Progress in Development Studies 2,4 (2002) pp. 283–305

The macro-economic impact of disasters

Mark Pelling[a,*], Alpaslan Özerdem[b] and Sultan Barakat[b]

[a]Department of Geography, University of Liverpool, UK
[b]Department of Politics, University of York, UK

Abstract: Despite 30 years of study, international development policy appears to be little closer to generating protection to vulnerable people from the preventable losses of disaster. Part of the reason for a lack of progress has been the sidelining of disaster in development studies. Disaster events have been seen as exceptional and allowed to fall outside the mainstream of development theory. In this paper we set out and use a framework that allows a more holistic accounting for the macro-economic impacts of disaster, and is a step towards a deeper integration of disasters and development.

Key words: disaster, disaster losses, economic loss, economic shock, vulnerability.

I Introduction

> Disaster can disrupt or destroy many different sorts of functions and institutions all at once. It may bring society-wide or systemic crisis (Hewitt, 1997: 36).

Disasters serve as reminders that progress is not linear and that development is characterized by discontinuities and dislocations of order. Emergencies provide blunt examples of development, supposedly benign that has gone awry (Norgaard, 1994; Nafziger *et al*., 2000). Increasing interest in disasters is justified by the rising frequency with which disasters are taking place. Reported disaster frequency has doubled every ten years since 1960 with 96% of all deaths from natural disasters occurring in the global South (International Federation of the Red Cross and Red Crescent (IFRC/RC), 1999). The annual average financial loss caused by natural disasters, accidents, technological accidents and urban fires, estimated between 1991 and 2000 in US$ millions at constant

*Author for correspondence: Department of Geography, University of Liverpool, Liverpool L69 7ZT, UK. E-mail: pelling@liverpool.ac.uk

 10.1191/1464993402ps042ra

2000 prices, was 234 in Africa; 21 293 in the Americas; 40 346 in Asia; 17 930 in Europe; and 1178 in Oceania (IFRC/RC, 2001). Individual annual losses fluctuate greatly, with 1995 being the worst year on record when 0.7% of global GDP was lost to natural disasters. All disaster loss estimates need to be viewed with caution. They are compiled from government reports and insurance statements with no common methodology and little transparency in their calculation. Moreover, they account only for loss of physical assets and indicate nothing of the full scale of personal loss and livelihood disruption, which is proportionately higher in less developed countries. Low human development countries average more than 1000 deaths per disaster but less than US$100 million loss, compared with high human development countries that average less than ten deaths but over US$600 million in losses per disaster (IFRC/RC, 2001). Such losses are difficult for any economy to absorb but, for developing countries, they can be devastating. Hurricane Mitch is said to have set back development in Nicaragua by 20 years (Day, 2000).

The frequency with which the media reports losses to natural disasters implies that the economic impacts of disaster are well understood and easily traced. Neither is the case. Most reports of disaster loss are limited to accounting for the replacement value of physical infrastructure, and do not incorporate the potentially larger systemic impacts of disasters on regional or national economies (Vermeiren, 1991; Buckle *et al*., 2001). Whilst there has been a lively discussion in the literature on the contrasting merits of differing ontological approaches towards disasters and development – the advantages of focusing on human or physical causation (Pelling, 2001), there has been less emphasis on the more basic issue of accounting for the impact of disaster on economic systems (Alabala-Bertrand, 1993). In this review paper we argue for a movement towards a more holistic accounting methodology and for a view of disasters and disaster mitigation that places them firmly within the development process. This is a break with the modernist tradition which has placed 'disaster' outside of 'development' just as it has separated 'nature' from 'society' in other areas of environmental management (Dickins, 1996; Escobar, 1996). Throughout the paper we refer to the macro-economic impacts of disaster and do not deal in detail with impacts at an individual or household level. Disaster is felt at many spatial scales – from the personal to the global – but here we focus on disaster impacts at the level of the nation state or national sub-region, which remain key units in development planning. We do not discuss in detail the production of human or ecological vulnerability to disaster or technical aspects of disaster prevention and response, as these are well covered elsewhere (Varley, 1994; Blaikie *et al*., 1994; Kasperson *et al*., 1995). Following this introduction, where we present a working definition of disaster, the paper is split into two main sections. The first reviews current knowledge on the interaction of disasters and national economic development and presents a framework for a more holistic analysis of the macro-economic impact of disaster. The second section discusses the interaction of disasters with the development process.

First, though we need to be clear about what constitutes a disaster. Here we include systemic disruptions with four different kinds of triggering event (which at times coincide and overlap):

- nature as trigger: earthquakes, floods, etc.
- violence as trigger: war, armed conflict, etc.

- technology as trigger: oil spillage, factory explosions, hazardous waste, etc.
- deterioration as trigger: declining social services, environmental degradation, etc.

It is often difficult to isolate the impacts of individual hazards. Different disaster types can occur in quick succession, or as secondary or tertiary damages to a primary event. But some generalizations can be made. Sudden-onset disasters (hurricanes, floods, fires, explosions and earthquakes) primarily damage productive capital, including infrastructure, and may effectively destroy the means of production as well as stocks. Slow-onset disasters (droughts and some floods) are typically more extensive in their impact and may be more destructive in the longer term as they erode rates of savings, investment and domestic demand as well as undermining productive capacity. Compound disasters (volcanic activity, complex humanitarian emergencies) have elements of both the sudden- and slow-onset disasters where an active period of risk can last for many years with varying intensity increasing uncertainty and depressing investment, with individual events within this period causing more immediate and focused damage (United Nations Disaster Relief Coordinator (UNDRCO), 1991).

II Accounting for the macro-economic effects of disaster

Generalizing the effects of disasters with varied triggers, on socio-economic systems with diverse structures is made dangerous through information scarcity and difficult by the lack of a universally accepted methodology for measuring disaster impact, the need for which is a major finding of this review. In this section the European Commission for Latin America and the Caribbean (ECLAC) methodology, which was designed to appraise impacts from natural trigger events (Figure 1) is used to frame a general discussion on the economics of disaster impacts. This is more sensitive than other methodologies that tend to measure impact and losses based on indicators such as population density and the distribution of infrastructure or simple economic indicators such as GDP per capita.

The ECLAC methodology separates direct physical damage from indirect production costs and further, or secondary, effects brought about by changes in national income and budget expenditure. In reality there are many linkages between these types of losses. Direct losses are incurred during the damage stages of a disaster but may lead to indirect losses resulting in secondary effects that continue to be felt throughout the recovery stage and may shape the preconditions of subsequent vulnerability. Reduced output and employment opportunities from direct and indirect damage in impacted activities or economic sectors create knock-on indirect and secondary costs through reduction in consumption and investment, reduced productive capacity and increased social costs (resettlement, health impacts). ECLAC's distinction between direct, indirect and secondary losses can be supported by the categorization of potential disaster losses as tangible and intangible. Table 1 presents this typology of losses and includes possible indicators.

Disaster impacts are shaped by the size and structure of the receiving socio-economy, as well as the nature of the triggering event. Small and poorly diversified economies with spatially concentrated productive assets are highly vulnerable to exogenous economic and disaster shocks alike. Antigua's economy is a good example. It is small

Direct damages:
All damage to fixed assets, capital and inventories of finished and semi-finished goods, raw materials and spare parts that occur simultaneously as a direct consequences of the natural phenomenon causing a disaster. Includes expenditure on relief and emergency response.

Indirect damages and flow losses:
The effect on flows of goods that will not be produced and services that will not be provided after a disaster. Indirect damages may increase operational expenditure following the destruction of physical infrastructure, or inventories. They incur additional costs from the alternative provision of services (additional costs are incurred because of the need to use alternative means of production and/or distribution for the provision of goods and services), losses of income resulting from the nonprovision of goods and services, losses of personal income in the case of total or partial loss of the means of production, business or livelihood.

Secondary effects:
The impact on the overall performance of the economy, as measured through the most significant macro-economic variables. Relevant variables may include overall and sectoral gross domestic product, the balance of trade and balance of payments, levels of indebtedness and monetary reserves, the state of public finances and gross capital investment. The effect of a disaster on public finance, such as a decline in tax revenue or an increase in current expenditure can be particularly important. Secondary effects are usually felt during the calendar or fiscal year in which the disaster occurs but may spill over a number of years.

Figure 1 The ECLAC methodology for disaster impact appraisal
Source: Zapata-Marti (1997: 10–11)

and dependent upon agriculture and tourism, two productive sectors with high vulnerability to disasters. In 1995, Hurricane Luis caused US$330m direct damage to Antigua, equivalent to 66% of GDP (Gibbs, 1997).

Larger, developed economies with sizeable foreign currency reserves, high proportions of insured assets, comprehensive social services and diversified production are more able to absorb and spread the burden of impacts over space and time. There is greater scope for coping with or absorbing direct losses and thereby reducing the likelihood of knock-on flow losses or secondary effects. For example, on 17 August 1999, an area of approximately 41 000 km^2 in the Marmara Region of Turkey was struck by an earthquake registering 7.4 on the Richter scale for about 45 seconds. The earthquake-affected area is home to 23% of the country's population, and accounts for 34.7% of GNP. The State Department for Planning (Devlet Planlama Teskilati, 1999) estimated direct economic losses of between US$9 billion and US$13 billion, (industrial facilities accounting for US$2 billion, buildings US$5 billion, and infrastructure US$1.4 billion) plus a similar figure for the costs of indirect losses generated through lost production during the many months required for factories and industrial facilities to return to their pre-disaster production levels (Özerdem and Barakat, 2000). However, only seven months after the disaster, which caused a decrease of 1% in the GNP growth

Table 1 Potential disaster losses

Consequences	Measure	Losses	
		Tangible	Intangible
Deaths	Number of people	Loss of economically active individuals	Social and psychological effects on remaining community
Injuries	Number and injury severity	Medical treatment needs, temporary loss of economic activity by productive individuals	Social and psychological pain and recovery
Physical damage	Inventory of damaged elements, by number and damage level	Replacement and repair cost	Cultural losses
Emergency operations	Volume of labour, workdays employed, equipment and resources	Mobilization costs, investment in preparedness capability	Stress and overwork in relief participants
Disruption to economy	Number of working days lost, volume of production lost	Value of lost production	Opportunities, competitiveness, reputation
Social disruption	Number of displaced persons, homeless	Temporary housing, relief, economic production community morale	Psychological, social contacts, cohesion
Environmental impact	Scale and severity	Clean-up costs, repair costs	Consequences of poorer environment, health risks, risk of future disaster

Source: Bull (1994).

of the country, economic performance figures for Spring 2000 show a down-turn in the rate of inflation and declining interest rates for government borrowing, indicating that the Turkish economy has made a fast recovery.

1 Direct damages

Academic literature and popular media are replete with case studies detailing the direct damages of disaster for all types of trigger event (for reviews see Blaikie *et al*., 1994; Hewitt, 1997). They also remain the basis for insurance assessment and many technical accounts of disaster impact because of their high visibility and the comparative simplicity of assessment (Center for Research on the Epidemiology of Disasters (CRED), 1997). Some of the immediate economic and social effects of natural disasters are presented in Table 2.

Direct losses have been the focus of much of the mitigation effort and preparedness is a key to reducing direct impacts. If direct losses can be minimized then indirect and secondary effects may be prevented or reduced. The influence of preparedness is shown by contrasting the experiences of the housing and small business sectors in Jamaica during the disaster caused by Hurricane Gilbert. Residential loss was a major damage inflicted by the hurricane with 30 235 homes destroyed, whilst many small businesses were able to return to operation with only minimal delays and output losses. Losses in the housing sector have been blamed on poor preparedness; partly as a result of structural adjustment policies that encouraged poor maintenance of rental property and noncompliance with building regulations (Ford, 1987, quoted in Blaikie *et al*., 1994), and also because the National Building Code of Jamaica (1983) was inappropriately modelled on UK standards (Clement, 1990). In contrast, many small businesses were well prepared and consequently contained direct impacts, for example: the Magic Toys company was able to unpack secured stock and fill all export orders with no delay, and in Afasia Knitters 80% of employees returned to work on the afternoon of the hurricane to clear up and resume the completion of overseas orders (Brown, 1994).

2 Indirect damages/flow losses

The extent of economic disruption caused by a disaster is greatly affected by the degree to which the disruptions can spread through economic networks. For example, in the short- to medium-term, manufacturing production and the service sector may be threatened through the loss of power supplies, labour and communications infrastructure, even when productive capital (factories and inputs) are undamaged. Thus, in the energy sector, whilst hydroelectric power (HEP) is seen as a cost-effective alternative to oil importation, in drought-prone countries this must be traded off for increased potential macro-economic vulnerability. For instance, the Philippines has pursued a deliberate policy of increased dependence on HEP, exposing it to severe power shortages during the 1989/90 drought. In consequence, the annual rate of industrial growth fell from 7.4% in 1989 to 2.5% in 1990 (Benson, 1997a).

The structure of a productive system influences the distribution of impacts within it as the impact of disaster is diffused into the wider economy. Following the Kobe earthquake in Japan, direct damage caused production stoppages in some large corpo-

Table 2 Immediate economic effects of natural disasters

Impact	Disaster trigger					
	Flood	High wind	Tsunami	Earthquake	Volcano	Drought
Short-term migration	X				X	X
Loss of housing	X	X	X	X	X	
Loss of business production	X	X	X	X		X
Loss of industrial production	X	X	X	X		X
Loss of crops	X	X	X		X	X
Damages to infrastructure	X	X	X	X		
Disruption of marketing systems		X		X	X	
Disruption of transport	X			X		
Disruption of communication	X	X	X	X		

Source: UNDRCO (1991).

rations such as the Kobe Steel Corporation and Kawasaki Heavy Industries Ltd, as well as in many smaller enterprises. Some 350 out of 450 plastic shoe makers suffered damage. However, for other major producers such as Toyota Motor Corporation and Mitsubishi Motor Corporation who used a 'just-in-time' stocking approach, where parts are manufactured on demand by subcontractors, it was damage to subcontractors and delays in receiving inputs that held back production. In these cases the major producers were able to locate alternative sources of inputs within a few days and risk was passed on to the local subcontractors who had to cope with a double burden of disaster impacts and lost contracts. Many faced bankruptcy as a result (United Nations Centre for Regional Development (UNCRD), 1995a).

The resumption of production and especially of export activities will be a key goal of restoration programmes. Delays in restoring export production cause immediate losses in revenue and risk longer-term damage from the loss of international market shares. Rapid restoration of export activities lessens the period of dependence on aid for foreign currency and shortens the period for which the economy will be at its most vulnerable to subsequent disaster shocks. Damage to the Jamaican economy following Hurricane Gilbert was mitigated by quick recovery in the major productive sectors outside of agriculture. Tourism registered a loss of US$103m in 1988/89, but this was largely due to physical damage to hotels. Though there was an immediate fall off in tourist visits in the immediate post-disaster period it took only three months for the industry to recover, exposing it to little loss of market share. The bauxite industry was even more rapid in its recovery. Despite some damage to infrastructure production was halted for only two weeks (Brown, 1994).

If a disaster disrupts transportation and communication infrastructure, marketing and consumption may be halted even if production is unaffected. Following the Kobe earthquake in Japan (1995), transportation costs through the Kobe district increased by over 50% with a knock-on price increase for goods estimated at 10%. There was also an international dimension through the disabling of Kobe Port, which prevented shipment of parts and products both into Japan and out to joint venture partners in Southeast Asia.

3 Secondary effects

Disasters have inflationary potential through their capacity to interrupt all components of a market economy: production, distribution, marketing and consumption. But inflation is often only a transitory effect. Its spread over time and space has a number of determinants. In open economies demand for building materials, food, energy and water increases, damage to infrastructure (agricultural or industrial) causes domestic production to fall; transportation, marketing and communication is disrupted reducing the ability of goods to circulate; there is an inadequacy in the supply of imported goods because of capital scarcity or damage to transportation; and there are high levels of demand for skilled labour forcing wages and prices to increase. In Fiji, a 6.8% increase in annual food prices was attributed to Cyclone Kina (1993) (Benson, 1997b). Local commodity price increases can also be felt as a direct result of government policy in more centrally planed economies. In Kenya and Ethiopia, banning trade in grain between districts during periods of drought and famine was used to prevent

speculative trading. However, without sufficient government supplies of food in drought districts food availability decreased and local price inflation set in, causing greater hardship (Drèze and Sen, 1989).

Disruption of production displaces employment in urban and rural economies. Though different triggers will impact in different ways, urban economies may recover sooner as they are less dependent upon seasonal production and have better access to insurance, relief and recovery services. In Kobe, production failures resulted in 4500 redundancies. Within the first two weeks post-disaster the effective ratio of job offers to applicants decreased from 0.3 pre-disaster to 0.05. Together with direct damage to dwellings, crops, productive assets and household property, the knock-on effects in lost household earnings can have an aggregate impact on the economy through a tendency for individuals to reduce savings (in cash or other assets), increase borrowing and make claims on entitlements to social insurance or charity. If disaster insurance is held, the speedy processing and disbursement of claims provides a source of finance for the local and national economy if premiums have been reinsured overseas. The need for increased access to credit will be particularly problematic amongst those societies where bank lending is restricted and NGO sources are inadequate. In such circumstances the only recourse for many households will be to borrow at exorbitant rates from moneylenders, putting a further negative pressure on household economies and increasing their net losses.

But this period can be weathered with imaginative policy. Following an earthquake in July 1990, the Filipino Government advanced the payment to state employees of half their Christmas bonus and also announced a moratorium on the repayment of loans to the Development Bank of the Philippines (Benson, 1997a). Remittances from urban or overseas migrants also offer a means for households to overcome periods of crisis. In this way, countries or districts whose residents have extensive networks of overseas relatives paying remittances can benefit from a mechanism of independent access to foreign currency during disaster (Pelling, 1997).

Disasters may contribute towards longer-term balance-of-payments deficits. Disruption of domestic production lowers export capacity whilst demand is likely to remain high, and consequently the importation of food, building materials, energy (oil) and machinery cannot be compensated for by export earnings. Although demand for luxury goods may decline, relieving some pressure on balance-of-payments, a negative trend in trade accounts will tend to result, and can last for months or years after the disaster. This may force increased borrowing, with long-term implications for debt servicing and future economic growth. To meet a significant budgetary shortfall following severe floods in 1998, the Bangladesh government resorted to bank borrowings of US$309m in 1998–99 (IFRC/RC, 2001). However, in the recovery and reconstruction stages there is scope for alternative foreign capital flows from reinsurance payments, aid flows, debt relief and private transfers that may (temporarily) avert trade deficit. In some cases the external current account may even show improvement over this period. In the 1980s and 1990s, disasters have had little overall impact on balance-of-payments in Fiji, because of access to substantial reinsurance payments and foreign currency gains from productive sectors such as agriculture and tourism (Benson, 1997b).

Economic growth is likely to decline in the aftermath of a disaster through loss of infrastructure and productive assets and development opportunities foregone.

Table 3 Long-term macro-economic damage, of Hurricane George in Jamaica 1988–92

Financial year	Current account deficit (US$m)	Inflation rate (CPI) (%)
1988/89	38.3	9.1
1989/90	297.6	16.3
1990/91	262.l	24.8
1991/92	111.9	68.6

Source: Brown (1994).

However, disasters can also provide stimuli for growth, particularly in the construction sector, which can contribute substantially to GDP during reconstruction (Alabala-Bertrand, 1993). Growth and foreign currency gains will normally be restricted to the immediate recovery and reconstruction period, usually less than six months post-disaster. However, negotiating grant and loan terms can be notoriously timeconsuming, so that some inflows may still be being received a year or more after the disaster. In the Dominican Republic, following Hurricane Georges in 1998, parliamentary procedure delayed the release of a US$200m fast-track disaster rehabilitation loan from the World Bank for seven months (Pelling, 2002). By the time monies were available the 1999 hurricane season had commenced.

It is important that this period of increasing import capacity is not interpreted as a genuine economic upturn and is recognized as a temporary boom, restricted to the period of reconstruction. Following Hurricane Gilbert in 1988, Jamaica experienced a boom that turned a potential external current account deficit of US$253m into one of US$38.3m. The two main contributors to this were reinsurance flows of US$413m and foreign grant aid of US$104m. Unfortunately, this positive situation was short-lived and as reinsurance and grant aid sources of finance dried up, so indirect and secondary losses became increasingly felt. This is reflected in Table 3, which shows that current account deficit figures and inflation rate (CPI) rose between 1988 and 1992, though it is difficult to say exactly what proportion of this can be accounted for by the disaster (Brown, 1994).

Building on the above review of the macro-economic impacts of disaster, the paper turns to examine the inter-relationship between these impacts and the disaster management process. The main focus will be on the production of vulnerability and efforts to interrupt this process and reduce the costs of vulnerability through the establishment of coping mechanisms.

III Disasters and development

In hazard-prone districts and countries, development potential may be depressed as a result of increased public expenditure on disaster mitigation and the potential declines in revenue owing to reduced economic activity as well as any losses incurred by actual disaster events. This serves to exacerbate inequalities in economic development. Disaster proneness may act as a disincentive to new investors, particularly during reconstruction when perceptions of hazard risks are heightened and the economy is

unstable, though as Benson (1997b) found in Fiji, investors may have little awareness of hazard risks even in highly hazard-prone environments. In Vietnam the distribution of rural poverty has been linked to regional variations in deforestation, flooding and drought in the mountains and to typhoons and poor soil on the coast (Benson, 1997c). Disasters reduce government ability to invest in developmental projects through lowering the tax base as a result of development opportunities foregone and production failures, and the additional burdens of hazard mitigation and preparedness, relief and reconstruction. In Dominica, repeated disasters have hampered long-term efforts of infrastructure improvement to such an extent that the government has continually identified the weakness of the island's infrastructure base as a critical constraint to economic growth (IFRC/RC, 2001). There is a consensus of opinion that in many cases and in the long term, scarce resources would be better spent in improved preparedness and mitigation. Unfortunately, many of the costs of disasters are highly variable and difficult to identify, and cost/benefit analysis to make this judgement more transparent is in its infancy (Dedeurwaerdere, 1998; Barnett, 2001).

On the other hand, development can itself heighten disaster risk or economic vulnerability. In a study of vulnerability to sub-Saharan drought, Benson and Clay (1998) suggest that the most vulnerable economies are not the most undeveloped. Undeveloped economies are overwhelmingly agricultural and semi-subsistence in their structure. This group includes Burkina Faso, Ethiopia, Malawi, Mozambique and Swaziland. Although these countries may be severely affected by drought, once rains return their recovery will also be fast and supported by high levels of donor and NGO support. Intermediate economies with some diversification appear more secure. However, direct, indirect and secondary impacts can be greater than in simple agro-economies. Linkages between the industrial and agricultural sectors enable shocks to diffuse quickly throughout the economy. Similarly remittances from urban to rural workers can spread impacts throughout lower-income groups. Both Senegal and Zimbabwe have shown sensitivity in their manufacturing sectors to drought periods. In these cases, economy-wide direct and indirect damages can undermine consumer purchasing power, multiplying indirect impacts through delayed capital investment, with long-term secondary damages and development implications. As with the simple economy, recovery in the agricultural sector may be rapid, but input shortages and reduced internal demand drag out depression in the manufacturing sector, extending the period of secondary impacts and worsening overall damage to the economy. Moreover, only limited foreign aid may be available to intermediate states, which will be expected to take on a greater proportion of the burden of drought relief, increasing direct losses.

A similar development dilemma faces countries with small economies such as small island developing states (Pelling and Uitto, 2001). Supporters of economic globalization argue that small economies can be strengthened by specializing in areas of comparative advantage, such as tourism, offshore finance or agricultural production (Commonwealth Secretariat, 1985; World Bank, 1998). This appears to contradict received wisdom from disasters theory, which argues that resilience comes from a diversified productive base. Relative prosperity is often built on fragile economic foundations. Barbados is the highest ranked 'developing country' (United Nations Development Programme (UNDP), 2000), but its national economy is based on international beach tourism and a national service economy that is highly vulnerable to

changes in consumer taste and natural disaster impacts. The vulnerability of tourism was shown in Nicaragua, where one month after Hurricane Mitch the sector was operating at only 10% of capacity despite most tourist destinations and infrastructure being untouched (Nicaraguan Association of Tourism, 1998). A reluctance amongst North American tourists to fly following the 11 September 2001 terrorist action in New York has hit hardest tourism-dependent economies.

The private sector has also come into greater prominence as a mechanism for positive social change through workforce or community welfare programmes with which to reduce vulnerability, and through the contracting out of relief projects. Whilst questions remain over the accountability and ethics of private-sector involvement in relief, especially for complex emergencies (Walker, 1996) the roles for northern and southern NGOs, multilateral agencies, bilateral donors and recipient countries are all under review as disasters become larger and more complex, and as the competitive advantages of actors shift (German and Randel, 1998). Expectations that the private sector might play a more altruistic role as part of a growing emphasis on corporate social responsibility have so far not been met (Twigg, 2001). The World Bank has been active in raising the profile of private-sector activity, for example through its Market Incentives for Mitigation Investments project and in exploratory weather insurance mechanisms (Kreimer *et al.*, 1999; Kreimer and Arnold, 2000; Varangis, 2001). The insurance industry in particular has been identified as a mechanism for channelling finance to countries recovering from disaster in a climate of diminishing aid payments (Charvériat, 2000). Careful reform is needed in the insurance and reinsurance sectors and perhaps a greater role for government to encourage insurers not to pull out of areas that appear to be becoming increasingly disaster prone as a result of global climate change and continuing uneven global development. The insurance industry is in the curious position of being a major shareholder in many of the industries that are contributing to global climate change whilst also being the biggest potential private-sector loser should catastrophic natural disaster related to climate change increase in frequency and severity (Salt, 2000)

1 Disaster aid

There are two principal barriers that reduce the effectiveness of aid as a mechanism for post-disaster reconstruction. First, agreements with both bilateral and multilateral donors can take many weeks to negotiate and months may elapse between the disaster event and the release of funds. In Jamaica, after Hurricane Gilbert, 23% of foreign aid had not been received after 18 months whereas only 22% of insurance payments were outstanding after four months (Brown, 1994). Secondly, whilst some aid may be unconditional, much is received as soft loans that only serve to worsen national debt in the long term. Debt may also be added to by the need to acquire bridging loans during the relief and early recovery periods before donor aid can be accessed. In fact, the character of emergency aid has changed in parallel with those changes in post-Cold War politics. In the early 1990s donor spending on humanitarian relief increased in response to the Gulf War, and the crises in the former Yugoslavia and Rwanda, reaching its peak of US$3.5 billion in 1994. Since then spending has declined, and although expenditure of US$2.7 billion in 1996 remains three times the 1990 level. This was not continued in 1997

or 1998. Relief food aid also fell consistently between 1992 and 1996, reflecting a desire from donors to move away from food as a means of development assistance, but rose slightly in 1997 to around 1990 levels (Cosgrave, 1998). Fluctuating and slow delivery of relief funding from donor nations has led some humanitarian organizations to establish disaster contingency funds with which to respond to sudden-onset crises. Oxfam has created a rapid response fund of £4m per annum, which was used in 1994 in Zaire to provide water and sanitation for refugees from Rwanda and in response to the 1998 earthquake in Afghanistan (IFRC/RC, 2000).

Despite increased official development assistance from OECD countries in 1998 and 1999, aid was US$6530m less in 1999 than in 1991. Not only is there less emergency aid and development aid than in the past, the delivery of aid is also undergoing change. Security and aid agendas are growing closer together. The complex emergencies of Somalia and Haiti and the unfolding disaster in Afghanistan demonstrated the interconnectedness of poverty, fragile civil society and socio-political instability, with aid donors placing emphasis on human rights, good governance and the strengthening of civil society as a means of addressing development and disasters simultaneously. In July 2000 the British government announced its intention to establish a ministerial group to coordinate action on conflict resolution chiefly in subSaharan Africa. The group is to include ministers from the Treasury, Ministry of Defence and the Foreign Office and will work with an integrated budget (The *Guardian*, 8 July 2000). Integration is likely to be a challenge given the conflicting priorities of these sectoral agencies, as was shown in the UK and UN response to crisis in Sierra Leone. However, as the UK government's continuing lack of internal cooperation and clumsy handling of the needs of the victims of disaster in Montserrat and Mozambique have shown, any improvement in cross-ministry communication is to be welcomed.

Fluctuating official development assistance flows are much smaller than similar fluctuations experienced in private capital flows to developing countries. The negative consequences of such fluctuations were seen in the financial crisis in Asia in 1997, which has resulted in reduced investment in basic needs and social services and increased levels of social and political tension in the region. Foreign direct investment (FDI) has been promoted as being a more suitable alternative source of funds (Department for International Development (DFID), 2000). However, the likelihood that FDI will enable vulnerability reduction is very small. FDI tends to be attracted to middle income economies and to be used as a buffer against economic shocks or to buy up local firms rather than being put to productive use in receiving economies. The 48 least developed countries received less than 1% of FDI in 1998 (United Nations Conference on Trade and Development (UNCTAD), 1999). Reforms in debt relief, international trade and the 'carbon debt' might be more promising strategies for increasing capital availability for investment that will reduce vulnerability to disaster. Schelling (1992) reckoned that 2% of world GNP in perpetuity would be needed for greenhouse gas abatement technology if global warming was to be seriously tackled at source and questions whether this money (some US$10 trillion in 50 years time) might not be better spent on adaptation and general investment for economic development in countries at risk. The political shift that such a strategy would require from restructuring in greenhouse gas producing countries, to change in countries vulnerable to the impacts of climate change is not without its dangers. This is especially so for low-lying areas whose very physical existence is threatened by global climate change.

Changing fashions in aid intervention have reduced the emphasis on development and increased proportionate revenues for relief work. This has been dubbed the CNN syndrome – where aid money follows public interest and media coverage has played a large part in this shift. The outcome has been that large amounts of money are at times spent inefficiently in concentrated relief efforts that distort longer-term development and risk reduction efforts. Sparrow (2001: 14) comments on two quotes by Oxfam's Prasant Naik who is critical of responses during the initial emergency phase of the 1999 Orissa floods in India:

> 'It was difficult for other agencies to make progress ... because of the expectancy and dependency created'. The daily wage rate reflected that. By the time relief operations ended, it had been inflated to two-and-a-half times the government's recommended figure. 'After everything had been thrown at the people, to go in a talk about disaster preparedness and community participation was like beating your head against a wall'.

Sparrow (2001) argues for disasters to be integrated into development planning and for the emergency relief period to be an opportunity for the voices of the most marginalized and vulnerable to be heard loud and to shape longer-term development strategy. That such wishes were voiced 20 years ago by the first disasters analysts to use a political-economy approach (O'Keefe *et al*., 1977; Hewitt, 1983) suggests that whilst vulnerable individuals and communities may have little resiliency, the aid industry has plenty to spare.

2 Disasters and international financial flows

The debt burden of developing countries has clearly contributed to their vulnerability. Before Hurricane Mitch (1997), Nicaragua spent US$220m in debt servicing, over twice the combined budget for health and education. Even after HIPC II it has been estimated that Mozambique will spend US$45m a year on debt servicing, which exceeds national investment in health or education (IFRC/RC, 2000). Control of the public-sector budget is also an important and challenging aspect of disaster management. The pressure to increase public-sector expenditure is especially acute following sudden-onset hazards during relief and recovery before foreign currency inflows have materialized, and throughout the longer-duration disasters such as famine or war. Pressure on public spending can be reduced if contingency funds are built into local/metropolitan and central government budgets, though this is often not politically practical in the strained economies of Southern states where funds are scarce. In the Philippines, local government reserves 5% of revenue for natural disasters. However this has proven insufficient for large events – the Mindoro Island Earthquake in 1994 is reckoned to have set back the regional development plan by five years, as investment finance was redirected into recovery (UNCRD, 1995b).

In those cases where government revenue, foreign currency transfers and foreign assets are not sufficient to cover reconstruction costs there will be pressure to turn for financing to private banks, worsening the long-term domestic balance, or to increase base money, which is inflationary. Contingency funds and access to foreign transfers that are adequate in size and expedient in their disbursement are critical components of fiscal management during reconstruction.

A possible solution for some countries is the creation of a permanent and dedicated disaster fund held in international reserves, although this is unrealistic for countries with severe financial constraints. An alternative, though less flexible, option is to stockpile specific goods to cover the emergency period. This is an appropriate mechanism for small island states and has been undertaken in Antigua, Dominica and St Maarten (IFRC/RC, 1998). Internal financing for relief funds can come from blanket taxes (such as Vietnam's Flood and Storm Preparedness and Prevention Fund) or from levies raised only from beneficiaries (Benson, 1997c). The latter approach may contribute towards regional or social inequalities if vulnerable groups become doubly burdened by disaster losses and higher taxes, whereas blanket taxes can act as a mechanism for the redistribution of wealth towards the most vulnerable. However, supporting vulnerable groups by sharing disaster burdens across society must be done with care or resources and people may shift towards locations of risk.

With regard to reducing collective vulnerability to complex emergencies, Nafziger *et al*. (2000) suggests a range of actions for international and national actors including: increased transparency in adjustment negotiations between the Breton Woods institutions and national governments, reductions in trade barriers against Africa and other Third World countries; encouraging aid donors to review the role of aid in vulnerable economies; encouraging direct foreign investments in LDCs; strengthening an independent civil society; strengthening the state's ability to collect taxes and provide basic services; meaningful democratization; safety nets for the poor; reduction of uneven development and social/regional inequality; land reform; and the protection of rights for traditional collective land systems.

During the post-disaster stages in countries with limited international reserves, reinsurance can offer a potential mechanism for accessing foreign currency with which to finance relief and reconstruction. However, in the poorest (and often most vulnerable) countries and communities the majority of households and businesses are not likely to be able to afford the everyday expense of insurance, nor to have structures built to insurable standards. Similarly, for many farmers crop insurance may also be unavailable because of a lack of the extensive historical data on crop production and hazards needed to calculate insurance premiums. However, insurance schemes can also play a preventive role as they can ensure the implementation of safety regulations. One of the lessons learned from the Marmara earthquake in Turkey was the necessity of initiating a general insurance scheme for buildings, as insurance companies would refuse to provide insurance for a building that is not earthquake resistant, or would at least ask for high premiums (Özerdem, 2000).

The insurance industry is similarly facing a period of uncertainty in the face of growing disaster losses (Salt, 2001). The *Finance Guardian* (1999) reported losses to the industry of US$22b in 1989; US$33b in 1992; US$23b in 1994 and US$22b in 1999. Such global losses are concentrated for insurers specializing in high risk areas; Hurricane Iniki lead to the insolvency of Hawaii's largest insurer. This has forced a rethink in strategy with some companies pulling out of high risk areas such as hurricane-prone Caribbean and Pacific (IFRC/RC, 1998). Options for reorganization include spreading losses by working with government insurance funds (one exists in Florida, USA), expanding the reinsurance industry, publicly traded catastrophe futures and options designed to spread risk beyond insurers to the wider capital markets, improved mitigation by building code enforcement and enhanced catastrophe forecasting and

improved vulnerability assessment ((Insurance Services Office (ISO), 1994). Reasons for increasing insurance losses are unclear, but reflect changing 'dynamic pressures' including increased vulnerability as a result of greater technological dependency, urbanization, population growth and economic growth in hazard-prone areas as well as the possibility of increasing risk from the effects of global climate change and El Niño events, environmental degradation and technological hazard (Lloyd's List, 1993; Legget, 1994; Rubin, 1998).

3 Coping with catastrophe

Efforts to mitigate disaster at any spatial scale have always boiled down to questions of probability. Individuals and policy makers alike have to weigh up whether an investment in mitigating infrastructure today will be rewarded in the long-run by avoiding a loss to disaster some time in the future. Where the costs of mitigation are low and there is a strong likelihood of large financial and human losses in the future decisions are easy. More often, and increasingly, budgets are stretched and long-termism is a difficult political strategy to maintain in the face of more immediate financial needs. As Chambers (1989) noted, the demands of poverty usually out-compete the demands of vulnerability. With global environmental change, and growing international political–economic interconnectedness (as demonstrated by the fall-out of 11 September or the Asian financial crisis) uncertainty in the future is growing, making it even more difficult for decision-makers to commit resources to long-term planning goals.

Given the high costs of physical infrastructure investments, investment in 'social infrastructure' such as community capacity building, institutional strengthening within civil society and a more responsible role for the private sector is being increasingly focused upon. This may present a policy area where disaster mitigation can be attached to more generic development programmes at little additional cost. Policy interest in the ways that individuals and institutions cope with disaster is growing. See, for example, the World Bank's Disaster Management Facility, which was established in 1998 (retrieved July 2002 from http://www.worldbank.org/dmf/). An interest in the social aspects of disaster has also stimulated a growing academic engagement with postmodernism and, in particular, the ways in which dominant political power tends to shape understandings of disaster and risk and how potential responses are justified or rejected by decision-makers (Bankoff, 2001; Pelling, 2001).

Choice of individual and collective coping strategy, and the decision to respond at all, is constrained by imperfect knowledge of the physical and human environments and access to resources. Coping strategies are further structured by the extent to which claims for customary rights from marginalized individuals or groups are recognized. This 'moral economy' (Scott, 1985) is susceptible to erosion by the extension of the market and the privatization of communal resources, the penetration of the state into traditional social relations so that formal welfare replaces indigenous reciprocity and support systems, and social stress produced by population growth (Watts, 1983; Swift, 1993). Adger (1996) argues that in most societies the moral economy is in decline. Paulinson (1993) found that traditional coping mechanisms and agricultural practices had been undermined by the enhanced role of the market in Western Samoa.

Work on violence and social capital suggests that violence erodes 'bridging' capital – the ties that link social groups – and that people retreat into small social groups that have strong 'bonding' capital. It is the strength of bonding capital that Goodhand *et al*. (2000) argue makes post-conflict resolution and community building so problematic. Conversely it is the spontaneous extension of bridging capital between social groups following a natural disaster that forms the basis for much emergency response. Experience with responding to the needs of war-affected people also shows that family and community structures are often the key elements through which people obtain physical and psychological support. The presence of strong family and community networks is what makes the difference as to who suffers most, at least in an emergency, and if communities remain intact, it is more likely that they could also remain in control of their lives (British Agencies Afghanistan Group (BAAG), 1996). In a study carried out by BAAG, the responses to the reconstruction process of two Afghan communities – one that stayed in the country and the other that was in an Iranian refugee camp – was compared. It was observed that those who stayed were much more secure and in control of the reconstruction process. On the other hand, the community members in the refugee camp were mainly from urban areas (Kabul and Kandahar) and they felt that they could not rely on an extended family. Moreover, those who returned to Afghanistan had lost touch with those in the camps. Subsequently, it was much more difficult for the displaced community to feel secure and participate in all the decisions relating to their long-term future.

In an increasing number of emergencies, like Afghanistan, the relationships between economic development and disaster become especially contradictory. Such emergencies are characterized by protracted struggles with immediate economic goals taking over from any political objectives of the warring parties. The apparent chaos that results is often carefully manipulated in an act of resistance by elite groups threatened by democracy or to generate a productive economic niche (Keen, 1998). In Afghanistan, political and military instability have both produced the dislocations that allow the development of a regional economy based on the production of opium and have restricted the opportunities for farmers in the formal sector, pushing them towards informal and illegal opium production (Goodhand, 2000). A similar contradiction has been noted in natural disasters where states of emergency may be called as a mechanism to access foreign currency aid flows. The 1996 National Flood Emergency in Guyana is a case in point where extensive but minor flooding was presented as a national disaster generating increased inward capital aid flows (Pelling, 1996).

Notwithstanding the acknowledgement that disasters are firmly rooted in social life, structural mitigation (engineering responses) continues to receive greater attention than nonstructural or mixed alternatives (Hewitt, 1995). The legacy of past structural investment means that many countries find it hard to redirect mitigation policy. This is partly a result of institutional inertia but also reflects the need to maintain existing structures (such as the US$103 billion (1989 prices) that Turner *et al*. (1990) estimate is required to protect cities from a 1-m rise in sea-level), which may have themselves increased risk (e.g. levels raising river beds above flood plains) or vulnerability (e.g., sea-defences encouraging settlement in coastal plains). For many countries, past investment in structural solutions make present and future investments a necessity. Nonstructural alternatives including land-use planning, building codes, hazard risk mapping, community preparedness, disaster forecasting and warning can also be

problematic. The enforcement of planning and building regulations is hampered by poverty and administrative inefficiencies and in many countries vulnerable groups have only a limited scope to reduce disaster damage even with greater warning periods. Increasing public awareness of hazards, risk and mitigation strategies is seen as a key to addressing these problems, with the insurance industry also having a role to play in promoting appropriate construction standards and land-use planning. Given the benefits that nonstructural mitigation can offer it is unfortunate that there is little donor support compared with finance offered for structural alternatives, indeed it is the NGO sector that has tended to be most active in providing external support for non-structural and mixed mitigation efforts. An example of good practice is examined in the case study of the Dominican Disaster Mitigation Institute, below.

4 The Dominican Disaster Mitigation Committee: a social approach to mitigation

The Dominican Disaster Mitigation Committee (DDMC; for more information on DDMC see http://www.oas.org/en/cdmp/rdom/Homepag.htm, retrieved July 2002) was founded in 1995 with the aim of working through public, private and grassroots civil-sector actors to enhance the resiliency of at-risk communities to natural disaster in the Dominican Republic. It has been largely funded by the Organization of American States (OAS) and has five main areas of work: training leaders to coordinate local disaster management efforts, enabling the take-up of good practice through coordinating resiliency work undertaken by governmental or nongovernmental organizations, spreading information of disaster preparedness and prevention as widely as possible, stimulating local social and human capital to build resiliency in at-risk communities though community education and community initiatives.

Worthy of particular note is the nationwide community education programme. Up to 2000, 578 meetings had been held in high-risk communities to raise awareness of risk, vulnerability and options for mitigation. DDMC had also been able to part-fund a number of community mitigation projects that act to fill the gaps in infrastructure provision caused by an impoverished state and to counteract infrastructure inequalities. These are community-led projects: project identification, initial project planning, construction and post-project maintenance labour is provided by the community. Between 1996 and 2000, 17 projects had been completed worth US$300 000 and with 25 000 beneficiaries.

In addition to these direct efforts at working with at-risk groups to reduce vulnerability the DDMC has cooperated with other actors in helping to re-shape the mitigation agenda, to raise its political profile nationally and increase popular awareness of social mitigation techniques. A large part of this work has involved institutional capacity building at a number of levels:

- working with the Dominican Red Cross to develop a disaster training programme;
- working through NGOs and CBOs in the community mitigation programme;
- working with the media to promote a culture of prevention and to raise the political will to act (1400 minutes of TV time have been donated between 1996 and 2000);
- working with the insurance industry and architects to encourage best practice in construction monitoring;

- liaising with the public sector and private sectors to raise awareness of prevention and mitigation strategies.

In building local capacity DDMC has worked though established NGOs with ties to community-level organizations. DDMC works directly with the community groups facilitating a number of disaster prevention workshops during which community representatives put forward an outline proposal for a small physical mitigation project. DDMC then works with the community organization to source funding and technical support. The physical outputs of these projects have included improved urban drainage infrastructure, sewerage systems, retaining walls and bridges, perhaps as important are the institutional outputs where community groups and intermediary NGOs have gained experience of successful project management.

When Hurricane Georges struck the Dominican Republic in 1998, DDMC's work was fully tested. Although most of the at-risk communities suffered losses, in some cases up to 75% of houses were damaged or destroyed, comments by local participants in DDMCs projects suggest that these losses could have been higher (Pelling, 2000). Communities had for example, organized evacuations of vulnerable people and, after the hurricane, rescued people trapped by swollen rivers and rebuilt houses. In many rural areas community groups were the principal form of post-disaster organization for up to two weeks before government or Red Cross relief groups arrived. The flexibility of strengthened community groups allows then to respond to local risk in whatever form it takes. This is especially valuable to reducing losses when extra-local organizations are unable (or unwilling) to extend support. This enhanced local capacity, together with a growing national awareness of disaster as a developmental issue and a growing cooperation between actors in disaster mitigation across the public–private divide, are indicators that DDMC has had some success in meeting its objectives. It is in its roles as facilitator, communicator and enabler that DDMC has been able to exert an influence at the local and national levels far beyond its capacity to act had it chosen to engage more directly in the provision of physical infrastructure and follow a more traditional structural approach to disaster mitigation.

IV Conclusion

In the short term the post-disaster period can offer opportunities for acquiring foreign capital through reinsurance payments, remittances, international emergency relief and development aid. However, more usually this period of opportunity is short lived and insufficient to compensate for all losses, especially those systemic and secondary disaster impacts that may only be felt some time after the initial disaster shock. Whilst this paper has concentrated on the macro-economic impact of disaster, economic systems do not operate in isolation.

Given the far-reaching consequences of disaster shocks with a natural trigger it is perhaps surprising that disaster studies has held a relatively marginal place in development theory and practice until very recently. Disaster shocks have consistently been interpreted as exceptional events operating outside of 'normal' development theory and practice. As a result disaster vulnerability has not been integrated into development planning. But times seem to be changing. In its preparatory consultation

for the World Summit on Sustainable Development to be held in Johannesburg in 2002, the United Nations International Strategy for Disaster Reduction (UNISDR) has presented disaster as a priority concern for the development community and as a pressure that suppresses economic growth and human development (UNISDR, 2002). By presenting this review of the macro-economic impact of disaster around the ECLA accounting methodology, we have sought to contribute to this re-orientation of disaster and to show the depth to which disaster losses are part of long-term development. Relegating disasters to the sidelines of development theory and practice is both unhelpful and unethical. Calls for the recognition of a human right to be free from the negative impacts of preventable disasters (see the Radical Interpretation of Disasters Web site at http://www.apu.ac.uk/geography/radix, retrieved July 2002) indicate a growing pressure for the need to integrate disasters into development.

References

Adger, W.N. 1996: *A theory of social vulnerability in coastal Vietnam*. Paper presented at the 'designing sustainability' fourth biennial conference of the International Society for Ecological Economics, Boston University, 4–7 August.

Alabala-Bertrand, J.M. 1993: *Political economy of large natural disasters; with special reference to developing countries*. Oxford: Clarendon Press.

Bankoff, G. 2001: Rendering the world unsafe: 'vulnerability' as western discourse. *Disasters* 25(1), 19–35.

Barnett, J. 2001: Adapting to climate change in Pacific island countries: the problem of uncertainty. *World Development* 29(6), 977–94.

Benson, C. 1997a: *The economic impact of natural disasters in the Philippines*. Working paper 99. London: Overseas Development Institute.

Benson, C. 1997b: *The economic impact of natural disasters in Fiji*. Working paper 97. London: Overseas Development Institute.

Benson, C. 1997c: *The economic impact of natural disasters in Vietnam*. Working paper 98. London: Overseas Development Institute.

Benson, C. and **Clay, E.** 1998: *The impact of drought on sub-Saharan African economies*. Technical paper 401. Washington DC: World Bank.

Blaikie, P.M., Cannon, T., Davis, I. and **Wisner, B.** 1994: *At risk: natural hazards, people's vulnerability, and disasters*. London: Routledge.

British Agencies Afghanistan Group 1996: Study of coping strategies of refugees from and returnees to Afghanistan. London: BAAG, unpublished.

Brown, H.A. 1994: *Economics of disasters with special reference to the Jamaican experience*. Working paper 2. Jamaica: Centre for Environment and Development, University of the West Indies.

Buckle, P., Marsh, G. and **Smale, S.** 2001: *Assessment of personal and community resilience and vulnerability*. Emergency Management Australia Report 15/2000.

Bull, R. 1994: *Disaster economics*. Disaster Management Training Programmes. Geneva: UNDP and DHA.

Center for Research on the Epidemiology of Disasters (CRED) 1997: *Assessment of the economic impact of natural and man-made disasters*. Proceedings of the expert consultation on methodologies, 29–30 September, Universite Catholique de Louvain, Belgium.

Chambers, R. 1989: Editorial introduction: vulnerability, coping and policy. *IDS Bulletin* 20(2), 1–7.

Charvériat, C. 2000: *Natural disasters in Latin America and the Caribbean: an overview of risk*. Working paper 434. Washington DC: Inter-American Development Bank.

Clement, D. 1990: *An analysis of disaster. Life after Gilbert*. Working paper 37. Barbados: Institute of Social and Economic Research, University of the West Indies.

Commonwealth Secretariat 1985: *Vulnerability: small states in the global society*. Report of a Commonwealth Group of Experts, London.

Cosgrave, J. 1998: *Is the international aid system in recession*? InterWorks Europe, October 1998. Retrieved December 2001 from http://homepage.tinet.ie/~cOsgrave/Papers Irecessl .html.

Day, M. 2000: Nicaragua needs a break. In International Federation of the Red Cross and Red Crescent (IFRC/RC), *World disasters report 2000*. Switzerland: IFRC/RC.

Dedeurwaerdere, A. 1998: *Cost–benefit analysis for natural disaster management*. Centre for Research on the Epidemiology of Disasters working paper 143. Belgium: Universite Catholique de Louvain.

Department for International Development 2002: *Eliminating poverty: making globalization work for the poor*. White Paper on International Development. Norwich: Stationery Office.

Devlet Planlama Teskilati (DPT) 1999: Depremin Ekonomik and Sosyal Etkileri: Muhtemel Finans Ihtiyaci (Economic and social impacts of the earthquake: possible financial needs). Retrieved from http://ekutup.dpt.gov.tr/deprem on 19 October 1999.

Dickens, P. 1996: *Reconstructing nature: alienation, emancipation and the division of labour*. London: Routledge.

Drèze, J. and **Sen. A.** 1989: *Hunger and public action*. Oxford: Oxford University Press.

Escobar, A. 1996: Constructing nature: elements for a poststructural political ecology. In Peet, R. and Watts, M., editors, *Liberation ecologies: environment, development, social movements*. London: Routledge, Chapter 2, 46–68.

Finance Guardian 1999: *A great tear – if you enjoy catastrophes*. 15 December 1999, 29.

German, T. and **Randel, J.** 1998: Global trends squeeze international assistance, Red Cross/Red Crescent. *World disasters report 1998*. Oxford: Oxford University Press, 67–80.

Gibbs, T. 1997: Effects of hurricane Luis (September 1995) on structures in Antigua. In Ahmad, R., editor, *Natural hazards and hazard management in the Greater Caribbean and Latin America*. Jamaica: Disaster Studies Unit, University of the West Indies, 165–76.

Goodhand, J. 2000: From holy war to opium war? A case study of the opium economy in northeastern Afghanistan. *Disasters* 24(2), 87–102.

Goodhand, J., Hulme, D. and **Lewer, N.** 2000: Social capital and the political economy of violence: a case study of Sri Lanka. *Disasters* 24(4), 390–406.

Hewitt, K., editor 1983: *Interpretations of calamity from the viewpoint of human ecology*. London: Allen and Unwin.

Hewitt, K. 1995: Excluded perspectives in the social construction of disaster. *International Journal of Mass Emergencies and Disasters* 13(3), 317–39.

Hewitt, K. 1997: *Regions at risk*. Harlow: Longman.

Insurance Services Office (ISO) 1994: The impact of catastrophes on property insurance. Retrieved December 2001 from http://www.lso.com/docs/stud006.htm

International Federation of the Red Cross and Red Crescent (IFRC/RC) 1998: *World disasters report 1998*. Oxford: Oxford University Press.

International Federation of the Red Cross and Red Crescent (IFRC/RC) 1999: *World disasters report 1999*. Switzerland: IFRC/RC.

International Federation of the Red Cross and Red Crescent (IFRC/RC) 2000: *World disasters report 2000*. Switzerland: IFRC/RC.

International Federation of the Red Cross and Red Crescent (IFRC/RC) 2001: *World disasters report 2000*. Switzerland: IFRC/RC.

Kasperson, J.X., Kasperson, R.E. and **Turner, B.L. III,** editors 1995: *Regions at risk: comparisons of threatened environments*. Tokyo: United Nations University Press.

Keen, D. 1998: *The economic functions of violence in civil wars*. Adelphi Paper 320. London: International Institute of Strategic Studies.

Kreimer A., Arnold, M., Barham, C., Freeman, P., Gilbert, R., Krimgold, F., Lester, R., Pollner, J.D. and **Vogt, T.** 1999: *Managing disaster risk in Mexico: market incentives for mitigation*. Washington DC: World Bank.

Kreimer A. and **Arnold, M.,** editors 2000: *Managing disaster risk in emerging economies*. Washington DC: World Bank.

Leggett, J. 1994: *Climate change and the reinsurance market*. Retrieved December 2001 from www.greenpeace.org/homepage/gopher/campaigns/air/994/reinsu.txt

Lloyd's List 1993: *Munich re plea for catastrophe action*. 23 April 1993.

Nafzier, E.W., Stewart, F. and **Vayrynen, R.,** editors 2000: *War, hunger and displacement: the origins of humanitarian emergencies, volume 1*. Oxford: Oxford University Press.

Nicaraguan Association of Tourism 1998: *Nicaragua's tourism unharmed and devastated*. Press release 14/11/98.

Norgaard, R.B. 1994: *Development betrayed: the end of progress and a coevolutionary revisioning of the future*. London: Routledge.

O'Keefe, P., Wisner, B. and **Baird, A.** 1977: Kenyan underdevelopment: a case study of proletarianisation. In O'Keefe, P. and Wisner, R., editors, *Landuse and development*. London: International African Institute.

Özerdem, A. 2000: The Turkish earthquake catastrophe: what lessons to be learned for disaster preparedness? *Development and Cooperation* 1/2000, January/February, 5.

Özerdem, A. and **Barakat, S.** 2000: After the Marmara earthquake: lessons for avoiding short cuts to disasters. *Third World Quarterly* 21(3), 425–39.

Paulinson, D.D. 1993: Hurricane hazard in Western Samoa. *Geographical Review* 83, 45–53.

Pelling, M. 1996: Coastal flood hazard in Guyana: environmental and economic causes. *Caribbean Geography* 7(1), 3–22.

Pelling, M. 1997: What determines vulnerability to floods; a case study in Georgetown, Guyana. *Environment and Urbanisation* 9(1), 203–26.

Pelling, M. 2000: *The Dominican Republic*. Working paper no. 3. Social capital, sustainability and natural hazard in Caribbean microstates project. Department of Geography, University of Liverpool.

Pelling, M. 2001: Natural disasters? In Castree, N. and Braun, B., editors, *Social nature: theory, practice, and politics*. Oxford: Blackwell, 170–88.

Pelling, M. 2002: Assessing urban vulnerability and social adaptation to risk: evidence from Santo Domingo. *International Development Planning Review* 24(1), 59–76.

Pelling, M. and **Uitto, J.** 2001: Small island developing states: natural disaster vulnerability and global change. *Environmental Hazards* 3(2), 49–62.

Rubin, C.B. 1998: What hazards and disasters are likely in the 21st century – or sooner? Natural Hazards Research Working Paper 99. Natural Hazards Research and Applications Information Center, Institute of Behavioural Science, University of Colorado. Retrieved June 2002 from http://www.colorado.edu/hazards/wp/wp99.html

Salt, J. 2000: Climate change and the insurance industry. *Corporate Environmental Strategy* 7(2), 146–55.

Salt, J. 2001: *The insurance industry: can it cope with catastrophe*? Paper presented at the Annual Conference of the Royal Geographical Society – Institute of British Geographers, University of Plymouth, 4–7 January.

Schelling, T.C. 1992: Some economics of global warming. In Dorfman, R. and Dorfman, N.S., editors, *Economics of the environment*. London: Norton, 464–83.

Scott, J.C. 1985: *Weapons of the weak*. London: Yale University Press.

Sparrow, J. 2001: Relief, recovery and root causes. *IFRC/RC world disasters report, 2001*. London: RFRC/RC

Swift, J. 1993: Understanding and preventing famine and famine mortality. *IDS Bulletin* 4(4), 1–16.

Turner, R.K., Kelly, P.M. and **Kay, R.C.** 1990: *Cities at risk*. Occasional publication. University of East Anglia, Norwich.

Twigg, J. 2001: Corporate social responsibility and disaster reduction: a global overview. Benfield Greig Hazard Research Centre, University College London. Retrieved June 2002 from http://www.bghrc.com/

United Nations Centre for Regional Development (UNCRD) 1995a: *A call to arms: report of the 17 January Great Hanshin earthquake*. UNCRD discussion paper 95–2. Nagoya, Japan.

United Nations Centre for Regional Development (UNCRD) 1995b: *The challenge of Mindoro. Report of the Mindoro Island Earthquake on 15 November 1994*. UNCRD research report 11. Nagoya, Japan.

United Nations Conference on Trade and Development (UNCTAD) 1999: *Trade and development report 1999*. Geneva: UNCTAD.

United Nations Development Programme (UNDP) 2000: *Human development report 2000*. Oxford: Oxford University Press.

United Nations Disaster Relief Co-ordinator (UNDRCO) 1991: *Mitigating natural disaster phenomena, effects and options: a manual for policy makers and planners*. New York: UN.

United Nations International Stategy for Disaster Reduction (UNISDR) 2002: *Natural disasters and sustainable development: understanding the links between development, environment and natural disasters*. Background paper no. 5. Retrieved June 2002 from http://www.unisdr.org/unisdr/wssdisdrdoc.pdf

Varangis, P. 2001: *Hedging your bets*. Retrieved June 2002 from http://www.worldbank.org/dmf/knowledge/hedging.htm

Varley, A. editor 1994: *Disasters, development and environment*. London: John Wiley.

Vermeiren, J.C. 1991: Natural disasters: linking economics and the environment with a vengeance. In Girvan, N.P. and Simmons, D.A., editors, *Caribbean ecology and economics*.

Barbados: Caribbean Conservation Association, 127–41.

Walker, P. 1996: *Relief inc. and the disasters business*. International Federation of the Red Cross and Red Crescent Societies. Retrieved December 2001 from http://www.ifrc.org/pubs/wdr/96/paper1.htm

Watts, M. 1983: On the poverty of theory: natural hazards research in context. In Hewitt, K., editor, *Interpretations of calamity*. London: Allen and Unwin, 231–62.

World Bank 1998: *Enhancing the role of government in the Pacific Island economies*. Washington DC: World Bank DC.

Zapata-Marti, R. 1997: Methodological approaches: the ECLAC methodology. In Center for the Research on the Epidemiology of Disasters (CRED), *Assessment of the economic impact of natural and man-made disasters*. Proceedings of the expert consultation on methodologies, Brussels, 29–30 September, Universite Catholique de Louvain, Belgium, 10–12.