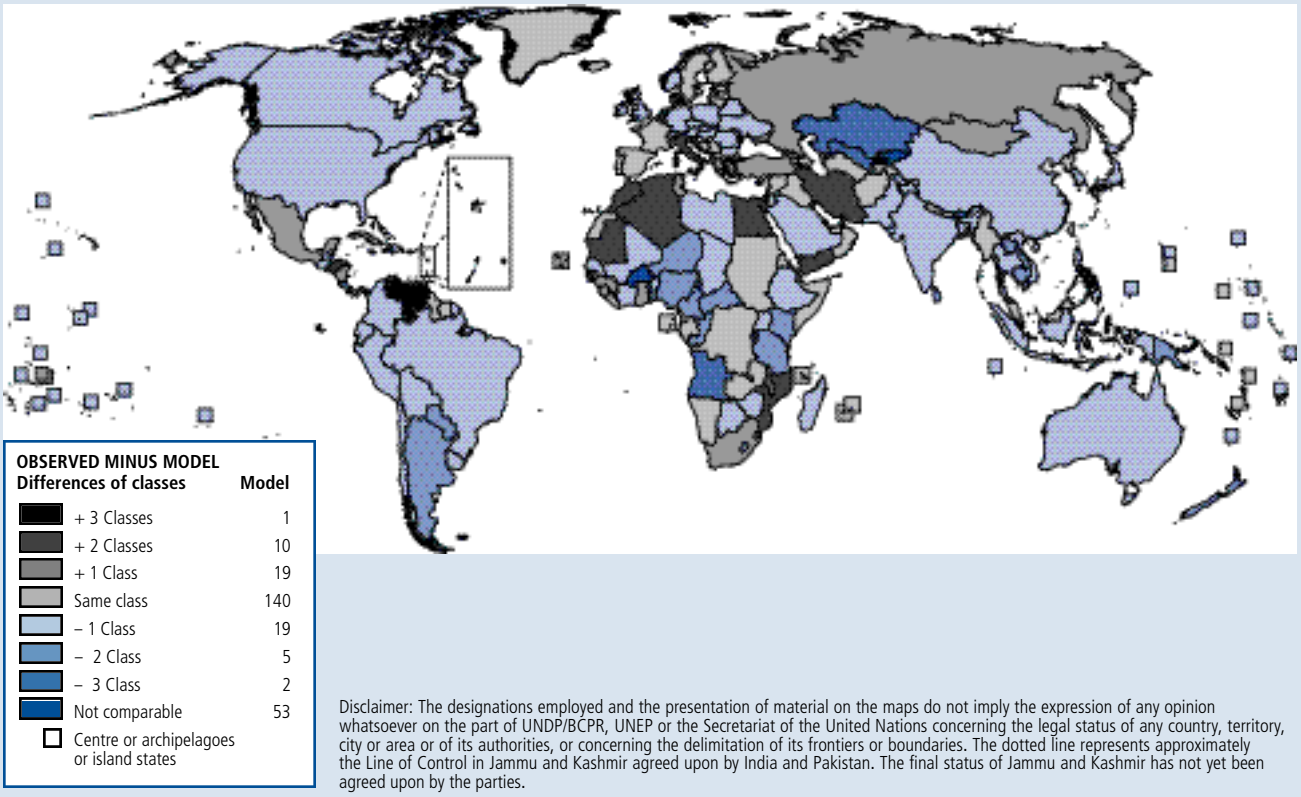
The potential for a multi-hazard DRI model is explored here by examining Figure 2.26, which shows differences between recorded deaths from EM-DAT and deaths calculated using the DRI multi-hazard model.

Even at this early stage, a number of conclusions can be drawn from the process of developing the multi-hazard DRI model.

Cases where the model overestimates people killed suggest the need to refine differences between poverty, as represented by HDI or GDP per capita,and vulnerability. Countries falling into this group are low income, for example Burkina Faso and Bhutan, but have recorded less people killed than the model suggests. This finding brings new weight to discussions about the utility of indicators of poverty in vulnerability assessments and the importance of governance. Lower recorded deaths may also indicate that episodic hazards with long time intervals between events, particularly earthquakes in Bhutan, did not coincide with the 1980-2000 period used in analysis.

Cases where the model underestimates people killed point to the influence of catastrophic disasters. For example, in 1999 about 30,000 people were killed in Venezuela associated with flooding and secondary landslide events.[12] Building a framework for analysis that can cope with small-scale local disasters and

FIGURE 2.26 DIFFERENCES BETWEEN OBSERVED AND MODEL CLASSES



Disclaimer: The designations employed and the presentation of material on the maps do not imply the expression of any opinion whatsoever on the part of UNDP/BCPR, UNEP or the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

Source: Geoprocessing, analysis and infography UNEP/GRID-Geneva 2003

catastrophic events is a challenge that the DRI model is working to address.

In 196 out of 249 countries,it was possible to compare the recorded and model deaths. Fifty-three countries were left out because of the absence of data. The drought hazard data was available, but with a low confidence on the ability of the vulnerability variables to capture driving pressures such as governance, armed conflict and HIV/AIDS, it was decided not to pursue analysis.

2.5 Improving Disaster Indicators

2.5.1 Improving Disaster Data

The DRI and other risk information systems use a deductive methodology[13] in which data on disaster impact is used as an indicator of *manifest risk*.

As was mentioned in Section 2.2, a key constraint is that reliable global data is limited to mortality. And this is only for large-scale and a part of the medium-scale disasters that occur. One opportunity for improving risk information,therefore, lies in improving the quality, coverage and accuracy of disaster data. Perhaps most required is more accurate data on losses and associated socio-economic variables with global coverage and sub-national resolution.

The Working Group 3 on Risk, Vulnerability and Impact Assessment of the Inter-Agency Task Force of the ISDR has recommended the development of a multi-tiered system of disaster reporting. In this system, disaggregated disaster data collected at the local level is progressively aggregated into national and global disaster datasets, using a unique global disaster identifier to link sub-national, national and global datasets.

The development of such a multi-tiered system of disaster reporting is a complex and challenging undertaking.

The collection of disaster data at the national level for all scales of development planning is a basic need if disaster risk is to be integrated into development planning. Only with this information can policies have the precision needed to tackle the variations in vulnerability and hazard that exist at the local level.

BOX 2.6 TOWARDS A MULTI-TIERED SYSTEM OF DISASTER REPORTING

The achievement of complete global coverage of national disaster datasets, using an appropriate comparable methodology, would be a major asset to risk analysis. Given the relatively significant coverage of national level disaster datasets in Latin America and the Caribbean, this requires promoting the compilation of national datasets in other regions such as Asia, the Pacific and Africa. Global coverage of national datasets is essential to underpin a range of upcoming initiatives, such as assessing the probable impact of climate change. A first step would be to survey additional national databases, especially to find out what more may be available at the national level and to bring those resources into the larger global effort

The consolidation of a system for creating a unique global disaster identifier for each disaster event is another important step in improving global disaster data. Right now, for example, a number of different institutions are involved in developing the Global Identifier (GLIDE) concept, originally proposed by the Asian Disaster Reduction Center (ADRC). GLIDE has been further developed by the Centre for Research on the Epidemiology of Disasters (CRED), the UN Office for the Coordination of Humanitarian Affairs (OCHA) and other partners in order to ease the linking of national and international datasets. GLIDE also permits disaster data to be annotated with reports, articles, photos and other material — a concept that is already being put into practice through the Relief Web project.

The adoption of a unique disaster identifier, based on GLIDE, in national datasets would allow the aggregation of disaster effects in different local administrative areas by disaster event. At the same time, it would allow the communication of medium-scale disaster events from national to international datasets, enriching global datasets like EM-DAT and enabling the integration of national and international reporting and data capture systems. In turn, this requires assistance with database integration and on-line access to participating countries and institutions. Other important steps include:

- The development of common reporting standards and protocols for capturing and exchanging data in both national and global databases with a view to increasing correlation and convergence.
- The development and promotion of methods and standards for capturing economic losses that are currently not adequately reported in either national or international disaster databases.
- The development of national capacities to compile and maintain disaster databases according to the common standards and protocols mentioned above. This requires the identification of national institutions able to undertake these tasks on a regular, predictable and sustainable basis. Previous experience with the development of national databases indicates that academic institutions may be the most appropriate to compile historical disaster inventories, while disaster management organisations may be appropriate to maintain and update disaster datasets on a day-to-day basis.

Source: Report of Working Group 3 of the Inter-Agency Task Force of the ISDR, October 2002[14]

National disaster databases have relatively good coverage in Latin America and the Caribbean, but far less so in other regions. While detailed assessments of the economic impact of particular large-scale disasters are carried out by The Economic Commission for Latin America and the Caribbean (ECLAC) and others, regular reporting of economic loss in disaster events is uneven and unreliable. Problems of data compatibility and definitions abound.

BOX 2.7 GLIDE – THE UNIQUE GLOBAL DISASTER IDENTIFIER

The GLIDE concept was developed by the Asian Disaster Reduction Center (ADRC) in association with the UN Office for the Coordination of Humanitarian Affairs (OCHA) Relief Web project, the Food and Agriculture Organization (FAO), the USAID Office of US Foreign Disaster Assistance (USAID-OFDA), the Centre for Research on the Epidemiology of Disasters (CRED) and other partners.

GLIDE was introduced in 2002 and makes the system of building an international database of national and sub-national disaster events much easier and more transparent.

Before the introduction of GLIDE in 2002, numerous organisations operated their own disaster databases. This meant searching the database of each organisation individually for every disaster. Sometimes different organisations would use different names for the same disaster, making searching more difficult. With no direct links between organisations, verifying data was also difficult.

Source: http://www.glidenumber.net/

Nevertheless, the potential for improving risk information, and in turn for informing development policy and planning, is so great that it is clear that this is an area in which major investments are both justified and required.

The current project of the Government of India and UNDP to develop a fully on-line system of disaster reporting at the state and national level is another example of innovative ongoing initiatives that start to address this challenge.

2.5.2 Enhancing the DRI

A constraint on the DRI was the availability of reliable global datasets based on hazard patterns and the socio-economic and environmental variables tested as vulnerability indicators. However, new datasets are constantly becoming available. Since the pilot DRI was completed, a number of new and potentially important datasets have become available which could be used to enhance and improve the accuracy and usefulness of the DRI model and expand it to additional hazard types.

It will be possible, therefore to generate further iterations of the DRI in the future with improved and enhanced datasets and on the basis of expert critique of the results and models used. Gradually, the DRI

should be able to produce a far more fine-tuned simulation of reality than was possible when this first pilot version was produced.

There are a number of other ongoing initiatives to develop indicators and indices on disaster risk and related themes. Of particular relevance to the mapping of disaster risk presented in this Report are two projects:

- In 2001, the World Bank, in association with Columbia University and the ProVention Consortium, commenced a Global Disaster Risk Hotspots research programme.[15]

- In 2002, the Inter-American Development Bank and Universidad Nacional de Colombia embarked on an Indicators for Disaster Risk Management in the Americas project.[16]

Both projects aim to develop decision-making tools to identify areas of high risk and causal factors underpinning risk with a view to help the targeting of national and international development investments. An overview produced for the Working Group 3 of the Inter-Agency Task Force of the ISDR is included as an Appendix.

Clearly, enormous potential exists for sharing data and feedback among the different methodologies and models used, as has already occurred in the development of the pilot DRI. Synergies between the different initiatives should be actively promoted and encouraged

2.5.3 Developing a disaster risk reduction indicator

The indicator of relative vulnerability for each hazard type developed in the DRI, presents a value which encompasses not only the different factors that increase the risk of mortality in a country, but also the factors that may decrease mortality. These latter factors include efforts being made in many countries to enhance disaster preparedness and mitigation and in some cases to manage and reduce disaster risks.

The importance of exposing capacities hidden in non-disaster situations is an overall challenge in promoting effective disaster risk reduction across the globe. The case studies included in Chapter 3 of this Report point to the range of actions being undertaken at the local and national levels to reduce disaster risk within the development process.

The pilot DRI did not include considerations of the relative capacity of countries in disaster risk management in the process of identifying and testing vulnerability indicators. In other words, the low relative vulnerability of a country to a given hazard may be due to the application of effective risk management measures. However, this cannot be captured by the DRI.

Potentially, if global datasets were to exist that measured in different ways countries' capacity to manage and reduce disaster risk, these could also be used as indicators within the DRI. This would enhance the advocacy role of the DRI by demonstrating how appropriate policy and planning interventions can reduce vulnerability to hazard.

The development of disaster risk reduction indicators is still at an early stage of development. The ISDR

BOX 2.8 THE ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN

The Economic Commission for Latin America and the Caribbean (ECLAC) has led the way in developing methodologies for calculating the economic impact of natural disasters. The division of impacts into direct, indirect and secondary losses presented in Chapter 1 were first developed by ECLAC.

In 2003, ECLAC published a Handbook for Estimating the Socio-Economic and Environmental Effects of Disasters. This is a tool for quantifying damages, identifying the most affected regions and those requiring priority attention during the reconstruction phase. It reckons that the total amount of accumulated damages to disaster in the region is probably more than US$ 65 billion. These losses primarily affect smaller, less developed countries, particularly in the Andes, Central America and the Caribbean.

Based on thirty years experience measuring the main disasters in the region, the ECLAC methodology for measuring damages and losses was first published in 1991. The revised methodology makes it possible to quantify economic, social and environmental effects.

ECLAC recently completed a study of the socio-economic impact of the January 2003 earthquake in Mexico's Colima state. The earthquake, which measured 7.8 on the Richter scale, affected the Mexican states of Colima, Jalisco and Michoacán. It caused 28 deaths and injured many more and caused considerable damage. Using the revised ECLAC methodology, an assessment of impacts in Colima state set the total amount of damages at about US$ 90 million, or 3 percent of its GDP in 2002, one of the highest losses to a natural disaster in Mexico in recent years.

After the flooding in Argentina's Santa Fe province in April 2003, the regional government requested an evaluation from ECLAC, which was carried out jointly with the UNDP. The final report estimates that losses reached US$ 1 billion.

Source: http://www.eclac.cl/analisis/TIN53.htm#6

BOX 2.9 A FRAMEWORK TO GUIDE AND MONITOR DISASTER RISK REDUCTION

Monitoring progress towards development and disaster risk reduction goals is made more transparent when measured by shared criteria.

The UN International Strategy for Disaster Reduction (ISDR) and UNDP have proposed a framework of five thematic areas each opening up to reveal a cluster of disaster risk management concerns with potential benchmarking tools. The Framework was presented by ISDR in 2002 in Living with Risk: A Global Review of Disaster Reduction Initiatives.

The thematic areas that drive the proposed framework are: governance, risk identification, knowledge management, risk management and preparedness, and emergency management. There are a host of suggested benchmarking tools to measure standards of practice. These include elements of policy and planning, legislation, codes and their enforcement, availability and use of disaster risk and impact assessments, education and training, the existence of social security and financial instruments for risk burden sharing, and the coverage of community-based preparedness.

This is an ambitious agenda covering a huge variety of organisational practices and technical specialisms. It will require international support. One possibility is to tie indicators in with the MDGs and other sub-national development targets. This will prevent unnecessary duplication of effort. Similarly, the Framework will need to specify which actors or partnerships of actors have responsibility for undertaking or completing individual tasks. To succeed as a vehicle for changing practices, the framework will need to be accepted by multiple stakeholders from civil society, the private sector and government agencies. To do this, these groups' participation in the planning process is paramount.

From 25 August 2003 to 26 September 2003, the Framework was presented for open scrutiny in an on-line conference. The need for tools to help enhance the transparency of the process of building disaster risk reduction into development planning was reinforced, as was the need for a flexible set of benchmarks that are robust, yet sensitive to local context.

Source: Source: http://www.glidenumber.net/

Secretariat and UNDP are currently working to develop a core set of indicators as a proposal to further develop a methodology against which to guide and monitor disaster risk reduction and are the result of an expert consultation.As a starting point to this process, the Secretariat has prepared a core set of principles and goals.[17]

2.5.4 The development of national level DRIs

As we have emphasised, the purpose of the global DRI is to illustrate relative patterns of vulnerability and risk between countries. Its goal is to provide evidence of the contribution of development to the configuration of disaster risk and to advocate for a change in development policy and planning. It is also of use to international organisations that may wish to set priorities according to a quantitative measure of relative risk between countries at the global level.

However, if disaster risks are to be managed and reduced, change in development policy and planning is required at the national level. In order to inform such change, the development of national level risk indicators and indices is required.

The development of DRI, with a national level of observation and a local level of resolution, that would enable the identification and explanation of relative risk and vulnerability, have enormous potential to support national development planning.

There are two main criteria for selecting in which countries to develop national level DRI. The global DRI analysis points towards those countries where risk to a given hazard is greater and where a national level DRI would be most useful. Indeed, all countries would not need to be covered for all hazards if they were not affected, or had a low level of risk.

A second consideration is data availability. As we have discussed above, national disaster data currently exists only for a small number of countries, mainly in Latin America and the Caribbean, and this would be a limiting factor on the development of national DRI. In contrast, in many countries at the national level there are relevant datasets that can be used to identify and test a far larger and better attuned variety of socio-economic and environmental vulnerability indicators than is possible at the global level. Building up national level databases of local conditions of vulnerability, to complement those national databases of local occurrences and impacts of disaster discussed above, would provide a strong foundation for fine-tuning the global assessments of disaster risk at the national level.

Recognising the weight of small and medium disaster events in total disaster losses has critical implications for our understanding of how risk is generated and accumulates at the local and national levels. A similar conclusion is presented in the *Human Development Report, 2003*. Here, the mapping of sub-national data for conflict with human development index scores makes clear the spatial bounding of exposure to conflict in Indonesia,Colombia, Nepal and Sri Lanka.[18] Variance in levels of exposure to conflict and differing development status at the local level are revealed by a

sub-national resolution and supported by sub-national level HD indicators.

This again points to the need for a multi-layered, nested approach to collecting data on disasters and linking risk analysis with development policy.

The global scale of observation is most useful for highlighting national priorities for action to confront failures of development and disaster risk management. Hurricane Mitch in Honduras was clearly such a case. Developing targeted risk reduction programmes below the international scale requires a local focus based on local disaster data gathering. Building the picture up from the local to the global again can indicate those countries that have experienced comparative success or failure in tackling development and disaster management weaknesses.

Note on physical exposure: physical exposure represents the number of people exposed per year to a particular hazard. This means that for some cases, this figure can be higher than the population of the country when a hazard is affecting a large part of the population and more than once per year. For example, in the Philippines, the population is hit by 5.5 cyclones per year. On average therefore, the physical exposure is much larger than the population.

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1. One of the first and most complete definitions of vulnerability was developed by Gustavo Wilches-Chaux. See Wilches-Chaux, Gustavo, "La Vulnerabilidad Global in Maskrey," Andrew (Ed), 1993, Los Desastres no Son Naturales, LA RED, Bogota, Colombia.
2. See Lavell, Allan in Fernandez, Maria Augusta, 1999, Cities at Risk: Environmental Degradation, Urban Risk and Disasters, LA RED/USAID, Quito, Ecuador.
3. Maskrey, Andrew and Romero Gilberto. 1986. Urbanizacion y Vulnerabilidad Sismica en Lima Metropolitana, PREDES, Lima.
4. Salazar, A. (2002) Normal Life after Disasters? 8 years of housing lessons, from Marathwada to Gujarat, Architecture + Design, New Delhi, Jan/Feb.
5. http://www.desinventar.org/sp/proyectos/lared/comparacion/index.html
6. http://www.sinaproc.gob.pa/estadisticas.htm
7. IFRC World Disasters Report 1998.
8. Famine deaths are also included in this figure.
9. Dreze and Sen 1998. Hunger and Public Action, Oxford University Press; Oxford.
10. **Major conflict:** At least 1000 battle-related deaths.
11. **Minor conflict:** At least 25 battle-related deaths per year and fewer than 1000 battle-related deaths during the course of the conflict.
12. EM-DAT: The OFDA/CRED International Disaster Database, Universite Catholique de Louvain, Brussels, Belgium.
13. A discussion of deductive and inductive models for risk modelling is presented in Maskrey, Andrew, 1998, Navegando entre Brumas: La Aplicacion de los Sistemas de Informacion Geografica al Analisis de Riesgos, LA RED, Bogota.
14. http://www.unisdr.org/task-force/eng/about_isdr/tf-meeting-6th-eng.htm
15. For more information and contact details, see appendix on international initiatives at modeling risk.
16. Indicators for Disaster Risk Management in the Americas. This project was initiated in August 2002 and involves the Instituto de Estudios Ambientales (IDEA), Universidad Nacional de Colombia and the Inter-American Development Bank (IDB). It is Component II of a technical cooperation entitled an Information and Indicators Programme for Disaster Risk Management in Latin America and the Caribbean. This indicators programme is developing an assessment methodology to measure key elements of countries' vulnerability and the performance of different risk management tools. The purpose of the project is to improve decision-makers' access to appropriate data and methodologies needed to meet the challenges of reducing and managing their risk to natural hazards in the region. Testing of the indicators methodology will be done in approximately 10 countries and include: (i)The definition of vulnerability and performance indicators for disaster risk management and their conceptual foundation. (ii) The design of the data/information collection method (iii) The testing of the indicators methodology in selected countries. The project will also finance a regional technical workshop with policy makers and experts from the region to evaluate the assessment methodology and disseminate results. For information regarding the indicators programme and its conceptual framework see: Cardona 2003, http://idea.unalmzl.edu.co/
17. See ISDR Secretariat 2002.
18. UNDP Human Development Report 2003, p. 48.

Chapter 3
DEVELOPMENT: WORKING TO REDUCE RISK?

For many people across the globe development does not appear to be working. The increasing number and intensity of disasters with a natural trigger are one way in which this crisis is manifest.

In the preceding chapters,the disaster-development relationship has been outlined and the extent of disaster risk and the key variables of human vulnerability found at the international scale have been reviewed. In this chapter, the analysis is expanded by providing more concrete evidence for the ways in which failures in development configure and prefigure patterns of disaster risk.

The central message of this chapter is that the strategic integration of disaster risk management within development planning can make a significant contribution to meeting the MDGs.

The choice of topics to be covered is guided by the evidence presented in Chapter 2. The variables of urban growth and agricultural land use were associated with vulnerability and the first task of this chapter is to use urbanisation and rural livelihoods as lenses through which to examine the disaster and development relationship. Neither urbanisation nor rural livelihoods are static phenomena and for each a key dynamic pressure is discussed — economic globalisation for urbanisation and global climate change for rural livelihoods.

The analysis of vulnerability undertaken by the DRI model is limited to those variables for which global datasets exist and can be compiled at the international level. Right now, a number of important development pressures, in which case study evidence suggests a close connection with disaster risk, do not have datasets of the necessary coverage and quality.

The second section of Chapter 3 aims to partially fill this gap by outlining the influence of violence and armed conflict, the changing epidemiology of disease (HIV/AIDS), governance and social capital on the disaster-development relationship.

Throughout the Chapter, case material and examples of good practice in overcoming development constraints are presented.

In a final discussion, the evidence provided in the Chapter is reviewed against the MDGs.

3.1 Risk Factors

In this section, an overview of two key variables that were associated with disaster risk in the DRI: *urbanisation* and *rural livelihoods,* is presented. For each, a critical dynamic pressure likely to shape the future characteristics of these variables is also examined.

For urbanisation, *economic globalisation* is discussed, and for rural livelihoods, *global climate change* is discussed.

In reality, both urbanisation and rural livelihoods will be impacted by economic globalisation and climate change while simultaneously interacting with each other through migration, financial flows and the transfer of information, goods and waste products.

In addition to urbanisation and rural livelihoods, the national HDI rank was associated with vulnerability to tropical cyclones in the DRI. In the analysis presented in this Chapter, the focus is on critical sectoral relationships rather than the broad background of human development. Consequently, HDI rank is integrated into the text, but not discussed as a separate theme. Similarly, rather than structure a discussion around environmental variables identified by the DRI (access to drinking water and man-made environmental degradation for drought hazard, and physical exposure for all other hazard types), they have been integrated into discussion throughout the Chapter. Environmental sustainability could be a theme for future editions of the Report.

3.1.1 Urbanisation

During the next decade, most of the world's population increase will occur in urban areas in the countries of Africa, Asia and Latin America and the Caribbean, with more than half of the world population becoming urban by 2007.

The average size of the world's 100 largest cities increased from 2.1 million in 1950 to 5.1 million in 1990. In developing countries, the number of cities with more than 1 million people has jumped sixfold since 1950. In the year 2000, the number of cities larger than 5 million was 41, and the United Nations believes this number will increase to 59 by 2015. This will add another 14 million people to the streets and homes of large cities. The complexity and sheer scale of humanity concentrated into large cities creates a new intensity of risk and risk-causing factors. This is a real challenge for planning and for the ability of the market to provide basic needs.[1]

It is in small- and medium-sized towns that the majority of the urban population live. In 2000, more than half of the world's urban population lived in towns of less than 500,000 people.[2] Smaller cities contribute less pollution to global climate change, but show high levels of internal environmental pollution and risk.[3] In smaller cities, very high rates of urban growth often coexist with a very limited technical and financial capacity to plan for and regulate urban expansion. That means that disaster risk considerations are very rarely factored into the urban development process.

The complexity of risk and vulnerability in cities suggests that dedicated high resolution data collection systems would be required in order to identify patterns of hazard, vulnerability and risk at a scale that can provide information for urban planning. For example, the national level disaster databases described in Chapter 2 point to house fire as a critical cause of death and loss in cities, a hazard type that is not highlighted in international databases.

The relationships between urbanisation and disaster risk are extremely complex and clearly context specific. Urbanisation does not necessarily have to lead to increasing disaster risk and can, if managed properly, contribute to reduce it. However, there are a number of key characteristics of the urbanisation process that can directly contribute to the configuration of risk.

Risk by origin

As was outlined in Chapter 1, cities may have been founded in highly hazardous locations for both political

and economic reasons. Lima, Peru for example, was a major political and economic centre in South America in the colonial period, but was founded in an area of very high seismicity. The city was severely damaged by destructive earthquakes in 1687,1746,1940,1966 and 1970.This constitutes a case of *risk by origin* shared by other urban centres founded in the colonial period in Asia, Latin America and the Caribbean and Africa.

Increasing physical exposure

The urbanisation process leads to the concentration of population in cities and in districts within cities: both megacities and rapidly expanding small- and medium-sized urban centres. When populations expand faster than the capacity of urban authorities or the private sector to supply housing or basic infrastructure, informal settlements can explode. Some 50 percent to 60 percent of residents live in informal settlements in Bogota, Bombay, Delhi, Buenos Aires, Lagos and Lusaka; 60 percent to 70 percent in Dar es Salaam and Kinshasa; and more than 70 percent in Addis Ababa, Cairo, Casablanca and Luanda.[4] In these conditions, everyday risks accumulate and prepare the way for disaster.

When cities are located in hazard-prone locations, this leads to a rapid increase in the number of people exposed to hazard — a phenomenon that has been described as physical exposure in the DRI.

Clearly, physical exposure itself does not explain nor automatically lead to increased risk.If urban growth in a hazard-prone location is accompanied by adequate building standards and urban planning that takes into account risk considerations, disaster risk can be managed and even reduced.

One way of planning to reduce urban risk is to compensate for losses in one neighbourhood by shifting patterns of production, consumption and servicing to nearby unaffected districts. This is difficult in the cities of Low and Middle Human Development countries, where more than half of the urban population may be living in illegal and unserviced neighbourhoods.

Despite less than half of Asia's population being urban, this world region includes six of the 10 largest cities in the world. Its importance as an urbanising region is set to increase as Asia and the Pacific has the highest urban population grow rate (2.7 percent) of any world region.[5]

BOX 3.1 EARTHQUAKE HAZARD AND DWELLING CONSTRUCTION STANDARDS: ALGERIA AND TURKEY

Algeria and Turkey are both recorded as having high vulnerability to earthquakes in the DRI. As Medium Human Development Countries with large urban populations exposed to earthquake hazard, they exhibit many of the characteristics of other countries at risk from earthquake hazards.

Lack of appropriate construction standards and failure to implement those standards that do exist are often sited as proximate causes of building failure and human loss from earthquakes in urban areas. In 2003, an earthquake causing more than 2,200 deaths hit Algiers and surrounding towns. Building collapse caused many deaths. It was found that public sector buildings (with the important exception of primary schools) were better constructed than buildings (mainly homes) in the private sector. This may be expected in a city with a sizeable informal housing sector, but the ability to construct appropriately in the public sector suggests that capacity does exist for safe building to be undertaken in the city.

Research following the Marmara earthquake in Turkey in 1999 has shown that high competition for contract design work and low levels of remuneration have reduced engineers' willingness to develop professional competence in disaster-proofing. Design engineers tend not to inspect on-site construction, allowing modifications that can compromise the buildings' resistance to earthquakes. The inability of municipalities to employ sufficient numbers of well-trained and paid personnel to inspect building work contributes to this dilemma. One possibility is to transfer construction supervision to the private sector with costs being carried by developers.

Source: Özerdem, A. (2003), and Government of Algeria (2003); www.proventionconsortium.org/articles/innovations.htm

The significance of both disasters and urbanisation for development in Asia has led to a number of innovative urban disaster risk management initiatives.

A number of projects have been implemented in the Philippines. For example, a project to reduce the vulnerability of two cities to natural hazards,beginning with the mitigation of floods in Naga City and followed by multi-hazard mitigation in San Carlos. In addition to hazard mapping and mitigation planning, the project emphasizes land-use planning, the formation of disaster management standards and the training of urban professionals. This is one of nine national demonstration projects initiated by the Asian Urban Disaster Mitigation Programme (AUDMP). Other projects are underway in Bangladesh, Cambodia, India, Indonesia, Lao PDR, Nepal, Sri Lanka and Thailand.[6]

Social exclusion

Compared to rural areas, risk accumulation in cities is shaped by greater levels of social exclusion and the market economy.[7] Social exclusion is tied to the high number of migrants at risk among rapidly expanding

BOX 3.2 COMMUNITY PARTICIPATION AND THE URBAN ENVIRONMENT IN RUFISQUE (SENEGAL)

Through community participation, nine low-income communities in the small Senegalese town of Rufisque were able to break the cycle of local risk accumulation and turn a public nuisance into a public asset.

Risk stemmed from a lack of sanitation. Much residential land lies below sea level and ground water sources of drinking water are easily polluted by sewerage from pit latrines. Together with the pollution of open spaces by excrement, dirty flood water and sewage has had a devastating effect on the health of the population, especially the children. Statistics prior to 1990 show high incidences of diarrhoea, dysentery and skin diseases.

Change began during the 1980s, when a government/INGO project was implemented to reinforce the coast and prevent loss of houses from coastal erosion. During this time, it became clear that the community was capable of joint action to improve the area. Today, through community efforts aided by Environmental Development Action in the Third World (ENDA-Third World) and The Canadian Host Country Participation Fund, and in collaboration with the Rusfique Local Authority, sanitation problems are well on their way to being solved. Horse-drawn carts collect rubbish and low-cost, narrow plumbing pipes dispose of waste water and sewage. Sewage, waste water and refuse all end up in a purification and recycling centre where young people treat and combine them to form compost for use in market gardens. The scheme is run by local management committees, which are democratically elected. Local people handle technical aspects and women and young people are active at all levels. In addition, most of the funding comes from the community itself and credit, initially provided by international funding, will soon no longer be necessary as it will be replaced by a local revolving credit system.

The local community actively participates in the scheme and women are prominent in all of this. Along with the other benefits, the project has enormously reduced the workload of women, compared to the situation before the scheme began. The safe disposal of rubbish, the elimination of excrement as a source of disease, the reduction of flies and mosquitoes and their accompanying diseases (such as malaria), have all improved both ecology and health. At the community level, the sanitation scheme reinforces the independence of the community and increases a sense of citizenship through training and interaction between various groups.

Above all, this example of urban governance and disaster risk reduction reveals a successful solution well suited to low-income areas.

Source: Gaye and Diallo (1997)[8]

urban populations. Social ties may be strong, but nevertheless tend to be less deeply held than those of rural communities. The market for goods in the city means little can be acquired without money, contrasting with rural areas, where it is often possible to obtain construction materials, water and food without the need of first earning money.

Little is known of the detailed interaction of multiple hazards with livelihoods and coping strategies in cities. Work by PeriPeri and the Disaster Mitigation for Sustainable Livelihoods Programme, based in the University of Cape Town in South Africa, is one initiative that is seeking to generate knowledge in this area for Southern Africa.[9] This is a first step in identifying the different qualities of disaster risk that affect different social groups, defined for example by age or gender, and for including those individuals most at risk in development planning programmes.

Migrants to the city are often at high risk from disaster. The functioning of land and property markets and inability of land-use planning to cope with rapid population growth means migrants frequently locate in hazard-prone locations. For example, in peripheral squatter settlements located in ravines, on unstable slopes or in flood-prone areas, or else in dense inner city slums.

Poor or non-existent sanitation, high unemployment and underemployment, deficient health and education services, insecure land tenure, crime and violence, and other factors configure a panorama of everyday risk.

For individuals caught up in the immediate concerns of daily survival,disaster risk management is often not a priority. However, at the scale of the city and over the medium- to long-term, sustainable development rests on the successful integration of disaster risk management into development planning. This is beginning to be recognised, for example, in the 1996 Habitat Agenda 'Disaster Prevention, Mitigation and Preparedness, and Post-disaster Rehabilitation Capabilities'.[10] Municipal government will have a central role to play in strategic planning for disaster risk at this scale.

Modification and generation of hazard patterns

Through processes of urban expansion, cities transform their environments and their surrounding hinterlands and may generate and create new hazard patterns. For example, seismic hazard may be significantly greater on reclaimed wetlands and on landfills than in other areas of a city. The destruction of mangroves in coastal areas may increase hazard associated with storm surge. The urbanisation of watersheds — through settlement, land use change and infrastructure development — may modify the hydraulic regime and destabilise slopes and increase flood and landslide hazard.

Additionally, in cities the hazards of natural origin interact with those of technological and man-made origin. Inadequate waste disposal in riverbeds and ravines may cause floods. Refuse tips may themselves become hazards, as occurred in the Philippines in 2000 (killing 300) and Bogota in 1997. When natural hazards affect industrial plants, the resulting contamination and pollution may constitute additional and more serious hazards. In other words, cities are not just affected by hazards, they can be generators of hazards.

In Calcutta and Baroda, a project by the Asian Urban Disaster Mitigation Programme (AUDMP), Baroda Citizens Council (BCC), assisted by Urban Studies Centre and Times Research Foundation with input from the Government of India, has identified numerous manufacturing and hazardous materials storage sites that magnify natural hazard in densely populated urban areas of the two cities. The project consists of hazard mapping and vulnerability assessment, the development of guidelines for incorporating technological hazards into urban development planning, and implementing a mitigation strategy and emergency preparedness plan.[11]

As it transforms the natural environment in and around cities, urbanisation generates and magnifies hazard problems. Quito exemplifies this relationship well as unplanned urbanisation and environmental degradation are compounding the hazards faced by a city population whose vulnerability and exposure are also increasing.

Between 1960 and 1995, the population of Quito quadrupled while its land area has also exponentially increased. The mountainous topography, where unplanned peri-urban settlement takes place, makes it difficult and expensive for the state to provide drinking water, sewerage, paved roads, electricity, waste collection and other services. The rate of deforestation through urbanisation has reached 247 hectares per year or more, increasing the instability of slopes and landslide hazard. Approximately 3,200 tons of solid waste per year is disposed of in ravines, obstructing drainage and increasing flash flood hazard. Brick manufacturing accounts for the destruction of another 116 hectares of forest per year while access roads also destabilise mountain slopes. The increased incidence of floods, flash floods, landslides, erosion and debris flow is being generated by the urbanisation process as the city configures its own risk scenario.[12]

Increasing physical vulnerability

In low- and middle-income countries, city governments have often proved ineffective in regulating the process of urban expansion through land-use planning and building codes. Unregulated low-income settlements, where land values are lowest, often occupy the most hazard-prone locations. Low building standards may reflect a lack of control and supervision in middle-income areas and the lack of resources to build hazard-resistant structures in low-income areas.

Hazard-prone locations are often preferred by the poor as a way of reducing everyday risks by gaining greater accessibility to urban services and employment, even though natural hazard risk may be increased. In central Delhi, a squatter settlement in the floodplain of the Yemuna River has been inhabited for more than 25 years. The settlement floods annually, but this is seen as the price to pay for living in the centre of the city at low cost.[13]

Rapid urban growth may also be accompanied by the physical and economic deterioration of established city areas, which were not necessarily risk-prone originally. Cities are not static and different areas fulfil different functions over time. The vulnerability of low-density residential areas in central locations can rapidly increase due to overcrowding and lack of maintenance as the former owners move to the suburbs and the area is transformed into a mixture of commerce and low-income rental housing. In Manila, the Philippines, for example, local flooding is concentrated in such densely populated areas and compounded by limited access to garbage collection, sanitation and drinking water.

The overcrowding and deterioration of inner city slum areas in Lima, Peru has been identified as a critical process of seismic risk accumulation in that city.[14]

Cultural assets at risk

Historical architecture is an important part of cultural heritage. This is valuable in itself, but also plays a role in economic development through helping to attract foreign investment or strengthen the tourism sector. The old centre of Quito provides an example of national architectural heritage at risk from disaster. The colonial architecture — that makes central Quito a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site — is

BOX 3.3 THE HURRICANE RESISTANT HOME IMPROVEMENT AND INSURANCE PROGRAMME FOR INFORMAL HOUSING IN THE CARIBBEAN

Small Island Developing States have some of the highest risk to tropical cyclones. Despite this, property insurance is generally not available to low-income households in the Caribbean. This is due to a combination of lack of legal property title, non-standard housing construction and affordability.

During the mid-1990s, the Caribbean Disaster Mitigation Project (CDMP) in collaboration with the Cooperative Housing Foundation introduced a Hurricane Resistant Home Improvement Programme in Dominica, Saint Lucia, St Kitts/Nevis and Antigua and Barbuda. Working through local NGOs, a training programme was initiated for building contractors, artisans and others working in the formal and informal building sectors. More than 145 local craftsmen were trained in safer construction techniques in Saint Lucia and Dominica. Safer construction manuals and minimum standards checklists were developed to guide retrofitting and home improvement work. NGOs also worked with local actors to establish a revolving loan fund to extend credit to low-income households to finance retrofitting work.

By 2001, the Saint Lucia safer housing programme had disbursed 43 home improvement loans and as of 2002, 371 homes have benefited from the programme. Although property insurance is generally not available to low-income households in the Caribbean, retrofitting was used to convince a local insurance broker to offer a group-based insurance programme for the beneficiaries of the scheme. Loan officers were trained in valuing the property and assessing the level of risk, which helped in keeping the underwriting costs low and making this innovative entry from the formal property insurance sector into the informal housing sector a reality.

Source: Vermeiren (2000), USAID (2001)[15]

as exposed to earthquake and volcanic hazard from the La Pichincha volcano as the low-income communities that live among the historical buildings in the overcrowded and poorly maintained city centre. The municipal government recognises this risk and has integrated architectural heritage into its disaster preparedness plan.

Urbanisation of new regions

Urbanisation can also configure new risk patterns over wide areas of territory as new economic relations unfold and communications links are developed. The construction of roads that link previously isolated areas to markets can trigger a rapid process of urban growth and territorial transformation — leading to a configuration of completely new risks that were not present previously. For example, the earthquakes that occurred in the Alto Mayo, Peru in 1990 and 1991; Limon, Costa Rica in 1991; and the Atrato Medio, Colombia in 1992; exposed new patterns of risk through urbanisation in regions that had a history of seismic activity, but which had never experienced earthquake disasters of this type before. Rapid expansion of urban corridors, for example, along China's coast are actively reshaping patterns of exposure.

Disasters, such as the one associated with the landslide of Chima in La Paz, Bolivia in March 2003, point out the ways in which urbanisation can configure disaster risk. Landslide hazard had been shaped by mining activity that over time had weakened the stability of the hillside of Cerro Puculama. At the same time, the population of Chima was made up of temporary migrants dedicated to mining activities and with high levels of social and economic vulnerability. In this context, the heavy rains that provoked the landslide only transformed a scenario of pre-configured disaster risk.[16]

Access to loss mitigation mechanisms

Small hazard events that do not grab headlines destroy poor people's livelihoods and homes. Local floods, fires and landslides are a common occurrence in many cities. For low-income communities, risk is tied to a hazardous living environment with limited access to emergency services, sanitation or drinking water. For middle-income communities, scope exists for affordable housing insurance (whether arranged through a NGO, government agency or a commercial company) to act as a mechanism for spreading risks and losses if disaster strikes. Box 3.3 discusses a programme aimed at building resilience to risk by extending access to household insurance to low-income groups in the Caribbean.

There are many more examples of participatory urban risk reduction driven from the bottom up.[17] Box 3.4 presents a case study of a participatory approach to urban risk management in Angola,which points towards the possibilities for bringing local actors, the government and private sector together in risk reduction.

According to the World Disasters Report, 'effective and accountable local authorities are the single most important institution for reducing the toll of natural and human-induced disasters in urban areas. An increasingly urbanised world actually holds the potential to greatly reduce the number of people at risk from hazards, but only if urban governments become more accountable to all their citizens'.[18] This echoes work on urban governance that also argues for the key role to be played by municipal government as a champion for governance — linking public, private and civil society actors in the city and bridging the gap between international and national level actors on the one

BOX 3.4 THE LUANDA-SUL SELF-FINANCED URBAN INFRASTRUCTURE PROGRAMME, ANGOLA

In 2000, The Luanda-Sul Self-Financed Urban Infrastructure Programme in Angola won a Dubai International Award for Best Practices in Improving the Living Environment.

The programme succeeded in integrating the aims of reducing everyday hazard with those of enhancing development opportunities. Daily life hazards for residents were reduced through extending access to urban infrastructure. This included the construction of 70km of pipes providing drinking water, 23km of drainage, 12km of power lines, and 2,210 houses and adequate shelter for 16,702 people. Development gains were made in the process of enacting the programme by providing livelihood opportunities, enabling local participation and engaging the private sector.

The programme was initiated in 1995 as a partnership between Government agencies, the private sector, community-based organisations and the population living in temporary settlements, many of whom have been displaced by war.

Finance for the project came from three sources. First, the sale of land tenure rights derived from the allocation of public land for private development. Second, taxes raised from the sale of goods and services. Third, investments made by the private sector. The willingness of private investors to become involved in the programme was made possible through the Government issuing guarantees for private investments. The programme involved an initial investment of US$ 30 million and a subsequent investment of US$ 14 million.

The community participated in the design and planning of the programme and members were given the first option to buy land. Technical and human resources came from a team of urban and infrastructure experts. In addition, some 4,000 jobs were created in the implementation phase of the programme.

The process involved the identification of suitable land for urban development, the acquisition of the land from landowners by the state, the legislation of the status of the land according to a land-use plan and the mobilisation of capital investment by the private sector. Infrastructure development includes community facilities, schools, commercial establishments, an industrial estate and a hospital.

Continuity is provided as the programme is now part of the Luanda Master Plan, supported by the World Bank.

Source: http://www.sustainabledevelopment.org/blp/awards/2000winners/summary.pdf

BOX 3.5 URBAN GOVERNANCE FOR URBAN DISASTER RISK MANAGEMENT, MANIZALES (COLOMBIA)

Earthquakes are a recurrent hazard for Manizales. In the late 19th century, authorities banned the use of inherited colonial building technology and Manizales developed its own earthquake-resistant building style using local materials. This wall-building bahareque technique, based on wooden elements and local bamboo, has become the predominant method of construction in Manizales. Colombia's national earthquake-resistance building code today recommends using this building technique in publicly subsidized homes after structural studies were made in the local university. The success of this technique was evident during the massive earthquake of 1938, which did not damage the city significantly. Similarly, the earthquakes of 1962, 1964, 1979, 1995 and 1999 caused only minor or moderate damage.

Since the 1980s, the city has had a municipal disaster prevention system in place, based on municipal development and land-use plans, that incorporates disaster risk management as a strategic and political cornerstone. Disaster preparedness has become part of the city's culture. Prevention-related information and education activities are conducted regularly in schools. Drills are held periodically to ensure that awareness and alertness remain high. The mayor has a disaster risk advisor for inter-agency coordination and the city employs a team of professionals who work at scientific research centres. All residents who take steps to reduce the vulnerability of their homes receive a tax break as an incentive. A collective and voluntary housing insurance scheme has been promoted by the city. It is added to local bimonthly tax payments, with the aim of covering the tax-free lower socio-economic strata, once a defined percentage of taxpayers paying for the insurance has been achieved. Seismic micro-zonation has enabled the local administration to estimate the expected annual losses of its public buildings and insure them selectively.

The city administration of Manizales has produced a disaster risk plan that aims to translate state-of-the-art theory into practice, transfer best practices from current experiences in other places, focus on local participation and sustainability, and build in local ownership. Broader integrated risk management activities have reinforced a number of themes and issues related to organisational structures and inter-organisational coordination for risk identification and reduction, preparedness, response and recovery.

Source: Cardona et al (2002); http://www.alcaldiamanizales.gov.co/Manizales_Alcaldia/Informacion/Gestión+del+Riesgo/

hand, and urban or community level organisations on the other. Box 3.5 presents a successful urban governance regime case study that has reduced risk in Manizales, Colombia.

A dynamic pressure: economic globalisation

'We believe that the central challenge we face today is to ensure that globalisation becomes a positive force for all the world's people'.

This extract from the statement of the Heads of State and Government of the United Nations in the Millennium Declaration was accompanied by a recognition that global economic and political ties — for the first time in history — offer an opportunity to fully confront global poverty.

Economic globalisation is not a new phenomenon, but the characteristics of the present form are distinctive from those of previous centuries. Shrinking space, shrinking time and disappearing borders are linking people's lives more deeply, more intensely, more immediately than ever before.[19]

Today's version of economic globalisation consists of the creation of new markets, the development of new

tools of communication, a global forum for negotiating economic interests (the World Trade Organization or WTO), and the elaboration of new rules relating to trade, services and intellectual property supported by powerful enforcement mechanisms.

From the point of view of disaster risk, the growing interconnectedness of global society means that catastrophic events in one place have the potential to affect lives and public policies in distant locations. At the same time, globalisation also has the power to shape new local economic relations and subsequent geographies of risk.

Niche territories that may offer competitive advantages in a given economic sector may experience very rapid economic and urban growth, while other territorial niches enter into an equally rapid decline.

Given that the decisions that generate such conditions (such as free trade agreements) are taken at the international level and without detailed knowledge of the territories potentially affected, it is not surprising that risk patterns are generally not considered.

Strengthening mechanisms for collecting accurate, detailed information on risk patterns at the global level would help attempts to factor risk considerations into investment decisions. But at the same time, the fast-changing and turbulent nature of markets means that globalisation adds a new, unpredictable and troubling dimension to risk at the local level. This, and the lack of channels for local consultation and participation in global economic decision-making, makes disaster risk reduction planning increasingly complex and challenging.

In the best of cases, investors undertake risk assessments when considering location in order to minimise risk to their investment. However, the impact of that investment on the shaping of new risks in the surrounding region is rarely considered.

There is need for disaster risk assessment to be integrated into development planning. There are particular opportunities for integrating risk assessment into the planning of large-scale infrastructure projects and private sector investments where environmental and social impact assessments are commonplace. Such projects are often supported by the World Bank or regional development banks. In both cases, there exists an opportunity to build risk assessment into development planning.

There have been many examples where past investment in large-scale power, irrigation and transport infrastructure has led to reconfigured and increased disaster risk. A contemporary example is a US$ 4 billion investment in an oil pipeline between Chad and Cameroon, with funding from the World Bank agreed in 2003. The project brings a major boost to the Chadian national exchequer. However, the distribution of social costs and benefits in terms of disaster risk has not been examined. In these early stages, the potential for human development and the lowering of Chad's high relative vulnerability to drought that this financial boost could support, has not been fulfilled. The massive size of the development has caused inflation, doubling the price of basic foods and increasing risk of food insecurity among the poor. While it is hoped that such effects are temporary, they will clearly impact on people's well-being, health and livelihood security.

Economic globalisation can provide opportunities for the enhancement of livelihoods and life quality in those places receiving new inward investment. However, without appropriate government oversight, investment can encourage economic and residential development in hazardous places.

In Central America, disaster risk reduction is being considered in some ongoing regional investment programmes. CEPREDENAC has played a pioneering role in recording and analysing links between development policy and disaster risk.[20] New investment contexts, such as those being opened up by Plan Puebla Panama (a vast infrastructure construction project that covers nine states in south-southeast Mexico and the seven Central American republics) are being studied. One of the eight initiatives of the Plan Puebla Panama is the Mesoamerican Initiative for Disaster Prevention and Mitigation. This initiative aims to include risk reduction concerns at the different stages of development planning.[21]

Such initiatives are not the norm. Encouraging governments and investors to formally take account of disaster risk in their decision-making might be a first step in raising the profile of disaster in corporate social responsibility, as well as promoting the responsibility of employers for human rights and environmental stewardship in and beyond the workplace in order to prevent the accumulation of disaster risk.

Disasters can greatly disrupt trade. This can be felt through flooding, droughts or tropical cyclones affecting the export of primary commodities, which form the primary source of foreign exchange earning for a number of countries. Flooding in Bangladesh has affected garment-manufacturing units in export-processing zones of Dhaka and Chittagong and damaged the country's biggest export sector. In Bangalore, India flooding and public demonstrations in its aftermath undermined the efforts of the authorities to present an image of the city to global investors of an international centre for the high-tech industry.[22]

Globalisation has greatly concentrated financial and data processing functions and subsequent disaster risk in urban centres. Disaster events that strike at key centres of the global exchange system for information, money and material resources, are particularly feared because they have the potential to create havoc throughout a vast web of interconnected states and societies.

The interconnectedness of contemporary global society has become apparent most recently through the impact of international tourism on disaster response in the Caribbean. Tourism and agriculture are the mainstay of Caribbean island economies — sectors with high vulnerability to natural hazards.[23] There is a perception in tourism-dependent island economies that national disaster declarations — a pre-requisite for accessing international humanitarian assistance funds — will create a negative economic impact on the tourism industry, creating greater economic losses than the storm itself and prolonging the recovery period for the tourism sector. This has led to reluctance from governments to declare national disasters following disaster events. In turn, disaster relief agencies that require they only intervene in declared disaster situations have had to reconsider their policy.

The challenge of globalisation is to ensure that measures are in place to promote equity and opportunities for those households that find their former livelihoods constrained and their risks increased by the rapid flows of capital made possible by global information networks and investment mechanisms. The current globalisation of economies and ongoing regional integration processes[24] are creating new threats to and opportunities for human security.[25]

BOX 3.6 WORLD BANK AND GOVERNANCE, POVERTY REDUCTION STRATEGY PAPERS

In responding to critiques of the structural adjustment process, which often led to high levels of social dislocation and exacerbated inequality and poverty, the World Bank has repackaged its development aid lending strategy through national Poverty Reduction Strategy Papers (PRSP).

Today, 21 countries have finalized three-year PRSPs and more than 30 other countries have begun progress in this direction. The PRSP approach helps to strengthen a focus on pro-poor strategies, encourages more consultation amongst stakeholders, provides a focus for strategic programming, highlights the importance of accurate poverty measurement, and encourages alignment of donor assistance in individual countries. However, in spite of progress being made, questions remain concerning the quality of stakeholder participation, country ownership of the process and necessary capacity building, the coordination of international assistance behind PRSPs, and the unrealistic timeframe of three years that was imposed by PRSP framework for sustainable poverty reduction to be realized. As a recent United Nations Conference on Trade and Development (UNCTAD) publication noted, effective poverty reduction will require policy which moves 'beyond adjustment policies and anchors PRSPs, which are three-year plans of action, within long-term development strategies'.

The implications of PRSP for disaster-development relationships have yet to be concretely explored, but the early stages of an evolving development approach is an appropriate time to consider more seriously the role of disaster in development and particularly poverty reduction. Can the PRSP move disaster risk reduction forward?

One interesting case is Madagascar, a poor island-economy in the Indian Ocean sharing many development concerns with countries in sub-Saharan Africa. It had a per capita GDP of US$ 260 and an extreme poverty headcount of 62 percent in 2000. It is frequently exposed to natural hazards, such as tropical cyclones, floods and droughts. The evidence presented in chapter 2 shows that this country has the thirteenth highest national population exposed to tropical cyclones, and has a higher than average relative vulnerability to droughts. Recently, within the context of the preparation for the Madagascar PRSP (2003), policy-makers have started paying increased attention to the role of shocks as a factor causing and perpetuating poverty. This was especially so after a six-month long political crisis (see note 1 below), which contributed to a 6 percent increase in the national extreme poverty rate. As a result, the PRSP incorporates risk and vulnerability considerations into poverty analyses. And in strategic planning, such as land planning, agriculture and transports, effectively integrates disaster risk and development policy.

Note 1: The crisis was the result of the disputed presidential election in December 2001. For six months, the country had two parallel governments, each with its own central bank and administration. Clashes between the two parties led to the destruction of key infrastructure and claimed about a hundred lives. The domestic instability also led to the isolation of the economy, freezing of Madagascar's assets abroad, a suspension of foreign exchange trading and a closure of the T-bills market for several months. The lower estimate of the cost of the political crisis alone increase to 11 percent of GDP. This led to the discontinuing of many social services and caused widespread suffering (CAS, 2002). The shock also had a powerful negative impact on jobs, income and prices.

Source: IDB/ECLAC (2000), IMF/WB (1999), UNCTAD, (2002), UNDP (2001), UNDP (2003); http://www.prspsynthesis.org/connections9.pdf

The transforming power of international financial investment for disaster risk can be seen in the mushrooming of business parks, free trade zones and transportation infrastructure to facilitate international trade and investment. Concentrated investment provides an opportunity for disaster risk reduction to be part of the development process. But time and again this has not been the case. The deepwater port in Dominica was designed to handle international trade. One year after construction,Hurricane David hit the port and required repairs equivalent to 40 percent of the original construction costs. Building disaster-proof design elements into the original plan would only have added 12 percent to construction costs.[26]

New global and regional markets will very possibly intensify current trends, such as urbanisation and marginalisation of rural areas that shape disaster risk. Through structural adjustment policies, the World Bank/International Monetary Fund (WB/IMF) have played a significant role in shaping macro-economic policy and restructuring urban and rural livelihood opportunities and basic needs provision by the state.[27] More recently these institutions have taken on board the need for a pro-poor stance. This policy shift and its implications for disaster risk are explored in Box 3.6 (see previous page).[28]

To prevent these inequalities from further polarising the world into those at risk and those who are not, the opportunities and benefits of globalisation need to be shared much more widely. This can only happen with stronger governance.

3.1.2 Rural livelihoods

The World Bank estimates that 70 percent of the world's poor live in rural areas.There is a great variety in the structure of rural economies and societies and their interaction with the environment. These dynamics shape local experiences of development and disaster risk and warrant against any easy generalisations. However, there are recurrent themes that characterise the ways in which flawed development can increase vulnerability and risk in the countryside.

Rural poverty

The absolute lack of assets and the precarious economies of many rural livelihoods is one of the key factors that configures risk to hazards such as floods and drought.

In severe droughts in the *sertao* of northeast Brazil, poor landless labourers are the first to reach a critical stage of asset depletion and be forced into either publicly funded emergency programmes or else into migration. Small landholders are often forced into selling their land to pay off debts created by the deficit in production and the need to buy food and basic necessities. Large-scale landowners, on the contrary, have better access to groundwater as well as credit.

The rural poor, who are most at risk, are often no longer subsistence peasants. In Haiti, for example, less than 30 percent of income in rural areas is derived from agriculture.[29] Instead, rural dwellers depend on complex livelihood strategies, including seasonal migration or inputs from remittances sent from relatives living in cities or overseas (see Box 3.18).

Many rural communities have sophisticated coping strategies that enable them to live and prosper in potentially hazardous environments. Shifting cultivation, nomadic cattle herding and intensive rice cultivation are three examples of specific agricultural systems that are well attuned to particular socio-environmental contexts.

Vulnerability can arise when the pressures that have shaped such coping systems over many generations rapidly change. Climate change is a key force that underlies such change and is discussed at length in the following section. Other driving forces for instability are increasing or decreasing populations, changing markets or local environmental degradation. Geographical information systems provide an opportunity for mapping the changing relationships between socio-economic,environmental and disaster risk variables,and can guide proactive disaster risk reduction planning.

The loss of adaptive capacity often comes from socio-economic structures that restrict flexibility in livelihood systems. In response, rural development initiatives have focused on programmes to foster livelihood diversity. Initiatives have included rural microfinance, cooperative production and marketing, and increasing the value added onto rural production through local skills training. Box 3.7 provides an account of the contribution of rural microfinance in building resilience to disaster stress in Bangladesh, a state with high exposure and vulnerability to tropical cyclones and flooding.

BOX 3.7 MICROFINANCE FOR DISASTER RISK MANAGEMENT IN BANGLADESH

Microfinance programmes include mechanisms for extending savings and insurance services to low-income groups.

Microfinance instruments can reduce risk by helping poor households diversify their income by source and season, and also by earner by providing earning opportunities for women. Diversifying income-earning opportunities and building assets through microfinance help poor households to offset disaster risk. If risk does materialise as disaster, microfinance can help again through loan forgiveness or rescheduling, enhancing the targeting of relief programmes through microfinance networks, improving the flow of information among the clientele of microfinance organisations, and the empowerment of women. An important feature of microfinance is its capacity to build social capital as expressed in specific mitigation measures.

The Bangladesh Floods, 1998

The role of microfinance services in responding to disaster risks was first demonstrated in Bangladesh during the 1998 floods. Approximately 100,000 square kilometres was inundated for two- and one-half months, affecting 30 million people. Damages to standing crops, livestock and houses virtually suspended the rural economy. During the floods, in addition to relief work coordinated by the government and military, microfinance workers were able to help recovery by maintaining contacts with local scheme members. Workers carried money with them and provided immediate interest-free consumption loans so that the members would not go hungry. Different programmes, as discussed below, provided a number of specific financial services.

The Grameen Bank set up a Disaster Mitigation Task Force at the central level. It prepared and implemented a rehabilitation programme, which included new loan products and loan assistance for housing rehabilitation and agricultural production. The Bank gave fresh loans to members who had five to 10 installments remaining in the repayment schedule. The borrowers who had already paid half or more of their loans were eligible to take new loans for the amount that they repaid.

Two large NGOs with microfinance programmes were also involved:

The Bangladeshi Rural Advancement Committee extended loans to 240,000 families to support the repairing and rebuilding of homes. It also purchased 364 tons of rice in the open market and sold it at subsidized rates to group members.

The Proshika took up an emergency rehabilitation programme worth Tk50 million, through which 100,000 affected families were provided an interest-free loan of Tk500 each. It also supported a credit programme worth Tk30 million for aman, vegetables and winter crop cultivation.

In addition to these credit operations, all the programmes took up a number of relief and recovery activities, independent of their credit operations. For example, they set up medical centres and distributed food, drinking water, milk and medicine. They also agreed to support a number of activities in the non-farm sector, which would help the people affected by floods to resume their economic activities.

A number of factors contributed to the effective intervention of microfinance programmes in the 1998 floods. Programmes with good leadership responded quickly to the situation, availed of existing disaster mitigation funds or developed alternative fundraising strategies to meet the demand for resources. The involvement of committed field staff was also very important. Close monitoring allowed for the collection of information on the damage to assets and income of clients and loss of programme income as a result of potential drops in savings and repayment. On the basis of this information, programmes projected capital requirements for loans during the rehabilitation period.

Source: Vatsa (2002)

Environmental degradation

Often the poorest in rural areas occupy the most marginal lands and this forces people to lead precarious and highly vulnerable livelihoods in areas prone to drought, floods and other hazards. The densely populated agricultural communities of coastal Viet Nam and on the 'bunds,' or islands, in the delta of the Ganges in Bangladesh, are examples.

In some Central American and Andean countries, settlement of previously sparsely populated areas has been used as a strategy to overcome rural poverty in other areas of a country. However, the subsequent destruction of tropical forests to make way for agricultural production that is often poorly adapted to the new ecosystem, can lead to the generation of new patterns of flood, drought, fire and landslide hazard. This in turn increases the impoverishment of the migrants. At the same time, migration breaks the cultural relationship between the rural population and their environment, meaning that people are unaware of and unable to manage the hazards in their new environment.

Market pressures and government policies may also increase risks in rural areas. Subsidised cultivation of crops with a high demand for water in arid areas can increase drought hazard over time. The cultivation of coca for the lucrative drug market has lead to the massive destruction of tropical forests in Colombia (more than 100,000 hectares are under coca cultivation), increasing flood, drought, fire and landslide hazard.

In the Islamic Republic of Iran, the negative effects of the severe drought that affected the country from 1999 through 2002 were magnified by non-climatic factors. In 2000, it was estimated that there were losses of US$ 1.7 billion in livestock and crop production. In 2001, it was estimated that these losses increased to US$ 2.6 billion. Additional effects of the drought included displacement from rural to urban areas, deterioration of public health and outbreak of water borne diseases, increased unemployment, the disappearance of wetlands of international significance, and increases in related hazards such as fires, wind and soil erosion, flood and landslide hazard. While severe deficits

of precipitation occurred over a three-year period, meteorological drought was magnified by the inappropriate use of water resources for irrigation and drinking. Irrigation water efficiency is only 35 percent, which suggests that two thirds of the water is lost. Per capita water usage in Tehran is 239 litres per day, compared to 120 litres per day in Western European countries. More than 25 percent of drinking water is lost in eroded pipes. Rangelands were being used for grazing three times more than their peak capacities in a non-drought year, resulting in severe degradation as well as accelerated soil erosion.The cultivation of high water-consuming plants, such as sugar beet, in arid areas is a further factor that depletes water resources.

Free trade and fair trade

For the majority of rural communities connected to the global economy, livelihoods are vulnerable to fluctuations in world commodity prices. When low commodity prices coincide with natural hazards, rural livelihoods come under high stress. In Nicaragua and Guatemala, the most impacted communities following a drought in 2001 were seasonal farm workers in depressed coffee-growing regions.

Ethiopia's rural economy depends on coffee revenues for a large part of its income. Fifty-four percent of the country's exports come from coffee, so the current coffee price crisis is having a significant impact on the national economy. Ethiopia's export revenues from coffee declined from US$ 257 million in 2000 to US$ 149 million in 2001 — a 42 percent reduction in just one year. This drop in income is nearly twice the US$ 58 million granted the country in debt reduction under a World Bank programme for Highly Indebted Poor Countries.

Fluctuations can be felt directly by those who extract a livelihood from the sale of primary resources (farmers, fishermen and foresters), but also by the rural landless who are reliant on selling their labour and may be the first to suffer in an economic downturn.

Isolation and remoteness

Those rural economies that are isolated from the global economy do not suffer from world market price fluctuations, but are not necessarily any less at risk. While in good years, dependence on local resources will insulate communities,in times of stress isolation tends to limit choices for coping strategies and may increase vulnerability. Reciprocal relationships, where wealthier individuals or households provide work or gifts for more food insecure groups, has been noted as an important risk reduction strategy in rural Asia and Africa.[30]

BOX 3.8 CAN FAIR TRADE REDUCE RISK?

Economic development strategies oriented towards primary commodity exports can offer substantial benefits for local development. These strategies can also be held hostage to fluctuating world commodity prices or terms of trade negotiated with partners in bilateral or regional trade agreements. Fair trade offers the potential for guaranteed prices, often above minimum market rates. Fair trade also seeks to provide for the empowerment of all partners. This can mean the promotion of collaborative decision-making and the setting aside of resources for enhancing social development or ecological protection. For those communities facing disaster risk, access to higher and more predictable levels of income can help build resilience. Where social empowerment and ecologically sustainable development is practiced, the gains are magnified even more by enhancing the capacity to cope with natural hazard and avoid disaster.

Kuapa Kokoo is a Ghanian cocoa growers cooperative which in 1998 joined forces with Twin Trading, The Body Shop, Christian Aid and Comic Relief to found The Day Chocolate Company. Kuapa Kokoo own one third of the shares in the company and two elected farmer representatives sit on its board.

Kuapa Kokoo sells about 1000 tonnes of yearly output to the European fair trade market. This means that, providing their production methods meet internationally audited conditions, the producers receive a guaranteed price for their goods and the security of long-term trading contracts. In the case of cocoa, recent prices on the world market have fallen as low as US$ 1,000 per tonne. In comparison, on the fair trade market they receive US$ 1,600 per tonne, plus an extra US$ 150. Even if the world market price reached US$ 1,600, the fair trade price would still include the extra US$ 150 on top of the world market price. Therefore, as well as the benefits that the farmers receive through being part of Kuapa Kokoo, they also benefit from the premium price paid for their cocoa on the fair trade market.

Kuapa Kokoo also has supported income-generating activities for women to supplement their incomes and to make them less dependent on men, as well as provide money for the family during the off-season while the cocoa is growing. For example, a project has been set up to make soap from the potash produced from burnt cocoa husks. This soap is then sold internationally, generating additional income from the waste cocoa materials.

Despite transaction costs, there is a growing waiting list of villages wanting to join Kuapa Kokoo. Training is all done in-house and the cooperative employs more than a dozen society support and development officers as part of its operations team. The buying and logistics as well as management systems have been gradually regionalised and by the 1999-2000 season, Kuapa Kokoo was operational in five cocoa-growing regions, with about 460 village societies and 35,000 farmer members. The proportion of women farmers has increased from 13 percent to nearly 30 percent.

Source: www.ico.org; www.oxfamamerica.org; http://www.divinechocolate.com/kuapa.htm

Deficient rural infrastructure, together with its vulnerability to hazard impacts, can increase livelihood risks and food insecurity in rural areas. During the 2002 food crisis in Mozambique, northern Mozambique was actually producing a surplus of food while the southern part of the country was experiencing a dramatic shortfall in cereal production. The weakness in the country's north-south communication, aggravated by the effects of floods on roads and bridges, meant that it was too costly to transfer the cereal surplus of the north to address the food crisis in the south. The destruction of crops during disaster or the loss of agricultural labour power that prevents cultivation (as in the case of households and families who have lost members to disease such as HIV/AIDS or to armed conflict), can ultimately lead to a crisis in food security for the household or community. As discussions regarding data used to present losses from drought in the DRI have indicated however, such crises are rarely a straightforward result of temperature or rainfall extremes.

In an open and equitable society, food can be accessed from elsewhere, bought from the international market or sourced from donors before food crises develop.

It is in those places where physical access is restricted that the greatest risk prevails. Physical access may be hindered because of physical barriers, such as floodwaters and high winds that can prevent emergency response or longer-term food aid arriving at the right time. But physical access can also be interrupted by human intervention, such as armed conflict, intentional or accidental diversion of aid, and in the worst cases, can be used as a political or military strategy.[31]

The use of land mines results in the loss of productivity of farmlands, removal of vast tracts of arable land from safe use for decades and disruption of transportation and agricultural markets (for example, in Angola).

BOX 3.9 FROM REGIONAL VULNERABILITY TO VULNERABLE PEOPLE: CHANGING CONCEPTUALISATIONS OF RURAL VULNERABILITY IN ETHIOPIA

Policies apparently aimed at combating rural vulnerability can sometimes be biased against those most at risk. Until recently, this was the case in Ethiopia. Government food aid was distributed at the regional level, based on accumulated knowledge of areas known to have suffered from chronic drought and food insecurity in past years. This was regardless of the spatial and temporal changes in vulnerability among affected regions over time or in relation to particular drought characteristics. In the 1995-1996 harvest period for example, 63 percent of the regions receiving aid had populations that already had access to at least the requirement of 1,680 kilo calories per person per day.

Ineffective targeting stems from an inability in the system of regional scale, food insecurity assessment to differentiate local needs. The responsibility for fair distribution is held at the national level, where the motives for aid giving can be shaped by many factors peripheral to farmers' needs.

The Government's rationale for basing food aid disbursement on regional measures of vulnerability is founded on a history of regionally specific famine affecting the north, particularly in 1974 and 1982-1984. There are also socio-economic similarities among people in specific areas in terms of income and economic constraints. Yet, it has been demonstrated that the actual relationship between food availability and food aid receipts in Ethiopia is not conditioned on localised need. The attention given to similarities obscures the specific vulnerabilities of the north's sub-regions.

Learning from these experiences in 2001, a draft handbook for use by practitioners in the field was agreed to by international and national agencies on the Food Aid Targeting Steering Committee. There is now an emphasis on differences in vulnerability at the community level — an outcome of both a policy change and collaboration among early warning organisations.

This has amounted to a shift in policy from the recent past. Previously, drought, vulnerability and food insecurity in Ethiopia were appraised through the lens of international agreements, the changing priorities under national political transitions, and concepts of sovereignty, nationhood and ethnicity. These perspectives had the effect of producing policies and strategies that, in effect, de-emphasized the situation of vulnerable people while targeting analysis and response to the region and nation. Now the pattern is changing. The vulnerability of people as well as regions are receiving the attention they deserve.

Source: Stephen, Linda (2002)

A dynamic pressure: global climate change

'Populations are highly vulnerable in their endowments and the developing countries, particularly the least developed countries…have lesser capacity to adapt and are more vulnerable to climate change damages, just as they are more vulnerable to other stresses. This condition is most extreme among the poorest people'.[32]

Climate change brings with it long-term shifts in mean weather conditions and the possibility of the increasing frequency and severity of extreme weather events. The latter is perhaps more threatening to agricultural livelihoods. A multi-agency report on poverty and climate change[33] identified specific challenges for Africa, Asia, and Latin America and the Caribbean and cross-cutting themes shaping vulnerability in small island states. Some of these are shown below:

- Key challenges for Africa include droughts contributing to a decrease in grain yields and sea

level surges affecting most of Africa's largest cities.
- In Asia, some northern areas might experience increased agricultural productivity. However, for more populated central and southern Asia, sea level surges and increased intensity of tropical cyclones could result in the displacement of tens of millions of people from low-lying coastal areas.
- For Latin America, a mixture of increases in flooding, droughts and tropical cyclone activity will change risk profiles.
- Small island states will be especially prone to stresses attributed to sea level surges, including loss of land, dislocation of people, salinisation of freshwater aquifers and damage to highly productive coastal mangrove and coral ecosystems.

Taken together, the effects of climate change increase uncertainty and the complexity of risk for everyone, ranging from poor, small-scale farmers to wealthy agriculturists. While the developed nations of the world produce the majority of greenhouse gases, the burden of impact will be more severe on developing countries as they have larger vulnerable populations and are less equipped to deal with extreme weather events.

Changing natural hazard risks related to climate change will alter disaster risk patterns. Of hydro-meteorological hazards potentially affected by climate change, floods, storms and droughts present the most widespread direct risk to human assets.

Flooding and landslides, pushed by heavier rainfall, and by surging sea levels in coastal areas, may become increasingly common. With sea levels predicted to rise by up to nearly one metre in the coming century, heavily populated areas of low-lying land — such as southern

BOX 3.10 CLIMATE CHANGE AND DISASTERS: TOWARDS AN INTEGRATED CLIMATE RISK MANAGEMENT

The scientific evidence that the climate is changing due to greenhouse gas emissions is now incontestable. It is equally well accepted that climate change will alter the severity, frequency and spatial distribution of climate-related hazards. However, even while the modelling of the linkages between global climate change and particular extreme climate events becomes increasingly sophisticated, it is still not possible to predict with any degree of confidence how particular climate events will behave in the future in specific locations. Even with regular and much better understood climate phenomenon like ENSO, considerable regional and temporal variations in impacts are observed from event to event.

The lack of capacity to manage and adapt to climate-related risks is already a central development issue for countries with low-lying coastlines or exposed to hydrometeorological hazards. The lack of capacity to manage the risks associated with current climate variability (on a season-to-season and year-to-year basis) will be magnified in countries exposed to global climate change. Here, disaster risk reduction will have to contend with additional pressures stemming from the complexity and uncertainty of global climate change. The challenges of climate change might best be met by building on current disaster risk reduction capacity. Such a synthesis of concerns reduces the likelihood of overlapping responsibilities and increases the cost efficiency of disaster and climate change risk reduction. Medium- and long-term adaptation must begin today with efforts to improve current risk management and adaptation. Responses to the local and national consequences of global climate change can benefit from current best practice in disaster risk reduction.

Current approaches towards managing disaster risk and adaptation to climate change fail to address the issue for different reasons. First, disaster risk is still predominantly focused on response to disaster events and fails to address the configuration of hazards, vulnerabilities and risks. Next, disaster risk reduction continues to be structured around specific hazard types rather than generic patterns of human vulnerability. This does not match with experiences of hazard which prevail in contexts more and more typified by concatenation, synergy and complexity. Third, focus on the impact of future climate change on risk fails to make the connection with currently existing climate-related risk events and patterns. At the same time, both approaches are divorced both in concept and in terms of the institutional arrangements and programming mechanisms at the national and international levels.

If development is to be advanced in countries affected by climate risks and if development is not to aggravate climate change risk, an integrated approach to local climate risk reduction needs to be promoted. Successful risk reduction approaches already practiced by the disaster risk community should be mainstreamed into national strategies and programmes. Addressing and managing climate risk, as it is manifested in extreme events and impacts today, will help to strengthen capacity to deal with future climate changes.

Integrated climate risk management would address both the hazards and vulnerabilities that configure particular risk scenarios. This could range in scale from actions to manage the local manifestations of global climate risk to global measures to mitigate hazard (for example by reducing greenhouse gas emissions) to reducing vulnerability by increasing the social and economic resilience of vulnerable countries (for example, SIDS). Integrated climate risk management would need to include elements of anticipatory risk management (ensuring that future development reduces rather than increases risk), compensatory risk management (actions to mitigate the losses associated with existing risk) and reactive risk management (ensuring that risk is not reconstructed after disaster events).

Integrated climate risk management could provide a framework to allow the disaster community to move beyond the still dominant focus on preparedness and response. In the adaptation to climate change, this could stimulate a move beyond the design of hypothetical future adaptation strategies. In some regions, such as the Caribbean and the South Pacific, synergy such as this is already being achieved. However, urgent actions must be taken at the international, national and local levels if integrated climate risk management is to move from a concept to a practice and serve to reduce risks and protect development.

Bangladesh, the Nile delta,parts of eastern China and many atoll islands of the South Pacific and Indian Oceans — face a bleak future. So, too, do the long stretches of low-lying coasts in western Africa from Senegal to Angola, in South America from Venezuela to Recife in Brazil, and much of the coastlines of Indonesia and Pakistan.

The damages associated with the regional climate impacts of El Niño provide some early indication of those that could accompany the regional consequences of global climate change.

The last strong cycle of El Niño appeared in mid-1997 and continued through 1998. A large number of countries in Central and South America and the Asia-Pacific region were severely affected by El Niño-related floods and droughts. Estimates of global economic loss range from US$ 32 billion to US$ 96 billion.[34]

The difference is that El Niño is a periodic event while climate change will generate lasting and cumulative stresses and shocks.

Climatic disturbances that change hazard profiles demand changes in coping strategy. Drought is a case in point. This hazard type, potentially under the influence of global climate change, has probably affected more households in southern and western Afghanistan than the recent conflict.[35]

In adjoining Pakistan, the drought in the Baluchistan and Sindh provinces were reported to be the worst in the country's history. In Iran, a 50 percent to 96 percent decrease in rainfall during the 1998-1999 winter season caused the loss of 37 percent of annual wheat production and 63 percent of annual barley production. Low water flows in the Tigris and Euphrates rivers basins in Iraq meant irrigated as well as rain-fed agriculture suffered.[36]

People have been living with drought in these and other regions for millennia. Whether and how their distribution and frequency will be affected by global climate change is not known. Nor is the extent to which traditional coping strategies, such as seasonal migration,will be useful under these changing conditions of hazard.

Where the dynamics of global climate change and economic globalisation are seen to interact, the shifting nature of hazard and disaster risk becomes even more apparent. The contribution of local disaster datasets to understanding the local distribution of impacts will assist in tracking the evolution of risk as climate change unfolds.

BOX 3.11 SMALL ISLAND STATES, VULNERABILITY AND CLIMATE CHANGE

The future impact of sea level rise on small island states includes substantial coastal flooding, salination of soils and drinking water, and the destruction of coral reefs and mangrove stands vital for fishing and coastal protection. In extreme cases, low-lying atolls in the Pacific, including those of Kiritabi, the Marshall Islands and Tuvalu may be submerged.

Climate change may also bring greater risk of drought to Pacific small island states. In the 1997-1998 El Niño, Fiji lost half its sugar crop. Existing risk from tropical cyclones and related flooding may also be increased. Caribbean islands are not threatened by submergence, but are at high risk from sea level rise and climate change creating a more hazard-prone environment. Empirical evidence suggests an overall drying tendency for the eastern Caribbean. The Association of Small Island States has had some success in lobbying the international community. Through the United Nations Framework Convention on Climate Change (UNFCCC) and 1997 Kyoto Protocol, adaptation is starting to receive attention, in recognition that climate change impacts are increasing and changing hazard profiles today. Modest progress has been made with the establishment of a fund for non-Annex 1 countries and a special programme of assistance for least developed countries that will help eligible small island states.

In the Plan of Implementation of the World Summit on Sustainable Development, 2002, a special section on small island states encouraged the international community to assist in 'mobilizing adequate resources and partnerships for their adaptation needs relating to the adverse effects of climate change, sea level rise and climate variability, consistent with commitments under the United Nations Framework Convention on Climate Change'.

Source: World Disasters Report (2002), Challenger (2002), UN (2002)[37]

It remains to be seen what links the interaction of economic globalisation to global climate change. Some contemporary interactions are being felt in Ethiopia, where drought in 2002-2003 combined with extremely low world prices for coffee have produced a double crisis for the national economy and for small farmers, farm workers and their families.

Climate change increases the uncertainty faced by vulnerable communities through a widening range of future climate variations and hazards. This is not a hypothetical risk to be addressed several decades into the future, but a real increase in risk that is presently threatening lives and livelihoods.

As local climates become more unstable, farmers have greater difficulty knowing what and when to

plant and harvest. Risk of crop, and hence, livelihood failure increases. While rural communities may have adapted their livelihoods over centuries and developed sophisticated coping strategies to deal with local risks, unexpected hazards such as unseasonal storms or droughts invalidate those strategies and increase risk.

Combined with the additional uncertainty caused by economic globalisation,which may suddenly invalidate the economic viability of local production, climate change makes local risk coping strategies increasingly difficult and the option of successful risk management more challenging.

3.2 Cross-Cutting Themes in Disaster-Development

The themes to be discussed in this section are: violence and armed conflict,disease, governance and social capital.

These themes have been mentioned in the preceding discussions, but are critical to shaping patterns of disaster risk and therefore deserve additional scrutiny. The themes are no less important than urbanisation, rural livelihoods, globalisation or climate change.They are presented here to flag their cross-cutting influence.

A lack of internationally comparable and verifiable data on these themes, or the difficulty of meaningfully reducing complex processes into numerical values, forced their exclusion from the DRI model in its search for socio-economic variables that could be associated with natural disaster losses. Despite this, their influence on development and disaster risk seems clear and it is hoped that future runs of the DRI might be able to include such variables. This is a second reason for wanting to present an exposition of their relationship to disaster risk here.

3.2.1 Violence and armed conflict

During the 1990s a total of 53 major armed conflicts resulted in 3.9 million deaths (nearly 90 percent of them were civilians).[38]

In 2002, there were approximately 22 million international refugees in the world and another 20 million to 25 million internally displaced people. Even before additional risk factors, including gender, class, ethnicity, age or disability are taken into account, the very fact of being a refugee or an internally displaced person raises vulnerability.[39]

When the displaced settle in squatter settlements in cities, they are often exposed to new hazards because dangerous locations (river margins, garbage dumps, steep slopes) are the only places where they (and the urban poor) can find shelter. In other cases, internally displaced people and refugees are often forced to degrade their immediate environment to obtain resources such as firewood, even though this may magnify landslide, fire and flood hazard. The environmental impact in Guinea of 600,000 refugees fleeing from conflicts in Sierra Leone and Liberia in the late 1990s was considerable. In formalised camps, they often run the risks of epidemic disease.[40]

The economies of war fuel violent conflicts — control over natural resources exploitation and the production of illegal drug crops are dominant contexts — but are interwoven with social instability and economic poverty that diminish the capacity of people to cope with disaster risks.[41]

A vicious circle appears when as the state's capacity to address everyday hazard and disaster risk diminishes, so does its legitimacy in the eyes of its citizens — resulting in yet greater isolation, corruption and in some cases, ultimate collapse.[42]

Many areas suffering from complex political emergencies are also subject to periodic natural hazards.

The provisional analysis of drought undertaken in the DRI noted armed conflict and governance as factors that can turn low rainfall episodes into famine events. The 2002 food crisis in Southern Africa may have been triggered by drought. But in countries like Zimbabwe and Angola, the impact of the drought must be understood and responded to within the context of political instability and conflict.

At the turn of the 21st century, Afghanistan suffered three years of drought and a major earthquake on top of decades of armed conflict, creating a particularly acute humanitarian crisis.

The volcanic eruption in Goma, in eastern Democratic Republic of Congo, is a similar example of a rapid-onset

natural hazard occurring within an area affected by ongoing conflict. In such contexts, there are currently more questions than answers about what should or could be reconstructed, and if and how institutions could provide a basis for reducing risk.

The fact that there are no self-evident answers is aggravated by the fact that few people are asking these big questions. The divisions between those working on natural disaster risk reduction and complex political emergencies and development have hindered the search for ways to address such situations. But these interrelationships could offer opportunities for reducing disaster risks. The case study of conflict and risk in Colombia in Box 3.12 presents a good example of common action.

Little or no attention has been paid to the potential of disaster management as a tool for conflict prevention initiatives.

At the international level, many examples exist of antagonistic nation states being brought together through the shared loss due to a disaster event,although such improvements are often temporary.

Following earthquakes in 1999, Greek-Turkish relations enjoyed some improvement with a jointly sponsored UN resolution on natural disasters made in November 2001 and high-level talks on Aegean issues in 2002.[43]

In Bosnia-Herzegovina, the relationship between disaster management and the need for local capacity building following conflict has been recognized. Since 2003, the central government's Ministry for Security has taken responsibility for natural disaster management and response in both the political-administrative entities in the country (Republika Srpska and the Federation of Bosnia and Herzegovina).[44]

In Colombia, violently opposed local communities in the Department of Meta have worked together to mitigate the impact of floods as a means not only of protecting livelihoods, but also of building trust and reconciliation.[45]

3.2.2 Changing epidemiologies

Epidemic diseases can be seen as disasters in their own right.They also interact with human vulnerability and natural disasters.

BOX 3.12 DISASTER RISK AND ARMED VIOLENCE IN COLOMBIA

In Colombia, the violent conflict that in its latest phase has affected the country for the last four decades, is a major factor in the configuration and accumulation of disaster risks. There are a large number of ways in which the conflict interacts with and aggravates already critical levels of disaster risk.

The illegal cultivation of coca and poppy in remote areas can lead to an increase in hydrometeorological hazard. The installation of coca cultivation in areas with fragile tropical forest ecosystems contributes to an increase in hydrometeorological hazard — notably flood, fire, landslide and drought. Additionally, coca cultivation, processing and export are a major source of income for armed irregular groups and thus a factor that 'fuels' the conflict in Colombia. In 2003, the areas under coca cultivation in Colombia had been reduced from 144,800 hectares to 102,000 hectares, partly a result of the policy of fumigating plantations. However, in the same period, dramatic increases in cultivation were detected by the United Nations Office on Drugs and Crime (UNODC) in the Departments of Guaviare, Narino y Arauco, showing that repression in some areas only pushes cultivation to new areas and leads to further environmental degradation.

The conflict has generated internal displacement and the Social Solidarity Network estimates that 964,904 people were displaced between 2000 and 2002. Internally displaced people from the conflict are often forced to occupy the most hazardous locations in the cities to which they move. Migrants can be even more socially and economically vulnerable than pre-existing low-income groups in the city. According to official sources, 73 percent of the displaced population comprises women and children. The displaced are particularly at risk to hazards such as floods and landslides in urban areas. According to the National Human Development Report 2003, some cities have seen their population significantly increase due to internal displacement. The displaced population in Quibdo in Choco Department, for example, reached the equivalent of 20 percent of the city's population at one stage.

The negative impact of hazard events such as floods on rural livelihoods is a force driving people into armed groups, illegal cultivation or migration and contributes to the reproduction of the conflict. According to the DesInventar database, some 1,546,585 hectares of agricultural land were affected by natural disasters in Colombia between 1993 and 2003, and more than 270,000 heads of livestock were lost. Losses on this scale seriously impact rural livelihoods, irrespective of the armed conflict.

In other words, a vicious circle exists where the conflict feeds hazard, exposure to hazard and human vulnerability in a process that generates risk. Risk in its turn feeds the conflict, which creates the conditions for yet greater hazard, exposure to hazard and human vulnerability.

Source: Cooperation Framework between the UNDP Bureau for Crisis Prevention and Recovery (BCPR) and UNDP Colombia (2003); National Human Development Report, (2003); DesInventar, Colombia database; Observatorio Sismico del Sur-Occidente, Universidad del Valle, Cali. (2003)

There is a great deal of variation in the relationships between disease, disaster and development. Following disaster, whether a population experiences a disease epidemic or not is influenced by the type of hazard and the environmental conditions in which it takes

BOX 3.13 AIDS AND DROUGHT IN SOUTHERN AFRICA

According to the Southern Africa Flood and Drought Network, rainfall totals during the 2002-2003 wet season were less than half normal levels across much of Swaziland, north-eastern South Africa and the southern-most provinces of Mozambique. In this region, risk from drought and other hazards exacerbates high levels of underlying stress powered by a regional health crisis. In 2002, 28 million people in Sub-Saharan Africa were living with AIDS.

The high incidences of HIV/AIDS combined with severe drought conditions are wreaking havoc on these countries already suffering from poverty. According to UNICEF, roughly 1.5 million Mozambicans are currently living with HIV/AIDS. Now that food is in short supply, many are developing full-blown AIDS and dying sooner as their bodies are weakened because of their poor nutritional intake. Some 300,000 children have already lost their mother or both parents to AIDS. While many orphans are looked after by extended families, those without support are particularly vulnerable to disease and economic exploitation in the struggle for survival.

It is this fight for survival that exposes people all the more to the harsh realities of HIV/AIDS and drought. Extreme poverty is only made worse by failed rural livelihoods and high food prices on the one hand, and the loss of income earners by AIDS and other diseases on the other. Where food is most scarce, nutritional status is weakened and HIV prevalence tends to be high. While women's empowerment and gender equality have been issues on the international development scene since the 1970s, the pathways through which HIV/AIDS is spread reflects the gendered politics of sex. As in most societies, women in eastern and southern African countries fight to gain equal status to men socially and in sexual relationships. Whether in a marriage that the woman relies upon for financial reasons, or in commercial sexual exchanges, the longer term and contingent possibility of HIV infection becomes subordinated to the more acute short-term necessities of economic survival.

In southern Africa, the national consequences of the drought — on top of chronic vulnerability caused by poverty and HIV/AIDS — is crippling. In combination, these three harsh realities intensify the negative impact of each and are having profound consequences for the human resources of this region — which is facing long-term degradation. As poverty and the impact of HIV/AIDS uncoils the traditional coping strategies, the risk of a hazard reinforcing a regional disaster has grown.

Source: UNDP, Expert Reviewer 2002

place, the particular characteristics of those people exposed to the disaster and their access to health services. Hazard events such as flooding or temperature increase in highland areas can extend the range of vector-born diseases such as malaria. Where people are not used to taking precautions, such as sleeping under a net, the disease can quickly spread.

In some cases, deaths caused by epidemics are higher than deaths caused as a direct result of the disaster, in other cases no deaths are recorded after a major disaster event. Whether the disease profile of a population makes individuals more or less susceptible to hazard and the impacts of a disaster depends on intervening factors,such as the quality of health services, nutrition, the demographics of the population and livelihood sustainability. In Bangladesh two floods show opposing relationships. In September 1991, a flood killing 100 people was associated with 1,700 deaths from diarrhoea or enteric epidemic. However, in September 1998, a flood causing 1,050 deaths was linked to 'only' 151 deaths from diarrhoea or enteric epidemic.[46]

In this section, the focus will primarily be on the relationship between HIV/AIDS and disaster. But other diseases, such as malaria, cholera, tuberculosis and diarrhoea, have important roles to play in shaping vulnerability and losses to disaster. Cholera can break out among displaced people following disaster. Malaria and dengue fever are common accompaniments of climatic hazards. Economic crisis and poverty also reduce people's coping capacities. During 2000, when Russia was hit by a particularly severe cold winter, the Red Cross reported that tuberculosis had reduced the capacity of the people to respond to the hazard.

In El Salvador, local health centres where parents in the past would have received antibiotics and timely treatment were destroyed in the 2002 earthquake. As a result, they must travel for hours to reach medical care.But because of the drought and low coffee prices, there is no surplus money for travel. Crop failure, due to drought and lack of income from wages on coffee farms, has produced hunger that reduces the children's resistance to infection.

A popular and successful strategy for reducing morbidity among low-income communities has been community-based health promotion. This strategy has great potential for piggybacking information and training in disaster risk reduction and emergency response in neighbourhoods where formal services are inadequate in their coverage.

In efforts to strengthen local adaptive capacity in countries affected by Hurricane Mitch, the Pan American Health Organisation (PAHO) worked through its network of community-level heath centres to promote local disaster preparedness with community members involved in key decision-making roles.[47]

In summary, development, disaster experience and health status are tightly coupled.A healthy population

is more productive and likely to be less vulnerable to disaster-related hazards. Despite the powerful arsenal of vaccines and drugs that exist today, infectious diseases are on the increase, particularly in low- and medium-human development countries. They are attacking vulnerable groups and threatening to wipe out entire communities.

The lethal nature of these diseases, such as diphtheria, malaria, cholera, tuberculosis or HIV/AIDS, is being aided and abetted by the ongoing erosion of health systems, the spread of antibiotic resistance, disruption caused by conflict and disasters and above all, poverty.

HIV/AIDS and other diseases can exacerbate the disaster risks brought on by climate change, urbanisation, marginalisation and armed conflict. With HIV/AIDS, the able-bodied, adult workforce whom would normally engage in disaster-coping activities are too weak from the disease, or they are already dead. That leaves households composed of the elderly and very young, who lack labour capacity and knowledge. The staff of frontline public service agencies that might be expected to assist them may themselves also have had their ranks decimated from the disease. Cholera is a well-known disease of poverty and it is particularly deadly among populations weakened by either war or HIV/AIDS.

In 2001, approximately 36 million people were living with HIV and the predictions are that the number is set to rise drastically. According to UNAIDS, HIV/AIDS has emerged as the single greatest threat to development in many countries of the world. In Africa, AIDS impairs almost every activity of government, every sector of the economy, every part of everyone's life. In parts of southern Africa, infection rates are as high as 40 percent of the adult population — and still rising. Unchecked, HIV/AIDS will wipe out development gains where they have been made in Africa.

Rapid improvements are possible if good practice is built upon. In Thailand, Senegal and Cambodia, strong prevention campaigns have come close to containing the disease. Uganda has also shown strong signs of successfully combating the spread of HIV/AIDS.

The importance of transparency in disaster risk reduction is increasingly recognized. An interesting case is China's response to large epidemics such as AIDS. Estimates of the number of people living with HIV/AIDS in China remain very uncertain. Official figures in December 2001 reported the number of cumulative HIV infections to be only 30,736. UNAIDS estimates that there are more than 1 million HIV cases. Revised estimates from China have come much closer to the UNAIDS figures.[48]

3.2.3 Governance

Governance is seen by UNDP as the exercise of economic, political and administrative authority to manage a country's affairs at all levels. It comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences. It brings together the actions of state, non-state and private sector actors.

Governance has three legs: economic, political and administrative.

- Economic governance includes the decision-making process that affects a country's economic activities and its relationships with other economies. It clearly has major implications for equity, poverty and quality of life.
- Political governance is the process of decision-making to formulate policies, including national disaster reduction policy and planning.
- Administrative governance is the system of policy implementation and requires the existence of well-functioning organisations at the central and local levels. In the case of disaster risk reduction, it requires functioning enforcement of building codes, land-use planning, environmental risk and human vulnerability monitoring and safety standards.[49]

The characteristics of good governance — participation, rule of law, transparency, responsiveness, consensus orientation, equity, effectiveness, efficiency, accountability and strategic vision — are key for sustainable development and disaster risk reduction.

Good governance for disaster risk reduction

At the heart of good governance is a commitment to sharing decision-making power between the stakeholders in a process. This must be built on the political will to accept power-sharing and see the state as a facilitator in development. This contrasts with the conception of the government as the dominant actor shaping development and disaster risk management. Still,

BOX 3.14 THE STATE AND DISASTER PREVENTION: CUBA

In Chapter 2 of this Report, Cuba was identified as exhibiting very low relative vulnerability to tropical cyclones, despite having a high proportion of its population exposed to this hazard. Given Cuba's weak economy, this trend might appear especially surprising. Part of the explanation lies in Cuban social policy and disaster preparedness work.

Disaster reports from Cuba consistently report high economic and infrastructural losses, but low loss of life. In 2002, the International Federation of the Red Cross and Red Crescent Societies (IFRC) reported that hurricanes Isidore and Lili crossed the island less than two weeks apart. But thanks to well-organised evacuation procedures and shelter management, no deaths or injuries were reported. Success in saving lives under conditions of high economic stress is to be applauded. However, despite zero deaths and the evacuation of more than 600,000 people, hurricanes Isidore and Lili led to the damage or destruction of 57,000 homes, most of them in poor rural areas.

The hurricanes have also resulted in the Government's commitment to undertake an important housing reconstruction programme with a strong risk reduction component, with support from the UNDP and the international community. The programme introduces risk reduction approaches into urban development planning through five projects: the reconstruction of damaged buildings in Santa Clara and Cambaito; the renovation of Old Havana; the relocation of 200 families from a slum in La Mercedes; and the improvement of La Coloma, Pinar del Rio. The programme will enhance the capacities of both the national institutions dealing with housing, such as the National Housing Institute, and the communities with regard to local risk reduction issues. The programme is instrumental in closing the gap between the successful disaster response capacity and efficient evacuation system and disaster mitigation and prevention.

Source: Reliefweb (2002), Wisner (2001), www.onu.org.cu/vivienda/index.html

government remains a critical actor in development, based on its unique capacity as a mediator between private and public interests and as an actor with local, national and international connections.

In very fundamental ways, all the policy alternatives for ensuring that development contributes to managing and reducing disaster risk have to be underpinned by good governance. The failures of urban planning, building regulation, environmental control and regional development, mentioned in other sections of this chapter, can all be described as governance failures. Successful disaster risk reduction, at all levels, will depend on governance innovation.

Good governance is more complicated than simply downsizing the state. As Box 3.14 indicates with the example of Cuba, the state has — and here continues —to play a lead role in disaster risk reduction. As governance has become a catchword in development policy, there is danger of its uncritical application. As with other elements of development policy, enacting governance must take into account development history and cultural context.

While governments bear the primary responsibility with regard to the right to safety and security, they cannot and should not shoulder these tasks alone.

At national and international levels, civil society as an important governance actor is playing an ever more active role in forming policies to address risk. Civil society can also promote local participation, accountability and ownership. It is being increasingly recognised that disaster risk management at the local level is a key element in any viable national strategy to reduce disaster risks, building on the quality of community networks, the social fabric and effective municipal governance.

The private sector also has a role to play in moving towards sustainable development that incorporates an awareness of disaster risk. Unfortunately, there are very few recorded examples of corporate social responsibility that have engaged with the disaster risk-reduction agenda in developing countries.[50] There is great scope for encouraging the private sector to incorporate disaster risk issues into their corporate social responsibility planning.

Can external interventions build governance for risk reduction?

In contemporary, externally assisted capacity-building programmes for disaster risk management, a component of institutional strengthening is invariably included. It generally consists of strengthening a national organisation for emergency management, preparing a national disaster management plan,enacting a disaster management law or setting up training facilities.

A problem is that in these approaches, governance in the case of disaster risk management,has been focused narrowly as the creation of disaster specific legislation, administrative arrangements and institutional structures.

These efforts do not always necessarily result in enhanced capacity in disaster risk management. Though national organisations are set up, they are often excessively centralised and at times unable to effectively coordinate across other government sectors

or with civil society. Similarly, centralised organisations can be excessively focused on emergency logistics, preparedness and response rather than risk reduction.

The existence of a national disaster organisation in the capital city may represent progress in countries where disaster risk-related organisations and legislation were previously weak or absent. But they may have little impact on risk-accumulation processes in remote provinces or districts.

Mainstreaming disaster risk reduction

One key challenge today is how to mainstream disaster risk management with development policy. The DRI makes such an agenda more possible by providing baseline data on risk, which then can be used to track the influence of development policy. But much remains to be done.

An example of good practice comes from the British Virgin Islands, one of seven countries in the Caribbean that are implementing a Comprehensive Disaster Management Strategy (CDMS) with support from USAID/OFDA, UNDP and the Caribbean Disaster Emergency Response Agency (CDERA).[51] The main objective of CDMS is to enhance sustainable development in the Caribbean by integrating disaster risk reduction into the development process of CDERA member states.

Also in the Caribbean region, the Caribbean Development Bank (CDB) is currently executing the Disaster Mitigation Facility for the Caribbean (DMFC) with 17 countries from 2001 to 2006. The DMFC has two strategic objectives: to strengthen the bank's institutional capacity for natural hazard management and to assist countries in adopting successful disaster mitigation policies and practices. The aim is to create a development planning framework and culture for effective natural hazard management through the incorporation of natural hazard mitigation into the project cycle.

Weaknesses in governance are frequently sited in assessments of rapid-onset disasters.

After every major disaster, the role of governments, NGOs, and other civil society actors is critically appraised. But the role of the private sector (for example, in underpinning land prices that produced geographies of risk or in assisting workers through the emergency and rehabilitation periods) is rarely assessed.

BOX 3.15 DECENTRALISED DISASTER RISK PLANNING: HAITI

Haiti is the only Least Developed Country in the Americas. When nearly 200 people died after Hurricane Georges in 1998, UNDP supported the government in the elaboration of a National Risk and Disaster Management Plan.

This National Plan was published in 2001 and established a highly decentralised Institutional National System on Risk and Disaster Management, in line with the importance accorded to participation of the population in the 1987 Haitian Constitution. It was recognised that the central government did not have the capacity to cover the entire country in a large-scale disaster scenario. But a lack of active district level disaster planning pointed to the need for supported decentralisation.

The participatory process of the preparation of the National Plan involved more than 30 institutions and eased the vital process of bonding between partners. Programme III of the Plan tackled local risk management. In this regard, the lack of a clear decentralization framework and operational local institutions led to a research-action exercise. This included a number of pilot projects by which local and national capacities were strengthened, particularly the Direction de la Protection Civile (DPC), which had core responsibility for improving training and monitoring skills. Several international organisations, such as UNDP, USAID/OFDA, the European Community Humanitarian Office (ECHO), Pan American Development Foundation (PADF), OXFAM and the Red Cross family, supported local risk and disaster management committees.

Several important gains have been made in the last four years. At the central level, the National Plan was approved and the process of legal reform was launched, including the reinforcement of the DPC and the consolidation of government-donor partnerships. At the local level, more than 90 local participatory committees have been created since 1999 and trained in high risk and poor areas outside Port-au-Prince. The proactive role of central government — directly or indirectly involved in most of these exercises — has provided more credibility and sustainability to community level interventions.

The increased number of committees, which include local authorities, civil society and private sector organisations, reflects the importance of risk and disaster management for the Haitian population. One lesson learned through this process is that where community-based mechanisms already existed for broader development work, it was more feasible and sustainable to factor risk management concerns in ongoing process — absorbing risk and disaster management functions — rather than creating new parallel community systems.

Source: Government of Haiti (2003), http://www.ht.undp.org/pnud-hai/projets/Bestpract.htm

Dealing with disasters is always a challenge for leaders. Swift and immediate response brings popular approval to the leadership. In extreme cases bad management of a disaster risk and event have resulted in leadership changes.

Popular discontent leading to the overthrow of the Somoza dictatorship in Nicaragua was fuelled by the

BOX 3.16 THE RELEVANCE OF GOVERNANCE: EVIDENCE FROM ZIMBABWE

On average, large-scale drought hits southern Africa once a decade. In 1992, the worst drought in living memory as it was called, parched the land from the Atlantic to the Indian Ocean. Despite a 75 percent crop loss, the grain-exporting country of Zimbabwe coped as the government reacted early. It had surplus maize from previous years, foreign exchange to import food, an efficient relief program in place and good will from donors. A well-planned relief operation averted a famine.

In 2002, after unseasonably heavy rain and a long dry spell, half of the population of 13 million needed food aid. Yet unlike 1992, reservoirs were full of water and there was plenty of grazing for cattle. Why were things worse? Ten years before, a drought induced by the El Nino weather phenomenon caused the crisis. This time, a combination of governance issues, economic crisis, widespread poverty and the spread of HIV/AIDS added human elements to a natural disaster.

Zimbabwe is the world's fastest-shrinking economy and declined at a rate of minus 10 percent in 2001. Poverty rates have doubled since 1992 and people's coping mechanisms are stretched to the limit. In the past decade, HIV/AIDS rates have soared to nearly 34 percent. As productive adults fall ill and die, households headed by orphans and grandmothers multiply.

Another factor playing a part in the crisis is commercial agriculture. Over the last two years, the amount of land planted and crops harvested by commercial farmers has decreased dramatically. Cereal production has fallen by two thirds since 1999. One million farm workers and their families have lost their jobs and homes — increasing the pressure in an already tense social climate.

The collapse of commercial agriculture means that, unlike 10 years ago, the country has no carry-over maize stocks to cushion the drought's impact. And the government's ability to import food is extremely low. Foreign exchange reserves are just US$ 65 million, enough to cover only half a month's imports. All of this is aggravated by the costs of supporting the country's military intervention in the Democratic Republic of Congo.

Source: Reliefweb C:\Documents and Settings\karl\Local Settings\Temporary Internet Files\Content.IE5\W9YB0PQR\1_ReliefWeb Zimbabwe's food crisis what went wrong[1].htm

theft of international funds provided for the rehabilitation of Managua, after a 1972 earthquake destroyed 80 percent of the houses.

Political systems recognise the need for strong intervention following a disaster. The challenge now is to increase the focus on disaster risk reduction as a central element of ongoing development policy. This should be a transitional point on the way to identifying development paths that can generate wealth without producing unacceptable levels of risk. Just what levels of risk are acceptable will be a political decision, requiring information on the disaster-development relationship and appropriate tools to aid transparent decision-making.

As with other development issues, disaster risk policy is sometimes hampered because of disjointed and uncoordinated policy-making. This very often has its roots in a fragmented governance structure.

Problems include competition or a failure to communicate between inter-governmental agencies and the state. Or in large countries,such as China or Brazil,between local, provincial and national tiers of government. That different agencies at the local and national levels hold responsibility for development policy serves to further fragment disaster-development policy.

A key problem caused by inadequate governance is the opportunity it allows for corruption in both the state and non-governmental sectors through a lack of transparency. Some political actors in disaster relief have been observed pursuing discriminatory policies in distributing relief and recovery assistance, favouring one segment of population over others. While this leads to the marginalisation of non-recipients (generally the most vulnerable), it also undermines the legitimacy of responsible organisations.

The example of Zimbabwe, shown in Box 3.16, may echo 1998 Nobel laureate Amartya Sen's argument that no substantial famine has ever occurred in any country with a relatively free press. In addition, data produced in the DRI analysis of drought identifies the Democratic People's Republic of Korea as a high-vulnerability state with respect to human loss from drought, even though it does not appear on the list of countries with large populations exposed to drought conditions.

Political will is critical at the national level to provide an enabling environment for good governance and disaster risk management. Such intention for reform is often most clearly expressed though legislative innovations.

In the last two decades, countries such as Algeria, El Salvador, Nicaragua, Haiti, Madagascar, Turkey, India and China, have demonstrated renewed political commitments to disaster risk reduction.[52] Within these reforms,legislation often remains a critical element in ensuring a solid ground for other focal areas such as institutional systems, sound planning and coordination, local participation and effective policy implementation.

In the mid-1990s, South Africa initiated a long process for reform with respect to disaster-related

legislation, following destructive floods that affected thousands of households on the Cape Flats (see Box 3.17).

Unlike the reform of disaster legislation undertaken elsewhere in southern Africa, the South African experience has been completely owned and driven by South Africa-based partners. As a result, the pressure that accompanies an externally driven process to deliver amended legislation in one or two years (often unrealistic for achieving a broad-based buy-in) has not prevailed.

In the late 1990s, countries such as Nicaragua, El Salvador, Costa Rica and the Dominican Republic revised their legislation. This reform was the result of a fertile south-south cooperation effort initiated by Colombia and shared and developed in Central America after Mitch. The reforms generally increase inter-institutional coordination, institutional prerogatives for disaster risk reduction and offer opportunities for civil society participation.

But the road of legal reform is not easy, as other experiences seem to suggest. Haiti and Madagascar — two Least Developed Countries (LDCs) with high relative vulnerability to climatic hazards — are currently revising their laws regarding disaster risk reduction and opening windows for greater popular participation. Turkey and Algeria (after the recent earthquakes) have also undertaken a serious reform with a strong seismic and technical focus.

The critical issue is what should be achieved through improved governance. Institutional design, legislation and building codes provide 'technical' solutions in the short-term. But long-term institutional development requires addressing larger governance issues regarding the distribution and decentralisation of power, structures of decision-making and accountability, and participation of communities in the scheme of governance.

Governance for disaster reduction at the regional level

The emergence of regional organisations addressing risk management issues has been one of the salient characteristics of the last fifteen years. In addition to developing their own expertise and policy initiatives, regional organisations can provide continuity at the regional scale to help maintain national level progress in development and disaster risk management.

Regional organisations have proved particularly effective in addressing trans-boundary risk issues, for example, the work of the Mekong River Commission on flood risk in the Mekong River Basin. Regional organisations are also effective in areas where multiple countries are frequently affected by the same hazard events, such as hurricanes and cyclones in small island states in the Pacific or Caribbean, or drought in southern Africa or the Horn of Africa.

The emergence and consolidation of regional organisations has tended to reflect the maturity of disaster risk management as a key governance issue at the national level. Thus the level of development in Latin America and the Caribbean has tended to be relatively greater than in Asia and even more so than in Africa.

Regional organisations are playing a pivotal role in defining and shaping regional level risk management policies, in sharing knowledge between countries and between key agencies and individuals, and in supporting the development of national capacities.[53]

BOX 3.17 LEGISLATION CAN ENABLE DISASTER SENSITIVE DEVELOPMENT: SOUTH AFRICA

In the 1990s, South Africa initiated a long process for reform with respect to disaster-related legislation. Several key elements have characterised this process: local ownership of legislation; professional pressure for change; a deliberate, slow multi-stage process of change; widespread dissemination of preparatory discussion and policy documentation; commitment to transparent debate and consultation through parliamentary processes; continuity in individuals supporting the process; and a commitment to streamline incoming legislation with best international practice.

While legislative reform has been a lengthy process, it has gradually built the momentum for accepting change at political and functional levels across a range of government ministries. Moreover, the new Disaster Management Act will be enacted in the legal-administrative context of other recent legislation, including the Municipal Systems Act, the National Environmental Management Act and the Veld and Forest Fires Act.

The open deliberations surrounding the Disaster Management Act were critical to shaping the breadth of the final Act. The Act has significant inclusions with respect to vulnerability reduction as well as requirements for more extensive provincial and municipal consultation in disaster management. It also provides scope for applying legislation to disaster-prone areas, communities and households, thus allowing for greater differentiation in efforts, and calls attention to the importance of research and education as well as indigenous knowledge.

Within government, the relative stability of key national personnel driving the process has provided essential continuity. Success has also been built on a critical mass of disaster professionals with international exposure. Nevertheless, the Act reflects almost a decade of sustained effort.

Source: Holloway (2003)

BOX 3.18 THE ROLE OF REGIONAL ORGANISATIONS AND NETWORKS IN STRENGTHENING CAPACITIES FOR DISASTER REDUCTION

Regional organisations and networks are playing an increasingly important role in strengthening capacities for disaster reduction in different regions around the world. There are a number of different types of regional organisations:

- Regional intergovernmental organisations with a specific disaster reduction mandate, such as the Caribbean Disaster Emergency Response Agency (CDERA) and the Coordination Center for the Prevention of Natural Disasters in Central America (CEPREDENAC).
- Regional intergovernmental organisations that have included aspects of disaster reduction within a broad mandate, for example, the Organization of American States (OAS), Southern Africa Development Community (SADC), the South Pacific Applied Geoscience Commission (SOPAC) and the Stability Pact for South Eastern Europe.
- Academic or governmental organisations with a regional focus on disaster reduction, for example, the Asia Disaster Preparedness Center (ADPC) and the Asia Disaster Reduction Center (ADRC).
- Regional disaster reduction networks of academic and non-governmental organisations, such as the Network for Social Studies on Disaster Prevention in Latin America (LA RED), PeriPeri in southern Africa and Duryog Nivaran in South Asia.

Such regional organisations and networks are currently involved in a number of tasks and functions, which vary widely from one case to another. These include:

- Strengthening national capacities through training, programme support, technical assistance and resource mobilisation.
- Information sharing, documentation and comparative analysis of issues on a regional and sub-regional basis.
- Coordination of regional or sub-regional disaster reduction projects.
- Development of common regional or sub-regional policy platforms and the advocacy of regional policy initiatives in global forum.

Source: UNDP Expert Group Meeting on the Roles of Regional Organisations and Networks in Strengthening Capacities for Disaster Reduction, 2002.

3.2.4 Social capital and civil society

In recent years, the concept of social capital has provided additional insights into the ways in which individuals, communities and groups mobilise to deal with disasters.

Social capital refers to those stocks of social trust,norms and networks that people derive from their membership in different types of social collectives. Social capital — measured by levels of trust, cooperation and reciprocity in a social group — plays the most important role in shaping actual resilience to disaster shocks and stress.

When Hurricane Mitch struck Honduras in 1998,the district of La Masica on the Caribbean coast was able to mitigate losses through a process of local level risk management and early warning developed before the disaster struck. No deaths occurred in La Masica, in comparison to neighbouring watersheds with similar characteristics, where hundreds lost their lives.[54]

Civil society and social capital are no longer exclusively local institutions.International NGOs have built support within networks of individuals throughout the world who share similar concerns about risk.Even kinship-based networks are of an increasingly international orientation.This is shown (and demonstrated in Box 3.19) in the growing recognition of how remittances from relatives abroad are often the most important resource for disaster-affected people in meeting survival and reconstruction needs.

Local level community response remains the most important factor enabling people to reduce the risks

BOX 3.19 INTERNATIONAL SOCIAL CAPITAL

One of the reasons for strong international attention to the 2001 earthquake in Gujarat, India was the political and commercial strength of the non-resident Gujarati community in a number of developed countries. Shortly after the Gujarat earthquake, the non-resident population living in the United Kingdom managed to raise £2 million for recovery and reconstruction. In April 2001, the American India Foundation, an organisation of non-resident Indians based in the United States, organised a five-day visit to Gujarat and promised to raise US$ 50 million for relief and reconstruction work. Political representatives and governments in many of these countries were influenced by the strength of the Gujarati communities in sending relief materials. International assistance in the wake of the Gujarat earthquake, when compared with the 1999 cyclone in Orissa, India in which more than 10,000 people died, could predominantly be attributed to the skills in linking forms of social capital which the Gujaratis commanded.

The flow of remittances has become a wide-spread strategy for coping with poverty that has reduced the risk of many households. Following disaster, financial remittance flows from unaffected to affected areas has made a significant contribution to reconstruction. Following an earthquake in 2001, the Central Reserve Bank of El Salvador estimated that Salvadoreans living abroad sent home US$ 1.9 billion in remittances.

Migration is a well-established survival strategy across low development regions and countries in Africa, Asia, Latin America and the Caribbean. An overview of Africa's rural non-farm sector showed that in areas distant from major cities, migration earnings constituted 20 percent of total non-farm earnings. It was as high as 75 percent in areas close to cities. Worldwide, international remittance flows were estimated in the 1980s to total US$ 71 billion — exceeding official development aid.[55]

Source: Vatsa (2002)

associated with or cope with disaster. But community ties can be eroded by long-term or extreme social stress. Under conditions of extreme poverty, inter-household ties within the community break down as individual households can no longer maintain relationships. Social networks can also be strong but counter development, as in the case of drugs gangs or ethnically divided communities.[56]

Depletion of social capital is also an important contributing factor in complex emergencies. In this case, social unrest and displacement undermines social networks and traditional safety nets that exist at the community level, and may result in a natural disaster spiralling into complex political emergencies.

Social capital can also be eroded by development policy that purposefully or incidentally breaks local bonds of trust or friendship. Crises in social capital are found in former centrally planned societies as well as those within liberal political economies (see Box 3.20).

Despite economic wealth and political stability in Barbados, in the past civil society was not built up from the island's stock of social capital. This reached a low point in 1999 when only six electoral districts had an active local disaster group — out of a national system of community-based disaster prevention and response organisations organised around the island's 28 electoral districts.

Barbados is not alone in having difficulties in consolidating local social organisation to confront development and disaster risk. This indicates the need for a renewed effort to support local social organisation in the future.[57]

Building social capital and supporting meaningful participation by vulnerable groups and individuals in development is not easy. Principle characteristics of social vulnerability are political marginalisation and social exclusion. Encouraging social integration and political participation to enhance resilience and other quality of life goals is a major challenge to disaster and development policy.

In the past, many programmes sponsored by international organisations and developmental NGOs have claimed that their projects have built social capital by enabling local participation. All too often though, local participation has been captured by local elites and left the vulnerable behind. When vulnerable groups are included, there is always a danger that participation can drift into the shifting of development burdens from the state or NGOs and onto local actors, those with the least time, energy or resources to spare.

BOX 3.20 THE EROSION OF SOCIAL CAPITAL AND DISASTER RISK IN MONGOLIA

Known as Zud, the snow disasters in Mongolia in 1999-2001 that left millions of animals dead and threatened the livelihood and food security of the country's predominantly pastoral society are another good example of the impact of the depletion of social capital. The de-collectivisation of pastoral households in Mongolia eliminated a number of support mechanisms available to these households. During the socialist period, substantial safety nets were provided by herding collectives. But during this period of state-supported social security, all other risk management mechanisms traditionally practiced by communities weakened. In the early 1990s, when the process of liberalization started in Mongolia, most of the social security measures were withdrawn. Since the communities had lost their own traditional risk management practices that existed in the pre-socialist period, they had little preparedness and capacities at the individual or communal level. This led to one of the worst disasters in Mongolia's history.

Source: Bass, Batjargal and Swift, 2001

Examples of the successful and long-term strengthening of local communities do exist, but remain uncommon. A long-term commitment is needed, which is often beyond the funding and staffing cycles of many agencies. Perhaps more difficult is avoiding the trap of communities becoming dependent on well-meaning external agencies.

Following Hurricane Mitch, a pilot project to warp natural disaster prevention within the development agenda at the local level was initiated in Nicaragua in 2001. This UNDP project supported the work of the new Sistema Nacional para la Prevencion, Mitigacion y Atencion de Desastres (SNPMAD) in six municipalities; three in Nueva Segovia and three in Matagalpa.

In this programme, the government of Nicaragua undertook a participatory process of local development planning within a disaster reduction approach. Disaster reduction was factored into a range of planning sectors including infrastructure development, productive sectors, social sectors and environmental management. Disaster reduction was also formally taken into consideration in investment decisions for areas with a history of natural disasters, such as flooding and landslides. Following a risk-mapping exercise, areas of high disaster risk received additional support

through protection measures, including incentives for environmental rehabilitation, the designation of safe areas for urban expansion and demarcation of zones for protection from human intervention.

This programme was itself a learning process. Key elements of success have included the realization that risk profiles and participatory processes in each municipality were different, so strategies should rely on local decision-making and be flexible in approach and implementation. In addition, local plans should be linked with central institutions to access support and blend with national development policy. The involvement of local stakeholders and the embracing of a gendered sensitivity to development, disaster risk management and participation were also key in maintaining local support and generating significant local outputs for disaster risk reduction.[58]

The most appropriate policies for enhancing the positive contribution of civil society will depend on the developmental context. For many countries in Africa, Latin America and Asia that have undergone structural adjustment and participatory development, the challenge may not be so much the creation of a non-governmental sector, as its coordination.

An overly strong civil society can undermine local and national government and undo democratic gains. This happens when private development agencies in civil society funded by the international community are perceived as overshadowing the state in driving local development.

In other cases, the state may still have an overriding control on civil society organisations and reduce their effectiveness and scope of operation. It is a fine balancing act, but the goal should be a strong civil society and a strong state working in partnership with a socially committed private sector.[59]

A final challenge for policies aimed at building social capital is the danger of undermining democratic institutions. It is all too easy to create an impression that non-state funding streams are more accessible, and locally far larger and more responsive, than local and state government agencies. Indeed, the main argument for funding civil society is weaknesses in the state sector. Over the long-term, funding civil society without strengthening the state simply reproduces the lopsided governance that interventions were designed to overcome. Working towards partnerships and transparency in funding, with support for good policy from state and non-state actors, may be a less rapid but ultimately more constructive approach to building local social capital to enhance resilience.

Disaster risk reduction also offers opportunities for embracing gender sensitivity in development policy and practice. For example, the skills and experience of women in building and maintaining local social networks can be critical for local risk reduction.

This said, the role of women in local decision-making often continues to be sharply constrained by social and economic status. It is not unusual to see women forming the majority of membership in an organisation, while men dominate in leadership positions.

For policy interventions seeking to include a participatory component, preliminary discussions to help map the social relationships within the community are essential if the vulnerable (who are also the socially excluded) are to be reached and helped to build their own levels of resilience through participation.

In Cox's Bazar, Bangladesh, the inclusion of women in disaster preparedness and development organisations (including education, reproductive health and micro-enterprise development groups) has been followed by a huge reduction in the numbers of women killed or affected by tropical cyclones.[60]

The importance of a gendered perspective on risk during the reconstruction period can be seen from the experiences of the civil society group Janpath after the Gujarat earthquake in 2001. Janpath is a network of activists and organisations that aim to enhance the status of women in Gujarati society as a means of building the foundations for more inclusive governance.[61]

3.3 How Can Integrating Disaster Risk Reduction and Development Planning Help to Meet the MDGs?

In Chapter 1, connections between each MDG and disaster risk management were made. Here, the discussion highlights opportunities for win-win policies that could help more people be free from preventable losses caused by disaster as part of a wider programme of meeting human development needs. MDGs 1, 3, 6, 7

and 8 are addressed as being of primary concern to disaster risk reduction.

MDG 1. Eradicating extreme poverty and hunger

There are many opportunities for interventions that could simultaneously reduce disaster risk and poverty and hunger.

- Strengthening and diversifying livelihoods.
- Encouraging responsible foreign investment and job creation.
- A flexible and participatory approach to urban planning.
- Building social security, including access to health and education.
- The provision of risk/loss spreading mechanisms for those excluded from insurance cover.

At levels from the individual to the national, the impact of disaster takes away the means of generating an income as well as any savings and assets. It is this aspect of disaster that means pro-poor development policy is also an opportunity for disaster risk reduction.

Many of the tools for delivering poverty-alleviation projects and programmes need simply to be modified to take account of disaster risk reduction. The added value of such work is to enhance the sustainability of poverty and hunger alleviation.

In development planning, many countries and international funding agencies include elements of environmental and social impact assessment for large projects. These assessments could take into account the potential impact of developments on disaster risk. This would allow for greater transparency in the power of large infrastructure developments to reshape where people live and what they do to make a living, and so to contribute to changing patterns of disaster risk. This information could then enable more informed claims from those impacted by disaster.

MDG 3. Promote gender equality and empower women

Gender influences the types of hazard to which an individual is exposed and an individual's access to resources with which to build resilience to hazard and to recover from disaster. Where structural constraints in society result in the exclusion of women from decision-making or economic security, risk will be unevenly spread.

The continued exclusion of women from all levels of political decision-making is one of the greatest lost opportunities for human development and disaster risk management.

Eliminating disparities in primary and secondary education is the quantitative target set for this MDG. But there are many other ways in which women's full participation in society can be measured at the local level.

The long-term goals for development and disaster risk reduction must be to empower women and to encourage a self-questioning of the social structures within which women and girls live their lives. Also, to work with women and girls and provide the tools for moving towards greater equality with men in household, familial and wider social relationships.

Enabling a greater voice for the views of women in development will allow women to identify priorities for development. In enabling women to confront disaster risk, reforms in land and dwelling ownership, inheritance and employment rights are likely to be as important as the needs to strengthen the social justice concerns of women in accessing health, education and legal services.

Highlighting gender in development and disaster risk reduction raises a broader issue of inclusiveness in decision-making. To promote resilience, inclusive and consultative processes are needed that engage those most at risk. Often those most at risk are the most resourceful members of society, but also the least included in economic and political life. This will include women, but also child-led households, elderly people caring for grandchildren, ethnic and religious minorities, people weakened by chronic illness and social classes and casts with low social status.

MDG 4. Reducing child mortality

Children are at greater risk of being affected, injured or killed by disaster impacts than adults. For example, an estimated 114,000 school-aged children were made homeless by the Marmara earthquake in Turkey in 1999.[62]

It is perhaps the indirect impacts of disaster that have the greatest toll on children and interact with national mortality levels. Most important here is the loss of livelihoods that can lead to extreme poverty and homelessness for children left behind.

Appropriate safety nets, such as help for extended families with capacity to absorb orphans or well run orphanages, can support many children. But for those children born into families whose livelihoods and homes have been taken away by disaster impacts, the chances of survival in the first years of life will be reduced.

MDG 6.Combating HIV/AIDS, malaria and other diseases

For many people, natural hazard stress and shock is felt as one of many pressures. As the preceding discussion highlighted, HIV/AIDS and other diseases can undermine individual and collective coping capacity, just as disaster impacts can take away development gains and livelihoods, making people more vulnerable to illness.

Interventions to strengthen basic health care provision, family health care and preventative health planning can play central roles in strengthening society and building capacity with which to resist natural hazards.

Innovative development policy is required for those instances where natural hazard coincides with high rates of illness. Ways of providing subsistence, security and education for the children of families where adults may be dead or made weak from illness are difficult to find. This is even more so when rural livelihoods are under stress from drought conditions or crops and houses and tools have been swept away by floods.

Synergy exists between the aims of development and disaster risk reduction.The importance of integration is heightened amid chronic illness.

MDG 7.Ensuring environmental sustainability.

One of the clearest signals of a crisis in environment-human relations is natural disaster. Soil degradation, biodiversity loss, over-fishing, deforestation or drinking water scarcity undermine rural livelihoods and pave the way for vulnerability to environmental hazard.

In cities, pollution of waterways and the air and inadequate provision of drinking water, sanitation or solid waste management systems shape patterns of illness that run down resistance to everyday hazards. In rural and urban contexts, risk accumulation that ends in disaster is often closely tied to problems of environmental sustainability. Strategies to enhance environmental sustainability will make a contribution to breaking the chain of accumulated risk.

The man-made and natural environments are themselves at risk from disaster. Tropical cyclones and earthquakes can destroy natural assets and cultural treasures.

Geographical inequity describes much of disaster risk tied to environmental sustainability. The preceding discussion of global climate change highlighted the link between wealth creation for some, at the expense of increases in disaster risk for others in distant places. It is because of this that international cooperation is needed to support mitigation of climate change and for those societies forced to adapt to its impacts.

In the foreseeable future, it will not be possible to separate those aspects of hydrometeorlogical hazards that can be explained by climate change from background fluctuations. But the responsibility of industrialised countries for climate change is undeniable. Support for adapting to climate change and coping with its adverse impacts is an argument for increased international attention for disaster risk reduction.

MDG 8. Developing a global partnership for development

The most important components of this goal relate to trade, debt relief and aid. Success rests to a large extent on the willingness of developed countries to meet their commitments.The 2001 Ministerial Meeting of the World Trade Organization (WTO) in Doha,Qatar placed the needs and interests of the developing countries at the heart of WTO negotiations. However, in 2003, the subsequent stalemate in the Cancun round of WTO negotiations showed greater political will,collaborative thinking and action is required at the international level to allow developing countries to trade on a level playing field.

More progress has been made in debt relief under the Heavily Indebted Poor Countries (HIPC) initiative. Some 26 countries have now entered this process.The HIPC process is reinforced by international financial agencies that have integrated disaster lending into their portfolios.

Official Development Assistance (ODA) climbed in 2002 after nearly a decade in decline, but remains well below the target of 0.7 percent of donor countries GDP. Yet the amount of money provided for emergency and distress relief is small and fluctuates in response to annual crises. However, as a proportion of ODA, emergency and distress relief has steadily increased

from 1.9 percent in 1986 to 3.2 percent in 1991, and reaching a peak of 7.8 percent in 1999. It has since declined to 6.3 percent in 2001.[63] Within this percentage, the funds oriented towards disaster risk management remains minimal.

Increases in assistance finance may reflect an evolving change in international donor priorities. As likely is a response to increasing disaster losses as the disaster-development relationship becomes ever more tightly connected, and human and economic exposure to disaster risk grows.

ISDR has succeeded in building regional and international partnerships for disaster risk reduction and in disseminating good practice. Similarly, negotiations around the United Nations Framework Convention on Climate Change (UNFCCC), most recently centred on the Kyoto Protocol, also provide a focus for international attention that can directly address the concerns of disaster risk reduction.

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