



Small island developing states: natural disaster vulnerability and global change

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Abstract

This paper sets out an examination of natural disaster amongst small island developing states (SIDS), and presents a framework for assessing the interaction of global pressures and local dynamics in the production of human vulnerability. Change at the global level is found to be a source of new opportunities as well as constraints on building local resilience to natural disaster. Much depends on the orientation of the state in global economic and political systems. The United Nations is a key global actor with relevance to shaping vulnerability in island states, and the impact of the UN Decade for Natural Disaster Reduction is reviewed. It is concluded that this is a critical time for SIDS which must contend with ongoing developmental pressures in addition to growing pressures from risks associated with global environmental change and economic liberalisation that threaten their physical and economic security. © 2002 Elsevier Science Ltd. All rights reserved.

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1. Introduction

Of the 25 countries that suffered the greatest number of natural disasters during the 1970s and 1980s, 13 were small island developing states (SIDS) (UNCTAD, 1997). The disproportionate vulnerability of small islands to disaster with a natural trigger was demonstrated by Briguglio (1993). Using data on export dependence, insularity and remoteness and proneness to natural disaster Briguglio concluded that nine out of the ten most vulnerable countries were small island states. Despite this, the literature on SIDS and natural disaster vulnerability has an under-developed critical voice. It is dominated by accounts drawn from a human-ecology perspective, that while usefully emphasising the physical component of vulnerability and risk, often stops short of investigating the structural relationships that govern decision-making and policy implementation for small islands (Mossler, 1996). This is particularly true for the literature that engages with the implications

of global change for small island vulnerability. This literature is overwhelmingly concerned with global environmental change and associated sea-level rise (Cambers and Devine, 1993), with some passing contributions from work on the vulnerability of small state economies in an era of globalising market liberalism (Chand, 1997). This paper seeks to go some way towards addressing these deficits by asking two key questions. First, what is it that makes small islands vulnerable to natural disaster? Secondly, how are global changes in economic, political, institutional and environmental systems likely to influence future vulnerability in SIDS?

For island developing states, small national economies and deep integration into global markets make them especially open to the vicissitudes of economic globalisation (Fairburn, 1999). Relative prosperity is often built on fragile economic foundations. Barbados is the highest ranked 'developing country' (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. Conversely, for underdeveloped islands with only weak links into the global capitalist system, it is the very lack of global linkage that explains high contemporary levels of vulnerability. Haiti is an

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example where political crisis and economic underdevelopment have restricted the export base of the economy. This reduces dependence on international markets, but the failure of local development policy and a corresponding collapse in the national economy have resulted in widespread and long-term poverty and environmental degradation which in turn have increased individual and collective vulnerability to disaster risk (Schulz, 1998). In such a weak national political-economy encounters with global capital leave few benefits, Klak (1998) reports that Haitian workers earn <60 cents/h to make clothing with Disney logos, while Disney's Chief Executive earns US\$9700 h.

The aims of this paper are twofold. First, to establish the degree and past scale of vulnerability of SIDS. Secondly, to offer a framework for reviewing the types of global pressure of relevance to small islands. Global pressures act on island vulnerability in innumerable ways, far beyond the scope of a single paper to comprehensively engage with. Our goal is to identify critical pathways of interaction between global pressures and local dynamics that result in felt vulnerability, and in doing so to identify areas for further research. The framework is illustrated by a case study of Barbados.

2. Small island developing states, disaster and vulnerability

Land area, population, economic and environmental characteristics have all been used to define SIDS (Pantin, 1994). We have based our list on the territories identified by the United Nations Department of Economic and Social Affairs, programme on sustainable development in small islands (<http://www.un.org/esa/sustdev/sidslist.htm>). We have excluded the European islands of Malta and Cyprus because of our focus on developing states. A full list of islands is shown in Table 1. The modified list includes 38 island states with a total population of 39 million. It is disaggregated into four 'island regions' (Map 1) that share physical and cultural/historical commonalities: the Caribbean group (15 members) and the Pacific group (17 members), the Indian Ocean group (4 members) and the West African group (2 members). It is important to note the great heterogeneity that remains within each island region. There are differences in political orientation, economic development, population size and land area.

Table 1 presents data on disaster impact and losses and allows us to make some tentative comments on the past distribution of disaster among island states. The data were collected by the Centre for Research and Epidemiology of Disasters, Louvain Catholic University, Belgium (www.cred.be/emdat/intro.html). This is the most reliable centralised database on disasters

world-wide and is updated annually. Only disasters with a natural trigger are included. Information is collated and verified using government press releases, media reports and NGO statements. To be included events must have fulfilled one or more of the following criteria: ten or more people killed, 100 people affected, a call made for international assistance or a declared state of emergency. Notwithstanding these efforts to produce a clean and sensitive data set caution is needed. Information on disasters is open to suppression or exaggeration, depending upon the political motivations of observers (Alabala-Bertrand, 1993). There are rarely uncontested figures for total deaths and losses, particularly for older events. Data collected from before 1960 is particularly unreliable, more recently collection has been aided by improvements in global communications technology. Because of these weaknesses and to add comparative value, the data for 1987–1997 are presented separately and in both absolute and proportionate values.

The most disaster prone island group is the Greater Antilles: Cuba, Haiti and Jamaica reported 47, 48 and 44 disaster events for 1900–1997 and 20, 20 and 9 events for 1987–1997. In the South Pacific, Papua New Guinea (PNG) has a similarly high disaster frequency (47 for 1900–1997, 16 for 1987–1997), of the smaller Pacific islands Fiji (41 for 1900–1997, 9 for 1987–1997), Tonga (55 for 1900–1997, 4 for 1987–1997) and Vanuatu (32 for 1990–1997, 11 for 1987–1997) also score highly. The Lesser Antilles, most of the Pacific islands, Indian and West African islands have mid to low intensities of disaster. Singapore is an exceptional case, being the only island not to record a disaster, reflecting its relatively low levels of exposure to physical risk and relatively high levels of economic development and infrastructural capacity. Disaster impacts show two different trends. First, the highest relative losses are suffered by small islands usually in response to a single large catastrophe (Cook Islands, Antigua). Secondly, large islands in the Greater Antilles and Pacific (Haiti and PNG) with unstable economies and weak political and institutional development are heavy losers to repeated disaster shocks.

2.1. *Vulnerability: the concept*

A burgeoning literature on political ecology (Bryant and Bailey, 1997) has recently been applied to vulnerability and natural disasters (Blaikie et al., 1994; Adger, 1999; Pelling, 1999). As the name of this approach implies it is a synthesis of political-economy and human-ecology approaches to nature-society relationships. The aim of this synthesis is to enable the critical insight from political-economy perspectives to join with the awareness of physical-human systems interaction and place specificity that are the focus of the human-ecology

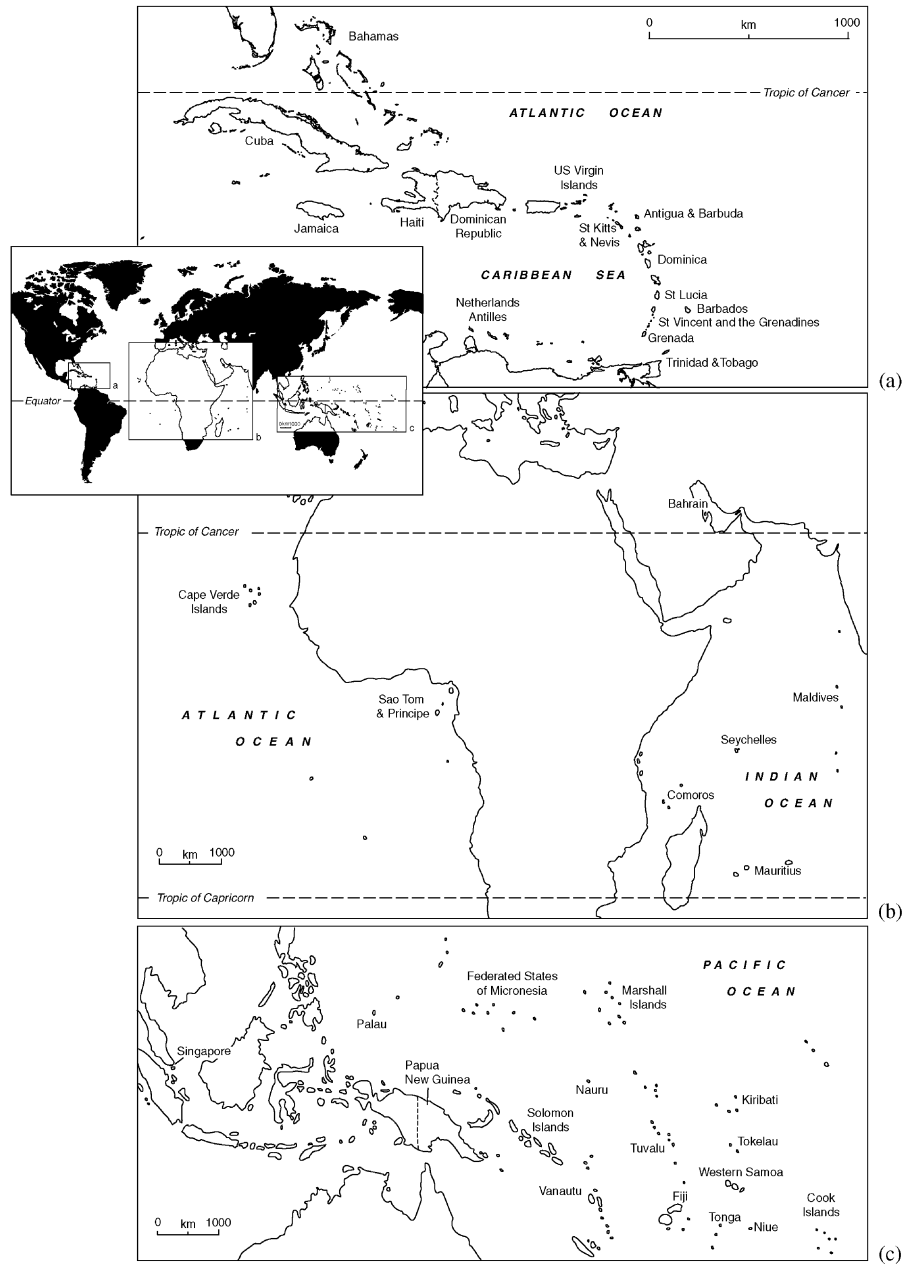
Table 1
Disaster events, deaths and affected for all SIDS, 1900–97 and 1987–97

Country	1900–1997		1987–1997				1997 Total population	
	Events	Deaths total	Events	Deaths		Affected		
				Total	1000	Total		1000
<i>Pacific</i>								
Cook Islands ^a	9	25	4	20	1.08	900	48.7	18,500
Fiji	41	493	9	28	0.035	15,887	19.9	800,000
Kiribati ^a	2	20	0	0	—	0	—	300,000
Papua New Guinea	47	7648	16	149	0.035	728,940	174.0	4,200,000
Solomon Islands	26	403	5	0	—	0	—	400,000
Tokelau ^a	5	0	2	0	—	0	—	3,300,000
Tonga ^a	55	14	4	0	—	0	—	1487
Tuvalu ^a	5	6	2	0	—	0	—	97,000
Marshal Islands	No data	No data	No data	No data		No data		9500
Micronesia	No data	No data	No data	No data		No data		123,000
Nauru	No data	No data	No data	No data		No data		10,200
Niue ^a	4	0	1	0	—	0	—	1708
Palau	No data	No data	No data	No data		No data		16,700
Vanuatu	32	168	11	6	0.03	0	—	200,000
W. Samoa	8	281	3	2	0.01	0	—	200,000
Singapore	0	0	0	0	—	0	—	3,300,000
<i>Caribbean</i>								
Antigua & Barbuda	7	8	3	0	—	6500	65.0	100,000
Bahamas	13	45	4	0	—	0	—	300,000
Barbados	7	60	2	0	—	0	—	300,000
Cuba	47	5079	20	134	0.012	200,366	18.4	10,900,000
Dominica	11	2061	2	0	—	300	3.0	100,000
Dominican Republic	28	4127	12	93	0.012	122,770	15.9	7,700,000
Grenada	4	6	1	0	—	0	—	100,000
Haiti	48	13,372	20	342	0.049	341,711	48.8	7,000,000
Jamaica	44	2354	9	7	0.003	108,217	45.1	2,400,000
StKitts/ Nevis ^a	7	1	?	0	—	180	4.0	45,000
St Lucia	12	64	4	5	0.05	78	0.8	100,000
Nether. Antilles ^a	3	1	5	0	—	4000	19.3	207,333
St Vincent	11	1694	1	0	—	100	1.0	100,000
Trinidad & Tobago	11	46	8	1	0.001	20	0.2	1,300,000
US Virgin Isles ^a	1	8	1	8	0.082	0	—	97,120
<i>Indian Ocean</i>								
Bahrain	No data	No data	No data	No data		No data		580,400
Comoros	12	587	5	51	0.09	450	0.75	600,000
Maldives	4	219	0	0	—	300	1.5	200,000
Mauritius	19	65	5	6	0.005	4000	3.6	1,100,000
Seychelles	1	5	0	0	—	250	2.5	100,000
<i>West Africa</i>								
Cape Verde	29	85,141	4	77	0.19	4296	10.74	400,000
SãoTomé/Príncipe	5	181	1	31	0.31	1063	10.63	100,000

^aTotal population data is from Turner (1998), all other population data is from UNDP (1998). Disaster events, deaths and affected from CRED, University of Louvain, 1998.

school (Burton et al., 1993). In this understanding human vulnerability is a product of physical exposure to natural hazard, and human capacity to prepare for or mitigate and to recover from (cope with) any negative impacts of disaster. Thus, vulnerability is a product of access to economic, political, social, environmental and geographical assets. Who, where and when vulnerability

and disaster strike is determined by the human and physical forces that shape the allocation of these assets in society. These forces are seen to act as a consequence of the interaction of structural forces (such as labour markets or exchange relations) with individual agency (such as participation in community based organisation or lifestyle choices) (Giddens, 1984).



Map 1. Small island developing states.

Recent work on vulnerability has been joined by a focus on its reciprocal, resilience. Resilience has been discussed within ecological theory, systems analysis and disasters studies (Tobin, 1999). It is a quality that enables an organisation, ecological system, household or nation to recover quickly from disaster shock. Resiliency puts emphasis on coping with disasters rather than promising to control or avoid their underlying physical energies. This signifies an important shift away from explanations of disaster loss to a search for patterns of human organisation and relationship that may reduce the costs of disaster (Comfort et al., 1999).

Increasing interest in resiliency needs to be tempered with a note of caution. It is critical that examinations on how best to cope with physical shocks and stress do not focus unduly on individual and local contexts. It is important to see local level risks as outputs of increasingly global political and economic systems and of physical processes that are global in scale. Otherwise we are in danger of treating local symptoms and of ignoring deeper root causes that may be distant in time and space from manifest physical risk. This puts the burden of adjustment on the recipients rather than the producers of risk. Increased local resilience in small

Box 1

Intrinsic vulnerability in small island developing states^a*Small size*

Limited natural resource base, high competition between land use, intensity of land-use, immediacy of interdependence in human-environment systems, spatial concentration of productive assets

Insularity and remoteness

High external transport costs, time delays and high costs in accessing external goods, delays and reduced quality in information flows, geopolitically weakened

Environmental factors

Small exposed interiors, large coastal zones

Disaster mitigation capability

Limited hazard forecasting ability, complacency, little insurance cover

Demographic factors

Limited human resource base, small population, rapid population changes, single urban centre, population concentrated on coastal zone, dis-economies of scale leading to high per capita costs for infrastructure and services

Economic factors

Small economies, dependence on external finance, small internal market, dependence on natural resources, highly specialisation production

^aSource: Lockhart et al. (1993), Conway (1998), Slade (1999).

islands is essential to limit losses to the inevitable consequences of global climate change, but this must go together with efforts to reduce risk by seeking and implementing alternatives to fossil fuel driven economies.

Small islands share many of the human systems and physical processes of larger or continental developing states which make them vulnerable to natural hazards: a colonial history, reliance on primary exports, extremes of poverty and inequality, limited physical and social infrastructure, inappropriate land use and weaknesses in governance and public administration. However, islands also exhibit a range of intrinsic problems (Box 1). The impact of globalisation on both facets of vulnerability needs to be considered.

2.2. Vulnerability indicators

Differentiating vulnerability between small islands to inform policy decision-making is difficult because of a lack of accessible data on key variables such as rural and urban service provision, the quality of housing infrastructure, detailed locations for human settlements, adherence to construction codes, insurance coverage, food security, disaster preparedness and emergency services. Attempts to build island specific vulnerability indices such as the United Nations Department for Economic and Social Affairs' Environmental Vulnerability Index developed by the South Pacific Applied Geoscience Commission (SOPAC) (<http://www.sopac.org/index.html>), and the European Commission Humanitarian Office's (ECHO) Composite Vulnerability

Index (<http://www.disaster.info.desastres.net/dipecho/>) remain in their early stages. With SOPAC concentrating on Pacific islands and ECHO on the Caribbean comparison of vulnerability between the major island groups using these methodologies is not possible.

To outline some tentative patterns in vulnerability between island groups a simple indicator based on the United Nations Human Development Index (UNDP, 2000) has been generated here (Table 2). In recognition of the importance of economic and social asset levels in the formation of vulnerability the indicator combines human development index rank with scores for debt service ratio, public expenditure on health, adult literacy and GDP per capita. The five variables are equally weighted (effectively putting a double weighting on the four variables which have already been included in calculating the human development index). For each indicator islands were ranked and then grouped by quartile with the lower quartile scoring 1 (labelled most vulnerable), and the upper quartile scoring 4 (least vulnerable). To account for voids in the country data, the final compound indicator was derived from the mean score for each island. Thus Fiji with scores of 3, 4, void, 4 and 2 has a compound indicator (mean) of 3.25. The maximum score for the compound indicator (indicating least vulnerability) is 4, the minimum (indicating most vulnerability) is 1.

Using this method, Haiti shows greatest vulnerability (1.25), with the Greater Antilles (apart from Cuba, 3.6) showing the highest vulnerability as an island group. The South Pacific islands (with the exception of Fiji, 3.25) show only a little less vulnerability, PNG (1.4) is the second most vulnerable island overall. The Lesser Antilles include some of the wealthiest SIDS and have a comparatively low vulnerability, Barbados (3.5) is the third least vulnerable state. The Indian Ocean and West African Coast island groups include the joint third most vulnerable states, Comoros, 1.6 and São Tomé and Príncipe, 1.6. The least vulnerable state is Singapore with an indicator value of 4. These results match the empirical evidence of vulnerability shown in Table 1, and emphasise the importance of political-economy as well as island size and proximity to sources of natural hazard as a cause of vulnerability.

3. Global change, uncertainty and resilience in small island developing states

Policy choices to enhance resilience need to respond to changing global pressures. Globalisation is nothing new for many small islands that have a long history of having to manage previous rounds of the transformation of global capitalism (Klak, 1998). In the past small island societies and environments have been among those most fundamentally reshaped by shifts in

Table 2
Vulnerability indicators

Country	Human development index (1999)	Debt service ratio (1997)	Public expenditure on health as per cent of GDP (1996)	Adult literacy (1997)	GDP per capita (1997)	Compound indicator
<i>Pacific Ocean</i>						
Fiji	3	4	—	4	2	3.25
PNG	2	2	2	2	1	1.8
Solomon Isles	2	4	—	—	1	2.3
Vanuatu	2	4	—	—	1	2.3
W. Samoa	2	4	3	—	1	2.5
Singapore	4	—	—	—	4	4.0
<i>Caribbean Sea</i>						
<i>Lesser Antilles</i>						
Antigua	4	—	3	—	3	3.3
Bahamas	4	—	2	4	—	3.3
Barbados	4	3	3	4	—	3.5
Dominica	3	3	3	—	2	2.75
Grenada	3	3	2	—	2	2.5
StKitts/Nevis ^a	3	4	2	3	3	3.0
St Lucia	3	4	2	—	2	2.75
St Vincent	3	3	3	—	2	2.75
Trinidad & Tobago	4	2	1	4	3	2.8
<i>Greater Antilles</i>						
Cuba	3	—	4	4	—	3.6
Dominican Republic	3	3	1	2	1	2.0
Haiti	1	2	1	—	1	1.25
Jamaica	3	2	—	1	1	1.75
<i>Indian Ocean</i>						
Comoros	1	4	1	1	1	1.6
Maldives	3	—	2	4	1	2.5
Seychelles	3	4	3	4	3	3.4
<i>West African Coast</i>						
Cape Verde	2	4	3	2	1	2.4
Sao Tome/Principe	2	1	4	—	1	2.0

^a Data Source: Human Development Report (1999).

international economic and political relations, and the spread of technological innovation. From the 1500s the sugar and slave economies of the Caribbean islands were built upon specific conditions of morality and political-economy emanating from the European global core-region. The local consequences were deforestation, loss of indigenous populations, local food insecurity and extremes of socio-economic and political inequality. This was—and to a large extent still is—reflected in economic dependency and human vulnerability. The 1898 hurricane in Saint Vincent destroyed 20,000 workers houses leaving half the population homeless and three-quarters without food as inappropriately constructed buildings, limited subsistence crops and external communications were lost (Richardson, 1997). If a hurricane of similar strength was to visit Saint Vincent today would impact assessments be very different?

What distinguishes contemporary from historical global pressure can be summed up by the notion of time-space compression (Harvey, 1990). Here, the increasingly wide reach and rapidity in transmission of global pressures are felt as though time and space are being compressed. It seems likely that time-space compression will have an impact on small island vulnerability, one of the key components of which is insularity and remoteness. Such rapid and expansive flows of capital, people, ideas and organisms are redrawing geographies of development, but what does this mean for SIDS? Are islands becoming enmeshed in or being marginalised from emerging patterns and relationships in the global political-economy? What are the consequences for small island sovereignty of contemporary global change? And what does all this mean for islands having to cope with vulnerability to natural disaster?

Globalisation does not mean that nation states no longer matter, but that they have to contend with new forms of non-territorial economic and political organisation such as multinational corporations, transnational social movements, international regulatory agencies, global communications networks etc. (Rosenau, 1997). Nor should globalisation be seen as any simple linear process of global integration, rather it reflects the emergence of interregional networks and systems of exchange and interaction (Castells, 1996). Important challenges for small states are likely to include a need to raise their profile in international political and regulatory arenas, and to attract foreign direct investment that can enhance resilience by stimulating local economic development and diversification in productive sectors.

To attempt to tease apart all the varied strands of global change is unrealistic, but we hope in this section to at least outline the pathways through which global pressures *interact* with local island systems. Interact is preferred to impact. Development outcomes are the result of power dissymmetries, but as Giddens (1984) and Scott (1990) argue, even the weakest of actors have some power to colour, undermine, resist or ultimately overturn structures imposed from above. Thus we see global pressures and local systems as interacting in a negotiation that can bring about changes in the production of vulnerability and resilience for a small island, not as unquestioned and all-powerful top-down forces that inevitably or uniformly dominate small island development.

Examinations of global change in the literature tend towards reductionism, interpreting global change narrowly with either the global spread of market liberalism and Western style democracy or global climate change. Here we offer a framework for analysis that integrates both human and physical dimensions of global change by unpacking globalisation into three different though interrelated groups: global processes, international linkages and local events occurring world-wide. Table 3 presents some examples of the types of global pressures that fall under each category. Such categorisation allows a more focused examination of global change whilst avoiding reductionism. This approach draws from previous works that linked particular global pressures to local human vulnerability. Kaspersen et al. (1995) examined the production of vulnerability at a regional level in relation to global patterns of information flows, access to the world market, urbanisation and global environmental change. Blaikie et al. (1994) identified population growth, urbanisation, global economic pressures, environmental degradation, global environmental change and war as global pressures likely to play a role in shaping local vulnerabilities to natural disaster. Both studies argue that global or 'external' factors need to be considered alongside local dynamic

Table 3
Components of global change

Global processes	International linkages	Local events occurring world-wide
Global climate change	International migration	Urbanisation
Sea-level rise	Development aid flows	Environmental degradation
International regulatory institutions and agreements	Foreign direct investment	Identity politics
	International communications networks	Insurance flight
	Cultural interaction	
	International debt	
	International policy co-operation	

pressures and contexts in understanding the production of vulnerability.

3.1. Global processes

3.1.1. Climate change

Small islands are particularly susceptible to changes in atmospheric and oceanic circulation. This is especially apparent during El Niño phases. In the Pacific, El Niño events have resulted in water shortages and drought in PNG, Marshall Islands, Federated States of Micronesia, American Samoa, Samoa, Tonga, Kiribati and Fiji, and greater chances of cyclones affecting Tuvalu, Samoa, Tonga, Cook Islands and French Polynesia (<http://www.sidsnet.org>).

Climate change models presently do not have a high enough resolution to offer predictions for future scenarios for individual islands. However, warming of the surrounding waters makes it likely that islands will experience moderate warming in the future. With a doubling of carbon dioxide temperatures may increase by 1–2°C, with rainfall intensity increasing by 20–30 per cent. However, higher rainfall intensity over the oceans may not benefit tropical small islands where rainfall is associated with the northerly migration of the Inter-Tropical Convergence Zone (Gray, 1993; IPCC, 2001). There is no clear agreement on possible changes to frequency, distribution or severity of tropical storms and hurricanes/cyclones. Several islands are 'water scarce nations' (e.g. Barbados and the West African Islands). Here, climatic variability may increase the frequency and severity of drought and floods. The importance of natural resource exploitation (agriculture, fisheries, tourism) to the economies of small islands means that climate change not only has a direct impact by increasing hazard risk but also an indirect impact through erosion of the economic base.

3.1.2. Sea-level rise

Estimates of global sea-level rise of 5 mm/yr must be balanced out with local tectonic movements but almost

all island states will be adversely affected by accelerated sea-level rise. (IPCC, 2001). Even modest rises in sea-level are likely to result in significant erosion and submersion of land, increased flood hazard, salinisation of freshwater aquifers, and the loss of protective coral reefs and sand beaches increasing exposure to hurricanes and storm surges in the coastal zone where much biological diversity and most of the population, agricultural land and capital assets are located (Lewis, 1990; Maul, 1993). The Pacific and Indian Ocean islands are low-lying and most at risk from sea-level rise. For instance, the islands of Maldives, with all of their land area <5 m above Sea-level, are extremely vulnerable to even a minor rise in Sea-level (<http://www.unep.ch/islands/IMJ.htm>). In the Pacific land has been lost from rising sea-levels at Kiribati and Tuvalu (www.sidsnet.org).

3.1.3. *International regulatory institutions and agreements*

Island states are signatories to many international agreements regulating human rights, environmental management and international trade. Potentially the most important is the World Trade Organisation (WTO) which has already acted to realign patterns of global trade by ruling on the legality of bilateral trade agreements and barriers. For those small islands whose economy is dominated by a single export product the WTO has special significance. For example, in 1997 a WTO ruling on sugar and banana trade, sponsored by the US, jeopardises the preferential relationships between the European Union and Caribbean states made under Lomé conventions (<http://wbln0018.worldbank.org>). Protected markets for sugar and bananas have been the backbone of many small island economies in the Caribbean and alternatives must be found to prevent economic and social crisis.

The United Nations Framework Convention on Climate Change (FCCC) is a critical global agreement from the perspective of small islands. The past focus of the FCCC has been on the mitigation of climate change by concentrating on greenhouse gas emissions. More recent negotiations have placed more emphasis on adaptation to climate change. This is a most important development for small islands as the impacts of climate change (sea-level rise, changed weather patterns) will be inevitable and it is essential for countries to reduce their vulnerability.

The World Bank and the International Monetary Fund continue to have a growing impact on island states. Most far reaching have been structural adjustment programmes negotiated as a conditionality for development loans and the renegotiation of external debt since the early 1980s. The retrenchment of public sector workers, devaluation in currencies and erosion of protected prices have led to widespread impoverishment and inequality. In several regions of the world, including

the Pacific islands reforms have been conducive to a resurgence of infectious diseases including tuberculosis, malaria and cholera (To'o, 2000). Only in the latter 1990s was a social support component built into structural adjustment programmes.

3.2. *International linkages*

3.2.1. *International migration and information flows*

Caribbean island populations have been amongst the most mobile in the world. Extensive familial networks linking the Caribbean and Pacific islands with North America, Australasia, and Europe are well developed and operate as a mechanism for islanders to cope with economic risk. Such networks increase resiliency by dispersing sites of income generation. Remittances from overseas relatives are a major source of sustenance for families coping with everyday as well as disaster shocks. Electronic communications networks offer a further opportunity for islands to develop resilience by accessing information and expertise that cannot be sourced locally. However, it is the wealthier individuals and islands that have greatest access to electronic communications and capability to use the information derived to its best effect (Demko and Woods, 1994). Inequality in resilience born out of inequality in wealth is therefore unlikely to be levelled by access to global electronics media (Yeomans, 1999).

3.2.2. *Cultural interaction*

The modernisation (Americanisation, consumerism, individualism) of island cultures is a particular issue for islands where indigenous knowledge and practices are most extensive (the Pacific and Indian Ocean islands). Burton et al. (1993) and Swift (1989) argue that the capacity of a society to absorb disaster shocks is likely to decline in the transition from folk to mixed economies, as traditional social supports are neither kept up in the face of capitalist incursions nor adequately replaced by welfarist support systems. Where local coping mechanisms are based on traditional social relationships this 'moral economy' (Scott, 1985) may be eroded by market expansion, the privatisation of communal resources and the penetration of the state into traditional social relations so that individual accumulation or state welfare replaces indigenous reciprocity and social support systems (Watts, 1983; Swift, 1993). Paulinson (1993) found that traditional coping mechanisms and agricultural practices had been undermined by the enhanced role of the market in Western Samoa.

Similarly, O'Keefe and Wisner (1975) warn that the local knowledge needed for local coping and adaptive responses may be lost or become irrelevant following social change. Benson (1997) observed this process in Fiji where signs of dependence on food from state and

non-governmental led relief measures had replaced traditional coping measures such as the consumption of uprooted tubers. Similarly, the indigenous agro-forestry systems of the Pacific islands, that offer disaster resilience, are threatened by conversion through the application of modern agricultural practices (Clarke and Thaman, 1993).

3.2.3. *International trade and investment*

Supporters of economic globalisation argue that small economies can be strengthened by specialising 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. This is a critical contradiction for small island security.

Wignaraja (1999) reviewed the relationship between globalisation and the economic development of small economies. He found that on average small states relied more on imports than larger states and argues that increasing international competition should lower commodity prices benefiting island consumers. More negatively, he found that small island states were not competing successfully in the international market. Exceptions to this were Singapore, Trinidad and Tobago, and Mauritius. Vanuatu, Fiji and PNG had high export growth rates but from small bases.

Wignaraja (1999) concludes that only a small number of island states, Singapore, Mauritius and Trinidad and Tobago (in addition to Malta and Cyprus), have successfully integrated into the world economy. These states have seen reduced dependence on primary commodity exports, increased foreign direct investment and improved social development, reducing vulnerability at the national scale. Success is explained by preferential access to international markets, access to grant aid, an educated and skilled workforce, political stability, efficient infrastructure and in the case of Trinidad and Tobago access to an offshore oil field.

3.2.4. *International politics*

National policy choice in small states is constrained by a lack of influence at the global scale. This is best exemplified by the failure of the international community to tackle climate change and a dangerous shift in emphasis in discourse from limiting change through the control of greenhouse gas emissions to support for national programmes of adaptation and loss bearing. The formation of the Association of Small Island States (AOSIS) in 1990, which has 36 members, has enabled small islands to negotiate in international fora for a positive change from a collective position. This has helped to gain greater recognition for the concerns of small islands in the United Nations organisations, but

has had limited impact on the global political stage where global core nations (North America, Australasia, Europe and Japan) dominate. The international economic policies of these core nations exert a similar pressure on island states. US policies have suppressed regimes that favour state centred development, and have regularly supported many others that do not allow for collective organising (Klak, 1998). They have imposed bilateral trade rules with very unequal consequences. In the Caribbean, the US passed that Helms–Burton Law in 1996, to choke off international trade with Cuba, while Puerto Rico is offered duty free access to US markets.

3.2.5. *International policy co-operation*

Despite the failure of islands to gain a loud voice in international politics, islands have been successful in regional organising. A significant regional initiative addressing the issue of climate change is the Caribbean Planning for Adaptation to Global Climate Change project, co-ordinated by the Organisation of American States and funded by the Global Environment Facility. Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Jamaica, Saint Kitts and Nevis, Saint Lucia, and Trinidad and Tobago have participated. The project aims to support countries in preparing to cope with the adverse effects of global climate change, particularly Sea-level rise, in coastal and marine areas, by means of vulnerability assessment, adaptation planning and capacity-building linked to adaptation planning (<http://www.cpacc.org/index.htm>). A second Caribbean network has developed from regional integration into the Regional Pan American Disaster Information System (<http://www.netsalud.sa.cr/crid/>). This network has brought together National Disaster Committee Co-ordinators from Jamaica, Haiti, Trinidad and Tobago and the Netherlands Antilles with the International Federation of the Red Cross and Red Crescent and the Pan American Health Organisation.

3.2.6. *The UN and IDNDR: a lever to promote resilience?*

Two areas where the UN's International Decade for Natural Disaster Reduction (IDNDR), 1990–1999, has contributed to confront the vulnerability of small islands have been the building of national disaster mitigation capacity and the overcoming of remoteness and insularity. In seeking to promote disaster mitigation capacity at the national scale National Disaster Committees were established in 30 islands. These included 17 in the Caribbean (Antigua and Barbuda, Bahamas, Barbados, Bermuda, British Virgin Islands, Cuba, Dominica, Haiti, Jamaica, Monserrat, Puerto Rico, Saint Vincent and the Grenadines, Saint Kitts and Nevis, Saint Lucia, Trinidad and Tobago, Turks and Cocos Islands), 11 in the South Pacific (Cook Islands,

Fiji, Kiribati, Marshall Islands, Federated States of Micronesia, Palau, PNG, Solomon Islands, Tonga, Vanuatu and Western Samoa) and 2 in the Indian Ocean (Maldives, Mauritius).

Links were built between governments and local and global insurance and reinsurance companies. This responded to the crisis in insurance in the 1990s, following events like Hurricane Georges in 1998, that caused US\$2.5 billion in insured losses, with 70 per cent of these in the Caribbean. Insurance companies increasingly considered withdrawing from insuring against catastrophic losses in small islands but instead developed special insurance cover policy for small island states (www.swissre.com; www.commonwealthdma.com).

Insularity and remoteness were confronted in the South Pacific through annual regional disaster management meetings, the South Pacific Programme Office of the UN Department of Humanitarian Affairs, in Suva, Fiji, has developed into an important hub for disaster mitigation activities in the region. According to Shah (1999), awareness of seismic risk in Fiji was zero at the beginning of the IDNDR, by 1999 awareness was there, although much still remained to be done in terms of practical preparedness and mitigation. A similar function was performed by the Association of Caribbean States, a regional grouping of 25 countries that established a Special Working Group for Natural Disasters (IDNDR, 1998).

The IDNDR successor arrangement is the International Strategy for Disaster Reduction (ISDR). The stated objectives of ISDR are to influence decision-makers and help communities focus on the creation of long-term, pro-active disaster prevention strategies, and to help communities reduce the risk of longer-term social and economic disruption in the face of a natural hazard (<http://www.unisdr.org>). The emphasis of the UN strategy is to move beyond protection against hazards to the management of risk through the integration of risk reduction into sustainable development. The focus, nevertheless, remains on disasters with a natural origin.

3.3. *Local events occurring world-wide*

3.3.1. *Urbanisation*

The Caribbean is the most urbanised island region. Here the urban population has been growing at 2.4 per cent per annum between 1990 and 1995 (McGregor and Potter, 1997) with 53.9 per cent of the Caribbean population living in urban settlements in 1997 (UNDP, 1999). In the Pacific Islands region, Fiji is the most urbanised with 41.2 per cent of its population being urban in 1997. Similar rates of urbanisation can also be observed in the West African coast (Cape Verde at 57.7 per cent urbanised in 1997) and Indian Ocean (Sey-

chelles at 56.1 per cent urbanised in 1997) (UNDP, 1999). Many islands, especially the smaller islands in the Pacific, Indian Ocean and Caribbean regions continue to be dominated by rural populations but the overall trend is towards urbanisation and this brings with it a shift in the nature and locus of vulnerability to natural hazard.

Urbanisation and attendant industrial development concentrate risk. Rapid and unplanned nature of urban expansion in the Caribbean and Pacific islands means that growing numbers of residents are denied access to urban services and basic needs and exposed to industrial hazards (Bryant, 1993; Potter and Conway, 1997). Inadequately constructed and dense dwelling forms, and the growth of informal settlements in vulnerable locations on steep hill-slopes or adjacent to hazardous industry similarly generate risk and were principal reasons for the large losses experienced in urban fringe settlements following Hurricane Mitch that devastated large tracts of the Caribbean coast in 1999. The break up of traditional social networks and extended commercialisation in urban areas may constrain coping options—particularly among rural migrants, who are also among the most vulnerable (Moser, 1996). Such social changes reduce opportunities for individuals to access food, water and shelter following disaster and reduce the likelihood of communal action to reduce pre-disaster vulnerability. However, Nicholson (1988) reported that customary obligations such as donations to weddings and funerals continued, despite becoming increasingly burdensome, for urban households in Melanesia and Fiji.

Urban settlements also offer advantages. They concentrate emergency relief organisations, medical services etc (IFRC/RC, 1997). Urban residents can apply a number of different coping strategies normally not available to rural people. For example, they can act as a catalyst for civil society organisation. Following Hurricane Georges, 1998, in Santo Domingo community groups organised to evacuate vulnerable households, provide emergency shelter, clear streets of debris and repair damaged houses some weeks before state involvement (Pelling, 2000a). What is needed in urban areas is appropriate planning regulation supported by systems of accountable governance (IFRC/RC, 1997).

3.3.2. *Identity politics*

A trend in the assertion of ethnic and nationalist identity politics has led to social conflict and political instability in many small islands. This is underlain by historical processes of development. In the Pacific mass migration between islands during the colonial era, subsequent ethnic competition for economic resources and a reluctance on the part of formerly colonial powers to assist in economic development and institutional strengthening have led to conflict in Palau, New

Caledonia, Fiji and the Solomon Islands (Minority Rights Group, 1986, 1987a, b). Most recently, violent conflict has erupted in Fiji between indigenous Fijians and Indian migrants and in the Solomon Islands between natives of Guadalcanal and Malaita islanders resident on Guadalcanal since the second world war. Such disruptions undermine institutional capacity to respond to vulnerability or disaster impacts. Recent examples of political instability include Fiji (1987 and 2000), Solomon Islands (2000), Trinidad and Tobago (1990). Political rivalry, although less intense than political instability can nevertheless distort decision-making and development policy. In the Dominican Republic, following Hurricane Georges in 1998, political rivalry delayed the release of a US\$200 million fast-track disaster rehabilitation loan from the World Bank for 7 months. By the time monies were available the 1999 hurricane season had commenced.

3.3.3. *Local environmental degradation*

Local development activities are the cause of much environmental change and associated human vulnerability in small islands. Many local pressures combine with global environmental change to place additional stress on local ecologies. Examples include coral bleaching and mangrove loss, both increasing the exposure of coastlines to flooding (IPCC, 2001). Cutting of forests for local consumption and associated changes in micro-climate and slope instability have resulted in

landslide hazards in the Caribbean islands, especially Haiti and the Lesser Antilles and drought in the West African islands (Hanna, 1996). Similar environmental changes have been experienced as the 'forestry frontier' has expanded into the Pacific islands. Notably the Solomon Islands, where a weak forestry department and civil society have little power to restrict the activity of foreign (mainly Japanese based) forestry companies (Dauvergne, 1998).

4. A case study of Barbados

It is informative to present a summary analysis to indicate the ways in which global pressures and local dynamics can interact in one island. Barbados is a relatively small island (population 300,000; land area 421 km²) with a high population density (612 persons/km²). Table 1 shows that since 1900 Barbados has not suffered extensive losses from natural disaster—seven events are recorded (two between 1987 and 1997) with 61 deaths (one between 1987 and 1997). The major event in this period was a hurricane in 1955 when 57 lives were lost (UNDP, 1990).

The impact of global pressures on Barbados is summarised in Table 4. The intention is not to put any weighting on these pressures, which are incommensurate, but simply to flag up those global pressures that have most influence on Barbados' security and which

Table 4
Assessing vulnerability and global change in Barbados

Global pressure	Local pathways to vulnerability and resilience
<i>Global processes</i>	
Global climate change	Sugar production at risk
Sea-level rise	Beach erosion and coral bleaching with long-term consequences for coastal defence and tourism
World Trade Organisation	The shift from sugar to tourism as the mainstay of the economy offers some protection following WTO rulings against Lomé
Structural adjustment	Limited increase in structural poverty and vulnerability
<i>International linkages</i>	
Cultural change	Rapid modernisation has undermined traditional community activities and social capital. Community based disaster relief committees are in crisis
International migration	Many cross-boarder families with members in North America or Britain sending financial remittances home increasing resilience
Foreign direct investment	Some diversification into data-processing and chemical production but tourism continues to dominate GDP
International policy co-operation	Barbados is the Caribbean base for many international non-governmental organisations and governmental aid agencies. This enhances the island's visibility. It hosted the 1994 UN conference on sustainable development in small island states. It is the base for the Caribbean Disaster Emergency Response Agency
<i>Local events occurring world-wide</i>	
Urbanisation	Annual urban growth rate is three times the total population growth rate. Urban inequality and sub-standard housing are of growing concern
Identity politics	A relatively homogenous society, Barbados has maintained an open democracy for 30 years
Environmental degradation	Water extraction exceeds natural replenishment levels from rainfall, the water distribution system is in urgent need of rehabilitation and water conservation methods should be installed
Insurance flight	Barbados suffered from insurance premium increases following hurricanes elsewhere in the Caribbean in the 1980s and 1990s

should be considered in long-term integrated development and disaster planning. There is much uncertainty surrounding global climate change but a clear link exists between rainfall and temperature variability, with the sugar crop being at risk. Further risk comes from the low volume of subsistence crops grown on the island. Food security relies upon the ability of islanders to purchase imported foodstuffs. Sea-level rise has been recorded in the Caribbean, and Barbados is already suffering from beach erosion and death of coral reefs that jeopardise beach tourism and increase coastal flood risk. Because Barbados' economy is not dominated by agricultural production the threat of Lomé withdrawal does not present as grave a risk to economic stability as it does to some other Caribbean islands. Economic stability has been sustained despite undergoing structural adjustment in the 1990s, form which the economy has largely recovered. The biggest losers from structural adjustment have been retrenched public sector workers, many of whom have yet to find employment, increasing structural poverty and vulnerability.

Economic growth has been accompanied by cultural change. Within a generation traditional pass-times centring on the extended family or local community have been replaced by individualised and home-based recreation. This has eroded social capital. For example, undermining a nation-wide community based disaster response network; of 28 local groups formed in 1978 only 6 were functional in 1998 (Pelling, 2000b). Cultural change is also associated with high rates of emigration which acts as a transmission rout for new ideas, but also financial resources which can act as an insurance mechanism in times of disaster. Barbados has had limited success in attracting foreign investors in non-traditional export sectors, primarily in its tourism industry which now dominates GDP (Klak and Conway, 1998). This brings security from economic revenue but risk from the industries' reliance on a local environmental product that is under threat from local environmental degradation and global climate change. The Weston flood in 1995 left 100 people homeless and was allegedly caused by the blocking of a gully during the construction of a tourist golf course (McGregor and Potter, 1997). Barbados has historically played a leading role in shaping regional policy and co-operation in the Lesser Antilles. Moreover, economic and political stability have made Barbados an attractive base for the Caribbean offices of many governmental and non-governmental development agencies including the Caribbean Disaster Emergency Relief Agency. Together, these factors increase the visibility of Barbados in international policy circles.

The annual urban growth rate in Barbados is 1.7 per cent compared to a national population growth rate of 0.4 per cent (UNDP, 2000). Whilst urban development

is generally well organised, informal settlement in Bridgetown has expanded over a drinking water catchment area and now threatens one-third of the country's drinking water supply. The arrival of economic migrants from poorer Caribbean islands has created a new vulnerable population. Environmental degradation is widespread, most dramatically in the central districts where deforestation has led to landslides forcing resettlement (Hanna, 1996). Weak institutional capacity, a strong business lobby and intense competition over land-use restrict policy options and resolutions to the conflicts outlined will be hard won. This summary analysis of global change and vulnerability indicates that further research and policy development to reduce vulnerability needs to be directed towards the causes and consequences of climate change and sea-level rise, local environmental degradation, the erosion of social capital and the recent production of vulnerable groups in urban areas following rapid urbanisation, structural adjustment and immigration. The analysis also identifies links between island resiliency and international migration, the hosting of regional NGOs and government aid agencies and the strength of the national economy. Overall there is a need for a greater awareness amongst policy makers of the embeddedness of disaster risk in local, national and international development.

5. Conclusions

We started this paper by asking two questions. What is it that makes islands vulnerable to disaster, and is globalisation changing the nature of this vulnerability? Small islands are made vulnerable by their small size, insularity and remoteness, environmental factors, limited disaster mitigation capability, and demographic and economic structure. The larger, and least globally connected island states are those most severely effected by disaster (Haiti, PNG, Jamaica). Although it is the smaller islands that are most at risk from 'knock-out' by a single event. Global pressures have been cast as having a negative influence on island vulnerabilities. However, global pressures should not only be interpreted as a negative. Some instances of globalisation are clearly positive, for example: institutionalised co-operation at the global scale facilitates greater co-operation at the national and regional scales, as the IDNDR and many regional initiatives show. Other global pressures can also be positive—urbanisation, foreign direct investment, cultural modernisation and identity politics can be tools for enhancing resilience given supportive regulatory mechanisms and transparent and accountable governance. As the case of Barbados demonstrated, the message here is that efforts to enhance island resilience must be mainstreamed into general development policy formulation, with disaster mitigation not seen as a

separate and largely engineering or land-use planning based realm. Perhaps most critical of all for island states is that a rising focus on building local resiliency does not detract from international efforts to reduce economic and environmental pressures resulting in risk for small island states. Small islands need their voice to be heard in international fora, in the WTO, the UN system and international climate change talks. Acting as a group through AOSIS, small island states have achieved some progress. The UNFCCC has a special fund for SIDS and the July 2001 climate change negotiations resulted in the establishment of a new adaptation fund to be managed by the Global Environment Facility. Nevertheless, much remains to be done to turn rhetoric into action.

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