Two worldwide trends in recent decades are commonly noted and sometimes linked in discussing disasters. First, the reported global cost of natural disasters has risen significantly, with a 14-fold increase between the 1950s and 1990s (Munich Re 1999). During the 1990s, major natural catastrophes are reported to have resulted in economic losses averaging an estimated US$54 billion per annum (in 1999 prices) (Munich Re 1999). Record losses of some US$198 billion were recorded in 1995, the year of the Kobe earthquake—equivalent to 0.7 per cent of global gross domestic product (GDP) (Munich Re 1999).

Second, there is an apparent steady movement toward globalization, with an increasing share of economic activity taking place across countries and regions as barriers to integration are reduced. Between 1987 and 1997, the share of international trade in total output (defined as exports plus imports relative to GDP) rose from 27 to 39 percent for developed countries and from 10 to 17 percent for developing countries (World Bank 2000). Global foreign direct investment (FDI) flows more than tripled between 1988 and 1998 to US$610 billion, and foreign direct investment is now the largest form of private capital flow to developing countries (World Bank 2000). Labor migration and financial remittances to home countries have also been of increasing importance to developing countries and poorer regions within them.

As the World Bank (2000: 1) comments, “globalization is one of the most charged issues of the day…. Extreme opponents charge it with impoverishing the world’s poor, enriching the rich and devastating the environment, while fervent supporters see it as a high-speed elevator to universal peace and prosperity.” Or, in the words of the 1998 Siena Declaration, “rather than leading to economic benefits for all people, it (economic globalization) has brought the planet to the brink of environmental catastrophe, social unrest that is unprecedented, economies of most countries in shambles, an increase in poverty, hunger, landlessness, migration and social dislocation. The experiment may now be called a failure.”

But what does globalization imply for vulnerability to natural hazards? Rising disaster losses have paralleled increasing globalization. But are the two trends related—and, if so, necessarily? Or are they coincidental but separate movements? And can differences in the incidence of occurrence and nature of natural hazards influence the form and level of integration of a country into the global economy?

This paper seeks to explore the relationship between integration in the global economy and sensitivity to natural hazards—that is, to events caused by geophysical, hydrological, and atmospheric forces. It takes a macroeconomic perspective and draws on both the wider literature and on evidence accumulated by the authors in a series of studies of the economic impacts of natural disasters. This research includes, most recently, an ongoing study on The Economic and Financial Impacts of Natural Disasters: An Assessment of Their Effects and Options for Mitigation undertaken on behalf of the World Bank’s Disaster Management Facility, with the financial support of the U.K.’s Department for International Development.

The paper is organized as follows. First, definitions of the key concepts concerning disasters and globalization employed in the paper are given. The next section then considers the implications of various aspects and impacts of globalization for forms and nature of vulnerability to natural hazards. Various aspects of globalization, covering international trade in goods and services; international financial markets; international labor mobility; and international research and exchange of information are considered. The domestic impacts of
globalization in certain specific areas—namely, rates of growth, poverty, food security, and environmental conditions—are also discussed.

The potential impacts that risk and disasters, in turn, can have on the pace and nature of globalization are then examined in a section on the implications of natural hazards for globalization, focusing in particular on the issue of whether natural hazards can present a fundamental obstacle to integration.

The next section presents evidence from three countries—Dominica, Bangladesh, and Malawi—illustrating a range of experience in terms of trends in vulnerability, forms that vulnerability can take, and the role of varying external linkages and relations. The case studies also demonstrate that globalization is not a new phenomenon; that it is possible for a country's level of integration into the global economy to decrease, as well as increase, over time; and that the nature of integration can change. The latter two factors, in turn, can have implications for an economy's sensitivity to natural hazards.

The paper concludes with some reflections on the policy and research implications of the complex and changing influences that determine an economy's sensitivity to natural hazards.

The literature relating to both natural disasters and to globalization indicates some diversity in the use of basic terms. At the outset, therefore, it is useful to define how key language is used in this paper:

A natural hazard is a geophysical, atmospheric, or hydrological event that has a potential to cause harm or loss. Usually these are both uncommon and extreme events in terms of the range of natural phenomena such as rainfall, tropical storms, flooding, and so forth. Hence the need to determine risk, which is understood to be “a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence” (Royal Society 1992: 4).

A natural disaster is the occurrence of an abnormal or infrequent hazard that impacts vulnerable communities or geographical areas, causing substantial damage, disruption, and possible casualties, and leaving the affected communities unable to function normally. From an economic perspective, a disaster implies some combination of losses in terms of human, physical, and financial capital, and a reduction in economic activity, such as income and investment, consumption, production, and employment in the “real” economy. There may also be severe impacts in terms of financial flows, such as revenue and expenditure of public and private bodies (Benson and Clay 1998). The losses in stocks of capital and inventory and reductions in short-term economic flows are sometimes confounded in reporting the costs of disaster impacts. These stock losses and short-term flow effects may be so extreme as to result in a modification in the medium- to longer-term trajectory or development path of an enterprise, region, or national economy as well.

Vulnerability is the potential to suffer harm or loss in terms of sensitivity, reliance, and reliability. Economic behavior is sensitive to a disaster shock. This impact is reflected at a macro or sectoral level in the deviation of economic aggregates from trends that were expected without taking into account the effects of this event. Because economic activity is sensitive to many influences, including other sources of shock, in practice it can be difficult to isolate precisely the impacts of a specific disaster or disasters. The primary objective of our studies has been to seek to isolate and understand these short- and long-term consequences of natural disasters. Resilience is the speed of recovery in economic activity, which may involve repair and replacement of lost and damaged capital.

Disaster management literature commonly distinguishes rapid-onset disasters, such as storm surges or earthquakes, which cause immediate loss and disruption, and slow-onset events, notably drought. In our empirical investigations of economic consequences, we have found it useful to distinguish climatic hazards and related riverine and coastal hydrological hazards from geophysical hazards.

Climate-related hazards present threats of varying intensity that are usually recognized at a local or national level, and there is consequently some form of adaptation in terms of economic behavior and the technology in which capital—productive, housing and habitat, or infrastructure—is embodied. The economic, and of course wider social, consequences of both individual events appear to be susceptible to investigation for most lower- and middle-income developing countries. In contrast, potentially catastrophic geophysical hazards may
be very rare in occurrence. Even in potentially high-risk geographical regions there may have been no extreme event in living memory or even within the historical record. Consequently, such hazards pose quite different problems of risk perception and economic behavior. However, a global phenomenon—satellite television and linked media information—may be changing that as well.

*Globalization* is the process through which there is an increase in cross-border economic activities, in the form of international trade of goods and services, foreign direct investment (in turn comprising the financing of new investments, retained earnings of affiliates, and cross-border mergers and acquisitions), capital market flows, and labor migration. It should be noted that greater globalization is not necessarily synonymous with a higher level of GDP, with increasing domestic or regional economic integration, or with market liberalization, although these phenomena are commonly related.

**Broader Implications of Globalization for Vulnerability**

In this section major aspects of the globalization process are considered in terms of their implications for vulnerability to natural hazards.

**International Trade**

Reductions in trade barriers and transport and communications costs have resulted in a rapid growth in openness since the mid-1950s, with increasing trade in manufactures (involving more two-way trade) and a fragmentation of the production process (Martin 2001). Initially, developing countries typically liberalized trade more slowly, with a number favoring import substitution policies instead, but since the mid-1980s developing countries have also increasingly reduced barriers to trade, often unilaterally rather than under the auspices of the World Trade Organization (WTO). Average tariff rates in developed countries are now low, although barriers remain in the two areas where developing countries have a comparative advantage: agriculture and labor-intensive manufactures (World Bank 2002). In the case of agriculture, various exceptions have been made for domestic support price schemes under successive GATT negotiations, although negotiations are currently underway in the WTO on a new agreement on agriculture. Quotas have also remained on exports of textiles and clothing, discriminating by country. Indeed, both the World Bank (2002) and others are calling for a “development round” of trade negotiations.

As a result of this broad process of liberalization as well as increased FDI (see the following “External Trade” section) and a relatively high rate of accumulation of human and physical capital, many globalizing developing countries have shifted exports from agricultural to manufacturing products. In 1965, agricultural commodities accounted for about half of developing country exports and manufactures for only around 15 percent. By the late 1990s, around 80 percent of developing country exports were in the form of manufactured items, with agricultural products falling to around 10 percent by 1998 (Martin 2001). Although there is considerable variation in the composition of exports between different developing countries, with some remaining as primarily agricultural exporters, even many of these latter countries have experienced some growth in manufacturing exports. Exports of services from developing countries have also increased significantly.

Different productive activities are potentially differentially sensitive to natural hazards; thus, any change in the composition of production could be significant in terms of the level and nature of risk. Natural hazard events may reduce the availability of particular goods and services for export (either directly or via disruptions to transport and communications networks) while simultaneously increasing imports, to meet both disaster-related domestic shortages and relief and rehabilitation requirements. Ramifications throughout the economy can be significant. Depending on levels of foreign-exchange reserves and on government external borrowing policy, a deterioration in the balance of trade could result in an increase in external borrowing, with implications for future levels of debt servicing and, ultimately, economic growth. Any worsening of the balance-of-payments position could also exert pressure on the exchange rate and, thus, on international competitiveness. There are also potential budgetary implications in so far as government revenue is derived from export and import duties and tariffs. Thus, it is important that a government be aware of the potential sensitivity of its
various exports to natural hazards and the possible consequences of any changes in both relative and absolute composition. As liberalization encourages trade, it also encourages shifts in the composition of an economy, with implications for livelihoods, their relative security, and ultimately household vulnerability to natural hazards, a theme explored in further detail below.

At first sight, diversification and the shift toward manufacturing exports would seem a positive development from a natural hazards and balance-of-payments perspective. Renewable natural resource commodities (agriculture, forestry, fisheries) are often among the most directly affected by natural hazards. The sector is particularly susceptible to climatic hazards such as droughts, excessive rainfall causing floods, and cyclones, although the extent and nature of impact depends in part on the timing of a hazard event relative to cropping cycles, and on the severity of the hazard itself. Moreover, it is often difficult to obtain insurance against crop losses. Natural hazards can also have indirect effects via their impact on agricultural equipment and infrastructure, such as drainage and irrigation systems, post-harvest and storage facilities, and boats, as well as generally on transport and marketing infrastructure.

Primary commodity exports, including metals, minerals, and oil, as well as renewable natural resources, are also vulnerable to commodity price shocks. Few countries are price-setters in such markets and thus may experience coincidental contemporaneous fluctuations in international commodity prices, either offsetting or exacerbating balance-of-payments and inflationary impacts of disasters.

That said, there is evidence that efforts have sometimes been taken to dampen the impact of hazard-related falls in agricultural production. In Fiji, for instance, sugar reserves have been used to maintain export earnings and prevent loss of export markets in the aftermath of natural disasters (Benson 1997a). There is probably less scope for using stockpiles of manufactured items to manage risk in this way. Shifts in technology and fashions make many manufactured items rapidly obsolete, while modern management techniques often emphasize just-in-time production processes. Moreover, most manufacturing production is in privately owned enterprises, with, by implication, little regard given to the stability of the broader external sector in undertaking production and export decisions. In contrast, stockpiling agricultural produce was often undertaken by public or quasi-public agencies, in part specifically to stabilize export earnings. Governments need to recognize this change and consider whether new ways of managing balance-of-payments risks—for example, encouraging international financial risk transfer mechanisms or maintaining increased foreign exchange reserves—are required.

The shift into manufacturing products also means that many developing countries are now competing against developed countries for markets. Thus, when disruptions to production occur—particularly where just-in-time production practices are employed—contracts may be lost and future market shares lost. For example, the shift from agricultural to manufacturing exports and thus, at first sight, to an apparently less sensitive form of economic activity, may not in fact have reduced the potential vulnerability of Bangladesh’s export earnings to natural hazards. Bangladesh faces severe global competition in the export of ready-made garments. In contrast, it was the world’s primary jute producer and, as such, was a price-setter on the international market. Disruption to the production of ready-made garments could result not only in the direct loss of export revenue but also in the longer-term loss of markets overseas.

The concept of vulnerability also entails potential to recover. Again, in some instances agriculture can offer certain advantages, as illustrated by banana cultivation in Dominica (see below), but generally, manufacturing activities can often be restored faster. In the event of hazard-related damage, however, there is a possibility that a particular productive activity will not be re-established at all. Although there has been no research undertaken in this area, it is plausible that manufacturing activities, which are less geographically tied than agricultural ones, could simply be relocated elsewhere, with implied losses to the local economy and, where FDI is involved, to the national economy.

Despite these reservations, the broad shift in composition of exports experienced by many developing countries in recent years is, on balance, almost certainly a positive development from the perspective of sensitivity of exports to natural hazards. However, again from a natural hazards perspective, the fiscal implications of trade liberalization may be less beneficial, to the extent that liberalization reduces earnings from import duties.
Revenue emanating from import duties is typically less sensitive to natural hazards. Import duties are also relatively easy to collect—an important point where a disaster results in administrative chaos and disruption. The precise implication of any reduction in import duties will depend on the precise structure of taxes in a country, including not only the significance of import duties but also the relative rates charged on different categories of imports (food, oil, inputs to industry, luxury items, and so forth).

Finally, over the past two to three decades, growth in various service industries linked into the international economy has offered another form of risk diversification as illustrated by the case of Dominica. International financial services and tourism are probably the most significant in this regard. International financial services can be structured in such a way that performance is determined almost entirely by non- domestic factors. The growth of tourism also offers some opportunity to reduce an economy's overall sensitivity to natural hazards. However, efforts are required to ensure that the transport, communications, and tourism infrastructure are hazard-proofed. Tourists themselves also need to be adequately protected in the event of a disaster. It should also be borne in mind that demand is potentially highly sensitive to bad publicity. These are regionally and globally relatively footloose sectors and so investment may cluster in perceived low-risk locations.

**Foreign Direct Investment**

The globalization process has also involved increasing flows of FDI, as already noted, in part stimulated by a reduction in developing country restrictions on foreign investment (World Bank 2002). The majority of FDI flows go from advanced industrial to advanced industrial countries. Advanced countries accounted for 85.3 percent of total FDI outflows between 1993 and 1997; and for 71.5 percent of FDI inflows over the period 1985 to 1997. However, the share of inflows to developing and transition economies is increasing, jumping from 21.8 percent in 1988–92 to 39.8 percent in 1993–97 (Shatz and Venables 2000).

There are two basic forms of FDI: horizontal and vertical. Much of the intra-industrial country investment is horizontal but, relative to developed-country investment, much of the inflows to developing countries are vertical (Shatz and Venables 2000). Both forms of FDI bring potential benefits in terms of increased supply of capital and access to technology, management expertise, and markets. Each can also alter the nature of sensitivity of an economy to natural hazards.

Horizontal integration, under which a firm supplies a foreign market with its product by producing locally rather than importing, implies that domestic availability of a product may be reduced due to direct damage to the operating plant, potentially placing additional pressure on the balance of payments post-disaster. Domestic production, rather than import, of a particular item also changes the nature of demands on a country's transport network; whether or not this is to the firm's advantage post-disaster remains unclear. Potential post-disaster slumps in an economy could also reduce demand for a particular item, perhaps with implications for demand for labor in the affected industry.

Vertical FDI involves shifting a stage of the production process to low-cost locations, on the basis that "different parts of the production process have different input requirements and, since input prices vary across countries, it may be profitable to split production" (Shatz and Venables 2000: 7). Vertical FDI offers the advantage that demand does not depend on domestic economic circumstances and thus is immune to the consequences of any disaster-related slump, instead continuing to offer employment. However, it can be affected by temporary disruption to transportation and communications networks.

From a natural hazards perspective, both forms of FDI are also potentially significant in spreading risk, both from the perspective of individual producers, who can hold assets in more than one country, and from that of an economy, reducing relative levels of risk borne domestically. Such benefits of foreign ownership were apparent in the case of lime production in Dominica in the past. Large multinational producers involved in the production of primary commodities may be better placed to transfer risk by taking advantage of commodity futures (offering the opportunity to buy and sell forward or reserve the right to do so at a pre-agreed price) and reinsurance markets, by virtue of their greater knowledge and experience.⁴
Foreign investors may also build factories and other buildings to companywide building standards which, where they exist, are often very high, reducing potential physical damage as a consequence of natural hazards. This is not always the case, however. In Bangladesh, for instance, inward investment in garment manufacture seeking low-cost sourcing that exploits potentially temporary tariff loopholes may be associated with low specification, poor safety designs in high-risk locations (see the following section on Bangladesh).

In summary, globalization in the form of increased FDI flows will alter the nature of risk. The nature of this change will depend on individual circumstances but, on balance, in many cases will probably play a role in reducing broader economic sensitivity to natural hazards.

**International Financial Markets**

Financial globalization entails the integration of a country's local financial system with international financial markets and institutions. It involves an increase in cross-country capital movement, including the participation of local borrowers and lenders in international markets and in widespread use of international financial intermediaries (in part via their presence, largely in the form of foreign banks, in local markets as well as in the use of those located overseas) (Schmukler and Zoido-Lobatón 2001). The process of financial globalization has been significantly aided by gains in information technology, reducing the importance of geography, as well as by liberalization and privatization of public financial institutions in developing countries.

From a natural hazard perspective, such instruments offer certain advantages. First, firms and households may be able to smooth consumption and investment while meeting rehabilitation costs as they arise. International banking also enables individuals to hold funds with institutions better able to diversify risks. An extreme example of the need to diversify is the case of the Montserrat Building Society during a volcanic emergency (box 1.1).

Increasing international financial integration could also offer a future mechanism for the spread of risk by microfinance institutions (MFIs). MFIs provide financial services to the poor, extending credit and providing savings facilities. The loans they provide are typically very small, are mainly intended for productive purposes, do not require conventional forms of collateral, and are extended on a nonprofit-making basis. MFIs are highly vulnerable to natural hazards because of temporary liquidity difficulties as they try to support clients through difficult periods while also experiencing a temporary drop in flows of debt repayments. Some MFIs are therefore beginning to explore options for disaster insurance to protect themselves and enable themselves to respond to the additional disaster-related needs of their clients. To date, the MFIs that have established such schemes have basically opted for self-insurance, setting some resources aside into a calamity fund for financial education.

**Box 1.1 Financial fallout from the Montserrat volcanic eruption**

The volcanic eruption in Montserrat, which began in mid-1995, resulted in the displacement of 90 percent of the residents from their homes, with more than half eventually leaving the island. One of the financial casualties was the Montserrat Building Society (MBS), the country's only building society, which effectively collapsed. The MBS is largely dedicated to using savings to finance housing. The MBS estimated that, prior to 1995, it had accounted for approximately 90 percent of mortgages on the island as well as for a high proportion of savings by residents and some non-resident migrants. However, following an escalation of the crisis in August 1997, most insurance policies were suddenly canceled by international companies that could easily give up business on an island that was a marginal part of their portfolio. The mortgaged assets held by the MBS immediately assumed a zero value, putting the Society into substantial deficit. Although the MBS remained open, following a temporary three-week closure, depositors were initially only able to withdraw up to 35 percent of their savings while the Society remained in deficit. In early 1999, the MBS announced that savers could withdraw a further 35 percent of their savings. The contrasting behavior of international insurers and a local financial institution illustrates the ambiguities of globalization that can alter but not necessarily reduce disaster risks (Clay and others 1999).
use in the event of an emergency. In the event of a disaster seriously affecting a significant proportion of clients, however, such funds would be grossly inadequate. The alternative—placing the risk externally—would create additional overheads, making the cost of credit itself more expensive. Instead, the solution could lie in some sort of international syndicate of MFIs. Good practice dictates that MFIs should not encourage a culture of default and that, instead, borrowers should ultimately repay any loans. Assuming this occurs and that default—as opposed to deferment—rates are low (as evidenced in, for instance, Bangladesh and Dominica), MFIs could benefit significantly from temporary access to additional resources to smooth fluctuations in demand relative to the availability of funds. Such resources could be provided by other, unaffected, syndicate members.

Globalization has also brought with it increasing possibilities for the use of traditional and newer forms of financial risk transfer. More traditional tools comprise insurance and reinsurance. Newer instruments, developed over the past five years in response to dramatic increases in more traditional ones, entail some form of hedging transaction in capital markets. Weather derivatives involve automatic and immediate payouts (typically available within 72 hours) upon the occurrence of a predetermined trigger event, irrespective of the scale or nature of damage. Catastrophe bonds provide attractive payments to investors unless the specified catastrophic event involves a reduction, and in some cases cancellation, of the principal and/or interest on a bond.

The potential advantages of these various mechanisms include the alleviation of post-disaster pressure on fiscal and external balances; increased government control over the financing of disasters, possibly including the immediate and timely availability of funds; increased capacity for the relevant government to set its own priorities in the management of relief and rehabilitation; increased transparency in the delivery of relief and reconstruction; and provision of a tool for promoting mitigation.

In developed countries there are already well-established markets for insurance against a wide range of natural hazards, including earthquakes, volcanic eruptions, floods, droughts, and cyclones. Newer hedging instruments are also gaining some popularity. However, insurance and capital market instruments have played a relatively small role to date in the transfer of risk in developing countries. Although there is thus scope for benefits of greater financial integration to be reaped, there are also a number of practical obstacles that need to be overcome before coverage can be increased significantly. There is a need to reform the structure and legal and regulatory framework of the insurance industry in a number of countries, including removal of barriers to entry. The cost of insurance also needs to be affordable and stable. At the same time, insurers need to remain sufficiently capitalized to bear any losses, in turn requiring detailed scientific information on current and future risks.

Despite the various potential benefits of financial integration from a natural hazard perspective, as discussed above, it should also be remembered that such integration carries other, more general, risks. Although the World Bank generally favors greater openness to trade and FDI because of its net beneficial implications for economic development and poverty reduction, it is “more cautious about liberalization of other financial or capital market flows” (World Bank 2000: 2). As Schmukler and Zoido-Lobatón (2001: 3) observe, “international market imperfections, such as herding, panics and boom-bust cycles, and the fluctuating nature of capital flows can lead to crises and contagion, even in countries with good economic fundamentals.” Banks and financial institutions can spread a crisis across countries, as demonstrated by the emerging-market crises in East Asia and elsewhere in 1997–98. Natural hazards themselves could even trigger such crises. The city of Tokyo, for instance, lies in a seismically active area. It experienced a major earthquake in 1923 and volcanologists warn that another major event is “long overdue.” As early as 1995, financial analysts were already forecasting that the next major Tokyo earthquake could result in bond and stock market crashes in the United States and a world recession, as well as severe domestic economic difficulties (Hadfield 1995). There is clearly a need to balance risks from different sources and, where possible, to seek to reduce them. The World Bank (2002), for instance, calls for building up supportive domestic institutions and policies to reduce the risks of a financial crisis before becoming involved.

Finally, as with FDI, private capital does not flow to all countries equally. Indeed, the share of flows to low- and middle-income countries (excluding the top 12)
has increased over time (Schmukler and Zoido-Lobatón 2001), implying that many hazard-prone developing countries have yet to benefit from potential risk-spreading tools available via financial integration.

**Labor Mobility**

Increased labor mobility, the third aspect of globalization, allows affected people a radical and socially ambiguous way of coping with disasters. Mobility provides a potential mechanism for spreading risk geographically via the transfer of remittances across borders. As the World Bank (2002:11) states, “geographic factors make it unlikely that capital flows and trade will eliminate the economic rationale for migration. Too many parts of the developing world have poor institutions and infrastructure that will not attract production; at the same time, some of the existing production networks in the North are too deeply rooted to move.” Thus, labor mobility looks set to remain as a potentially significant way of reducing sensitivity to natural hazards. However, there are potential costs in terms of loss of skills to the economy.

In the case of Bangladesh, for instance, flows of external remittances provide a significant source of foreign exchange and have played an important role post-disaster. A relaxation of restrictions on out-migration, including professionals such as doctors in government hospitals and medical colleges, was one of the measures adopted in Bangladesh in response to the economic crisis associated with the 1974 floods and famine. Evidence from the 1998 flood again suggests that remittances can increase sharply during times of crisis, rising by 11.9 percent (in U.S. dollar terms) year-on-year in 1998–99 to US$1.7 billion. Most migration is temporary, with migrants eventually expecting to return to Bangladesh (Ahmed and Chowdhury 1998), implying that family ties are strong.

The implications of migration for broad sensitivity to natural hazards are extremely complex in Sub-Saharan Africa, however, to the extent that migration is often to neighboring countries that may be simultaneously affected by drought, a problem of co-variant risk. In such circumstances, the impact depends on the nature of employment of migrants—for instance, agriculture, which is highly weather-sensitive, or mining (a major source of migrant employment in certain southern African countries), which is relatively insensitive to water shortages.

**Economic Growth**

Many of the countries that have grown fastest in recent decades have also increased their participation in world trade most rapidly (e.g., Dollar and Kraay 2000; Martin 2001). Although the direction of causality has yet to be established, developing countries included in the latest round of globalization, begun in the early 1980s, are experiencing rapid rates of growth and catching up with more developed countries; this mirrors patterns of convergence between OECD countries during earlier waves of globalization (World Bank 2002). This pattern basically reflects improved resource allocation, in part driven by increased competition as well as the removal of distortive tariffs and other barriers to trade that protect domestic production, and improved access to markets, with markets in turn expanding further as per capita incomes rise.

Economic growth is not necessarily synonymous with broader socioeconomic development, but higher per capita countries also tend to be among those countries classified as more developed. Certain broad generalizations can, in turn, be made about the sensitivity of economies at different stages of development—as defined in terms of complexity of intersectoral linkages, levels of physical and human capital, the scale of secondary and tertiary sectors, and so forth—to natural hazards.

In its earlier stages, development tends to alter, rather than reduce, vulnerability. Socioeconomic change associated with development can lead to the breakdown of traditional familial support, declines in traditional ways of life and associated coping measures, and the increased occupation of more hazardous land, a process in part associated with urbanization. The increased provision of infrastructure and services can also alter, even increase, vulnerability. The attempt to foster rapid growth may be reflected in standards of construction unable to withstand extreme conditions. This appears to have happened in Dominica in the 20 years prior to independence. Similarly, private sector investment in conditions of rapid technical and market change often sacrifices safety and durability to short-term profitability. These are conditions in which there may be increased vulnerability to hazards, especially those regarded as extremely unlikely to occur.
At a macroeconomic level, greater domestic integration increases the multiplier effects of adverse performance in a particular sector or regional economy. For example, droughts, floods, or hurricanes may impact the (larger) manufacturing as well as the agricultural and livestock sectors, particularly where initial growth of the manufacturing sector is based primarily around agro-processing. A notable exception is found in dual economies with largely self-contained extractive sectors that may be relatively insensitive at a macroeconomic level to climatic shocks. Examples are Botswana and Namibia.

As a country begins to develop, the structure of the financial sector is also likely to be more important in shaping the impact of a natural disaster. Intermediate economies typically have more developed economywide financial systems for the flow of funds, including small-scale private savings and transfers, which also diffuse impacts more widely. For example, in Zimbabwe following the 1991–92 drought, the transfer of remittances from urban to rural regions was facilitated by the well-articulated system for small savings. These transfers not only mitigated the impact of the drought in rural areas but also spread the effects more widely (Hicks 1993).

In the later stages of development, evidence suggests that the relative scale of the economic impacts of disasters is likely to decline again. In part, this reflects the smaller role of the particularly hazard-vulnerable agricultural sector in GDP, as a source of employment, a source of inputs to other sectors, and an end user. Other factors also contribute to reduced sensitivity, including typically higher investment in structural mitigation and proofing measures, generally higher building standards and maintenance practices, greater use of financial risk transfer mechanisms (see the FDI section below), fewer foreign exchange constraints, improved environmental management, and lower levels of poverty.

This framework for relating vulnerability to natural hazards to the growing complexity of the economy is a very broad brush. As the three country cases presented later suggest, a wide variety of other factors also determine sensitivity. For example, prevailing domestic macroeconomic and sectoral policies, deliberate changes in policy as a consequence of a disaster, the external policy environment, contemporaneous fluctuations in primary export and import prices, and the timing and nature of other adverse shocks can all be significant.

Nevertheless, the typology serves as a reminder that economic development and growth are not necessarily beneficial from a natural hazards perspective. Instead, natural hazards need to be taken into account in the determination of priorities, policies, and strategies, including those relating to integration into the global economy.

### Information Gathering and Exchange

Provision of various regional and global public goods—that is, goods and services that are nonrival in consumption (users do not reduce the supply available to others) and nonexcludable—can clearly benefit from improved transnational cooperation and integration. From the perspective of natural hazards, the greatest benefit has almost certainly been felt in the area of scientific monitoring and forecasting. This is most evident within meteorology and climatology (e.g. Lee and Davis 1998; IRI 2001)

There is a growth in regional and international cooperation in climatic forecasting for the three major climatic regions in Sub-Saharan Africa, for instance. This cooperation links into and has been considerably strengthened by research and monitoring of global climatic processes such as the El Niño Southern Oscillation phenomenon by international and industrialized country institutions such as WMO and NOAA, which have global monitoring networks and can draw on all the power of remote sensing technologies.

Regional cooperation on water resources, which relies more directly on the political cooperation of upper and lower riparian states without global partners, is less advanced. Recent disasters such as the devastating extreme 2000 floods in Mozambique and in southwestern Bangladesh have highlighted the considerable scope for progress on system modeling and flood forecasting.5

Another example of international cooperation is the global volcanology community. This is very close-knit, with a small team of international experts providing services around the world. The creation of this informal grouping has been greatly facilitated by improved communications and transportation. There are also major research benefits in the sense that the close cooperation has helped facilitate the building of a consolidated body of evidence from volcanoes around the world.
There are other areas where, from a natural hazard perspective, information gathering and exchange are also advantageous; these include crop research, the development of building codes, the development of strategies to control pollution, and the development of mechanisms for protecting the environment. For instance, in the case of the latter, as the World Bank (2002:17) notes, “some environmental issues, such as global warming, are intrinsically global. They require international cooperation, and the habit of such cooperation is easier in an integrated world.”

However, a constraint that is emerging as more information that could have important disaster reduction value is generated, is the capacity at country and regional levels to interpret and utilize these data. National meteorological systems provided as a public good, for example, have to compete for recurrent expenditure with all other areas of public spending. In all of the case studies undertaken by the authors, there was evidence of insufficient spending. This was reflected, for instance, in inadequate operation and maintenance of monitoring systems.6

Poverty and Vulnerability

Poor and socially disadvantaged groups are usually the most vulnerable to and affected by natural hazards, reflecting their social, cultural, economic, and political environment. Disasters, in turn, are a source of transient hardship and distress and a factor contributing to persistent poverty. At the household level, poverty is the single most important factor determining vulnerability, in part reflecting location of housing (e.g., on floodplains, riverbanks, steep slopes, or contaminated land previously occupied by industrial facilities), primary types of occupation, and level of access to financial and other resources. The poverty-exacerbating nature of vulnerability is attributable not only to post-disaster-related damage, temporary loss of income-generating opportunities, and increased indebtedness, but also to deliberate risk-averting livelihood choices that poorer households may make. For example, poorer households may choose to forgo the potential benefits of higher-yielding crops in favor of more hazard-tolerant ones, implying more stable and secure but, in most years, lower earnings.

The Government of Bangladesh, for instance, identifies natural hazards as one of the factors eroding the income of the poor via crisis-related expenditure and reductions in income-earning capabilities. Furthermore, it recognizes that poverty alleviation cannot be achieved simply by increasing income, but instead requires a range of other measures, including the strengthening of local capacity to protect the poor against shocks (GoB 2002).

Obviously, to the extent that globalization and related economic growth reduce poverty, they may help reduce vulnerability. Globalization tends to encourage growth and creates new job opportunities, potentially allowing people to move to better jobs. According to the World Bank (2002), in the long run workers gain from integration, with wages growing twice as fast in the more globalized developing countries than in the less globalized ones and faster than in rich countries. However, a reduction in either poverty or vulnerability is not inevitable. Indeed, the World Bank (2002:1) states that although “global integration is already a powerful force for poverty reduction… it could be even more effective.” For example, skilled wages rise faster, implying that the education system needs to serve all levels of society in order to avoid increasing inequality.

In terms of vulnerability, economic growth and development may not solve problems of risk and vulnerability, as already noted. The declining importance of agriculture—potentially one of the most hazard-sensitive sectors—typically associated with globalization may reduce vulnerability, both directly and as those previously dependent on agriculture take advantage of increasing alternatives. Some 70 percent of the world’s poor and food-insecure people currently depend on agriculture for their incomes and food entitlements (FAO 2001). Enhanced opportunities for diversification of household income can also help spread risk. However, traditional coping mechanisms may be simultaneously disrupted. Within the domestic economy, increased competition emanating from globalization can also imply increased entry and exit of firms, at least in the shorter term, implying greater labor market turnover. This can increase sensitivity to natural hazards and other shocks, requiring efforts to ensure that adequate social protection programs are in place. As the World Bank (2002) notes, social protection may also be crucial in encouraging poor people to take the risks involved in entrepreneurship.
Those facing higher levels of risk, such as those emanating from natural hazards, may require particular encouragement and support in recasting behavior from that of risk minimization to profit maximization.

Globalization and associated growth in the manufacturing sector as well as cuts in agricultural tariffs also fuel urbanization. This process is often rapid and unplanned, by implication forcing poorer groups to live in more marginal and hazardous areas such as floodplains, riverbanks, steep slopes, and reclaimed land (IFRC 2002). Sensitive and carefully designed measures are required to help redress associated risks.

Meanwhile, the World Bank (2002) points out that in those countries left out of the globalization process—which contain some 2 billion people—many are facing declining incomes and rising poverty. Whether this is a direct consequence of the fact that they are not globalizers is not clear. However, the fact remains that a significant segment of the world’s population, located in these countries, may remain poor and thus particularly vulnerable to natural hazards, despite global trends toward increasing integration and growth.

**Food Security**

Food security is “a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO 2002a).

This emphasis on people’s access as the key to food security is a measure of the considerable progress made toward assuring food security at national and international levels that is partly a consequence of the liberalization of external trade and currency markets. Most, but not all, developing countries are now able to acquire additional food imports to respond to temporary deficits. This is in stark contrast to the situation that prevailed in the early 1970s. For example, Bangladesh, a low-income country with sometimes large, temporary additional import requirements, was unable to finance food imports in the famine crisis of 1974 and was further hampered by a U.S. embargo. Subsequently, its government responded to major disasters with a combination of making massive commercial purchases and seeking—usually successfully—large-scale food aid. Finally, the private sector was allowed to cover a large part of the deficit after the floods in 1998. Small open economies like Dominica, marginal to world and regional or global markets, face logistical but not access difficulties to food imports after a disaster. There are still important exceptions, however: countries like Malawi, which is currently experiencing a food crisis, that have difficulty in financing and organizing national food security.

It is well recognized within the considerable body of literature on food security that natural hazard events, in particular droughts, are one of the principal triggers of potential transitory food insecurity for particular segments of a population. In that light, it is relevant to consider the implications of globalization, particularly agricultural trade liberalization, for sensitivity to chronic and transitory food security.

Historically, agriculture has represented a special case, with various exceptions made for domestic support price schemes under successive GATT negotiations, as already noted. However, under the present WTO Agreement on Agriculture, it was agreed that WTO member countries, other than LDCs, should reduce barriers to market access and market-distorting forms of domestic support to agriculture. Developed countries have now implemented this agreement, while the implementation period for developing countries will conclude in 2004. However, there are concerns that liberalization may not result in enhanced food security, as reflected, for instance, in “a common thread through many proposals by developing countries that staple food crops should be exempted from limits on, or reductions in, support under WTO arrangements” (Roberts and others 2002: 40).

In theory, trade liberalization and associated movements in relative prices of different crops should trigger a supply response, with more rational allocation of resources. This may lead to an increase in aggregate agricultural production levels and net incomes. Such responses would be more likely to reduce chronic, poverty-related food insecurity. Furthermore, the supply response could be modified by various constraints relating to access to markets, agroclimatic factors, and the level and availability of assets (including land), skills, and credit. As the 2001 IFAD Rural Poverty Report (IFAD 2001) states, “under globalization, market access becomes increasingly important as only those who have it can exploit the new opportunities. Without market access,
the potential benefits of higher product prices and lower input prices are not transmitted to poor households. Remoteness also restricts access to information about new technologies and changing prices, leaving the poor unable to respond to changes in incentives."

Moreover, even if agricultural production does increase, this does not necessarily imply an improvement in food security. Any shifts between food and nonfood cash crops and between tradable and non-taxable can have implications for food security (FAO 2002b). Some people may lose their livelihoods as part of the restructuring process associated with both agricultural and broader liberalization, again with potentially negative chronic food security and related poverty implications. Increased exposure to competition and world price fluctuations in countries where agricultural industries were previously protected from import competition could also expose some farmers to transitory food insecurity. Oxfam (2000), for example, asks whether small-scale farmers can compete in a liberalized environment and whether there is a need to retain some level of protection. Farmers in developing countries also typically have even more limited access to futures markets and other risk management tools (although globalization could help improve access—see section on FDI). In addition, many have few financial reserves. The two factors combined leave farmers more exposed to sudden price fluctuations under more liberalized conditions, potentially restricting their productive capacity the following season (Roberts and others 2002).

Liberalization could cause increased short-run volatility in international grain markets, posing difficulties for importing low-income countries. This possibility was highlighted by the severe price spike in international wheat and coarse grain markets during 1995–96, when there was a rapid reduction in U.S. and other stocks to low levels. Food aid levels plummeted as well. They also coincided and were thought to be associated with the more liberal trade provisions of the 1995 U.S. Farm Bill (Konandreas 2000). These developments significantly increased, for example, the import costs for southern African countries of coping with the 1994–95 drought.

From the perspective of consumers, food security is to a large degree an issue of affordability, food insecurity is mainly associated with poverty, and cheaper imports can be beneficial (Thompson 1999). This is most unambiguously so for the rapidly growing numbers of poor urban consumers dependent almost entirely on market supply. If trade liberalization promotes economic growth and this, in turn, reduces levels of poverty, then this, too, can improve food security, again by increasing access of the poor to food.

In summary, the impact of trade liberalization on food security has been broadly positive at a global level. But the short-term consequences of liberalization are less clear. Food security continues to be a highly country-specific issue, in part depending on the nature and scale of agriculture and the significance of the sector as a form of employment. There will be both winners and losers, and impacts on food security are likely to vary between groups—for instance, between small-scale and commercial farmers and between farmers, rural nonfarm producers, and urban consumers.

In terms of implications for sensitivity to natural hazards, the impacts are, again, likely to vary between countries. From a consumer’s perspective, increased access to world markets could dampen disaster-related food deficits resulting from reduced domestic production. To the extent that globalization more generally facilitates the spread of risk associated with a decline in production, it is also positive.

Environment

Finally, concerns have also been expressed about the impact of globalization on the environment. Environmental degradation, both via greenhouse gas emissions and physical destruction, has implications for the scale, frequency, and extent of the impact of natural hazards. There is clear evidence that a number of countries are becoming increasingly vulnerable to natural phenomena as a consequence of environmental degradation, particularly deforestation, and increased cultivation and occupation of marginal lands. Deforestation has disrupted watersheds, leading to more severe droughts and floods. It has also resulted in the siltation of riverbeds, deltas, bays, and gulfs, again increasing the incidence of flooding. Meanwhile, impacts of changes in the composition of the atmosphere on the frequency
and intensity of climatic hazards are predicted to vary significantly between regions and subregions but there are expectations of more extreme weather variability, with associated increases in the incidence of droughts and floods, as well as sea level rises, in many parts of the world.

Globalization is widely considered to be a cause of environmental degradation, as illustrated in the quote from the Sienna Declaration cited earlier. In discussing the impact of FDI more specifically, a recent WWF-UK report states that “the past decade has … seen all major trends of environmental degradation accelerate—for example, greenhouse gas emissions, deforestation, loss of biodiversity. Such patterns of environmental damage have been driven by increased economic activity, to which FDI is an increasingly significant contributor” (Mabey and McNally 1998:3). However, there is also a counter argument that globalization does not necessarily directly exacerbate this process. Regarding deforestation, for instance, growth is often associated with reductions in forest area, most obviously where there is a timber export sector and land is being cleared for export-oriented production. However, the World Bank (2002) argues that particularly high rates of deforestation in some countries may not be the direct result of globalization so much as they are domestic factors. In discussing the more general argument that intensification of competition creates a potential for a “race to the bottom” and “pollution havens,” with governments perhaps trying to attain a competitive advantage by lowering their environmental standards, the World Bank (2002) also argues that available evidence suggests that this is not happening. Evidently, the costs imposed by environmental regulation are small relative to other considerations, and so their impact upon location decisions between rich and poor countries is minimal. The WWF-UK report refutes this, however, arguing that studies on which such statements are based “have had serious flaws, and an excessive focus on site-specific environmental impacts and emissions of a few industrial pollutants” (Mabey and McNally 1998:3). The report continues on to present “ample empirical evidence that resource and pollution-intensive industries do have a locational preference for, and an influence in creating, areas of low environmental standards” (Mabey and McNally 1998:3).

**Implications of Natural Hazards for Globalization**

Risk in various forms can have potential implications for the pace and nature of globalization, whether related to such factors as exchange rate instability or natural hazards. This section considers the role of the latter in determining the extent to which countries are integrated into the global economy and, in addition, are able to reap the potential benefits of that integration.

It is beyond the scope of this paper to undertake an empirical examination of factors determining differences in levels of global integration across countries or, in particular, to explore the linkages between disasters, growth, and patterns of globalization. Nevertheless, natural hazards could be another factor preventing the growth benefits of globalization from being achieved and, as discussed in further detailed below, in some cases even inhibiting the pace of integration itself. As the World Bank (2002: 5) states, “while the new globalizers are beginning to catch up, much of the rest of the developing world—with about 2 billion people—is becoming marginalized. Their aggregate growth rate was actually negative in the 1990s” (World Bank 2002: 5).

**Disasters, Growth, and Globalization**

The direction of causality between high growth and increasing participation in world trade has yet to be established. Nevertheless, it is widely observed that these two phenomena are correlated. More open, export-oriented economies are also more successful in attracting FDI (see later discussion). Again, each affects the other, but empirical analysis by Singh and Jun (1995) suggests that, on balance, openness encourages FDI rather than vice versa.

Increasing integration can occur without raising growth, but this surely implies that some of the major potential benefits of globalization—specifically, growth and related rising per capita income and, hopefully, a reduction in the level of poverty—will be lost. As Roberts and others (2002: 36) comment, “whether such ready movement does in fact occur depends on whether there is sufficient growth in the economy and alternative activities available to absorb resources displaced through trade liberalization,” in turn requiring flexible economic structures and sufficient demand for labor and other
resources to enable relatively rapid and substantial adjustment between activities.

Natural hazards could be another factor preventing the growth benefits of globalization from being achieved or, depending on the direction of causality, preventing increasing integration into the global economy by restricting growth.

Theories of development place considerable emphasis on the roles of capital and labor growth and productivity (e.g., Solow 1956; Denison 1967). Yet capital assets and other resources can be severely affected by natural disasters while productivity of undamaged capital and labor can be reduced by associated disruptions to infrastructure and markets. There could be significant direct capital losses (except in the case of drought). All major types of disaster, including drought, can also disrupt longer-term investment plans, both in physical and human capital. Governments may divert resources from planned investments to fund the relief and rehabilitation process. Disaster-related external assistance may be extended, but this may not be entirely additional, instead in part replacing development aid flows due to some combination of limited donor resources and local counterpart funding constraints. Other damage may be covered by insurance policies, but there are still opportunity costs relating to the payment of premiums. And some destroyed assets may not be replaced at all. In the shorter term, disasters and hazard risk can also contribute to economic instability and an atmosphere of uncertainty. It is widely observed, for instance, that disasters typically cause a short-term decline in GDP (see, e.g., Benson and Clay 2000; Charvériat 2000). Yet, research indicates that “macroeconomic stability is essential for high and sustainable rates of growth” (Ames and others 2001: 2). Thus, hazard risks combined with post-disaster related economic instability could be a significant disincentive to potential new investment.

A recent research study undertaken by the International Institute for Applied Systems Analysis (IIASA), in conjunction with the World Bank, confirms the potentially adverse long-term impact of natural disasters. The study sought to model the potential implications of natural disasters for future longer-term growth in three countries (Freeman and others 2001). The analysis focused on their potential impact on capital accumulation and quantified the implications, in particular for growth objectives, of various policy options in dealing with disasters. The study concluded that potential catastrophes should be incorporated into economic projections for three reasons: high opportunity costs associated with the diversion of scarce financial resources into post-disaster relief and reconstruction efforts; the havoc imposed by natural disasters on the already-complicated budgetary planning process; and the high demands that natural disasters place on international aid resources, diverting resources away from development uses.

There has been little empirical analysis of historical evidence on the impact of disasters on long-term growth, however. Benson (forthcoming) attempts to address this gap, examining comparative cross-sectional data on real GDP performance for 115 countries over a 34-year period from 1960–93. The study involved regression analysis and an analysis of relative movements in GDP. Rather than attempting a ranking of countries according to natural hazard risk, countries were simply divided into two categories—higher and lower risk—based on evidence on the incidence of disasters over the period of analysis. Analysis was undertaken both including and excluding Sub-Saharan African countries.

The results suggest that, over the past three decades, more hazard-prone low-income countries may have experienced a relatively slower rate of economic growth than their less hazard-prone counterparts who had similar levels of per capita income at the beginning of the period. However, there are fundamental problems in undertaking such analysis, in particular, that less hazard-prone countries were already typically among the set of more developed countries by the latter half of the twentieth century. Thus, the results may simply reflect Quah’s (1993) broader finding of polarization toward a bi-modal distribution, with countries beginning at the higher end of the income distribution likely to experience further increases in income. Moreover, a wide range of other factors also could determine rates of growth.

Nevertheless, the basic findings, if tentative, are supported by anecdotal evidence from individual countries, with poorer regions of a country also often more hazard-prone. Charvériat (2000), for instance, notes that communities in the northeast part of Brazil and coastal areas of Ecuador and Peru are typically poorer than less hazard-prone parts of the same countries. In part, such patterns reflect differences in opportunities.
for growth and development as determined by the relative risks faced by different communities. For example, farmers in more hazard-prone regions of Vietnam have been less well placed to take advantage of higher-yielding but less hazard-tolerant strains of rice, while more hazard-prone regions of the country have also received disproportionately small shares in private and public investment and external assistance (Benson 1997b).

Disaster-related budgetary pressures can also affect a country’s ability to participate in the global economy in other ways. In the aftermath of a disaster, a government will be obliged to meet potential budgetary pressures by increasing the money supply, drawing down foreign-exchange reserves, or increasing levels of domestic and/or external borrowing. Foreign borrowing can result in an appreciation of the exchange rate, reducing the price of imports and increasing that of exports. In addition, it can place future strains on the economy via higher debt-servicing costs. Natural disasters can also trigger an increase in interest rates charged on new external loans by increasing the risk premia associated with a country’s assets. Another option, the rundown of foreign-exchange reserves, is limited by the size of those reserves and entails an appreciation in the exchange rate, with possible associated risks of capital flight and a balance-of-payments crisis (Fischer and Easterly 1990).

**External Trade**

Many of the nonglobalizers are Sub-Saharan African countries and former Soviet republics, with exports focused on a narrow range of primary commodities, making them highly vulnerable to commodity price shocks (World Bank 2002). Their failure to diversify exports has been attributed to various factors, including poor policies (e.g., product standards and regulations, health and safety regulations, labor and environmental regulations), weak institutions, poor access to information, corrupt governance, limited technology, poor infrastructure, adverse geography (e.g., being landlocked, greater proneness to disease), and climate (Brahmbhatt 1998; World Bank 2002). Natural disasters may certainly have contributed to some of these constraints, in particular poor infrastructure. Natural disasters could, in fact, be viewed as an aspect of adverse geography, although the literature on globalization and the role of geographical factors in determining growth (e.g., Acemoglu and others 2000; Diamond 1998; Gallup and Sach 1999) tends to ignore them.

In terms of the role of infrastructure, Limão and Venables (2001) argue that, now that recent liberalizations have reduced artificial trade barriers, the effective rate of protection provided by transport costs is considerably higher than that provided by tariffs for many countries. They estimate the elasticity of trade flows with respect to transport costs at approximately 2.5—that is, halving transport costs would increase the volume of trade by a factor of five, or improving infrastructure from the 75th percentile to the 50th would increase the volume of trade by 50 percent. Transport costs depend on various factors including distance, administrative barriers, and the structure of the shipping industry. However, Limão and Venables (2001) find that infrastructure is also quantitatively important. For example, their results suggest that improving one’s own and transit countries’ (that is, countries through which merchandise travels before reaching its destination) infrastructure from the 25th percentile to the 75th percentile would overcome approximately two-thirds of the disadvantage associated with being landlocked.

Natural hazard events can destroy transport and other infrastructure. Disasters can also result in the diversification of resources away from new investment and into reconstruction, ultimately constraining efforts to upgrade transportation systems. Efforts to improve the efficiency and economy of the Philippines’ transportation systems, for instance, are reported to have been only moderately successful because most available resources were redirected in response to calamities, with knock-on implications for the pace of improvement of rural transport linkages (Philippine NLUC 1992). Moreover, disaster-related repairs can disrupt general maintenance operations. In Dominica, unanticipated expenditure on the repair of roads following landslides and storm damage crowds out routine maintenance virtually every year. Obviously, difficult tradeoffs often have to be made between the quality and quantity of infrastructure. Construction of less hazard-resistant roads could facilitate more rapid progress in improving market access.
However, the vulnerability implications of alternative levels of overall quality and strength (e.g., adequate drainage of roads) should also be explored, as hazards could damage and disrupt transport networks.

As already noted, natural hazards can also affect patterns and levels of trade in terms of securing markets. If frequent occurrences affect reliability of supply, then exporting countries could face difficulties in securing and maintaining trading partners.

**FDI**

The literature suggests that location and related international transport costs, the cost of market access through exports, the quality of infrastructure, possession of raw materials, labor costs, government incentives, political risk, per capita income, the degree of industrialization, and the size of domestic markets are all important in attracting FDI (Shatz and Venables 2000; Singh and Jun 1995; Wheeler and Mody 1992). Generally, more open, export-orientated economies are more successful in attracting FDI, as discussed above. Indeed, the relative size of the export sector is the strongest explanatory variable for FDI flows according to Singh and Jun’s (1995) analysis.

There is little hard evidence reported in the literature that natural hazards and related risk have influenced decisions on FDI directly, although there is some anecdotal evidence that this may occur (see section on Dominica below). Again, however, natural hazards and risk may have had some indirect impact on factors determining flows. One of the more interesting lines of investigation from a natural hazards perspective concerns the importance of a hospitable business environment. Singh and Jun (1995) examined this using an operation risk index based on a range of factors including balance of payments performance, economic growth, and infrastructure—all factors that natural disasters can affect. Their results suggest that the business climate is important for high-FDI countries but not for low-FDI countries.

Singh and Jun’s (1995) analysis also suggests that, using a broad-based qualitative political risk index, political stability may be important for high-FDI countries, where the stakes are higher, but not for low-FDI countries. They suggest that this reflects the fact that direct investment is likely to be capital-intensive and so requires a relatively more substantive and long-term commitment. Disasters are another form of instability also potentially threatening the long-term viability of an investment. Singh and Jun’s analysis (1995) additionally indicates that work days lost in production, in turn affecting production efficiency, is more significant for low-FDI counties, presumably reflecting the fact that production in these countries is likely to be more labor-intensive. Frequent or extended natural hazard events (e.g., flooding) could affect days worked.

There is some evidence that FDI is spatially more clustered than other forms of production, possibly due to certain incentives to locate close to other firms, including spillovers created by research and development; the development of local networks of suppliers of specialized goods and services; the development of local labor markets with appropriate specialized skills; and confidence, and the possibility that firms “herd,” with firms uncertain whether a particular country is a good location for FDI but willing to take the success of one firm as a signal of underlying national characteristics (Shatz and Venables 2000). Again, this herding tendency could discriminate against more hazard-prone countries if potential investors are aware of the possibility of natural hazards, if perceived risk—whether or not correctly so—is high, and if few others have been seen to invest there.

**Country Experiences in an Era of Globalization**

The general discussion presented earlier indicates that the linkages between globalization and vulnerability to natural hazards are complex and that no easily sustainable generalizations about impacts and effects can be made. Our three most recent case studies suggest that there are important, distinct country type situations. There are therefore likely to be country-specific strategies for disaster reduction. These themes are illustrated by a more detailed account of changing vulnerability for the small, relatively less complex open economy of Dominica. These developments are shown to be country-specific by contrasting developments in Bangladesh and Malawi.
Dominica

Dominica is an important case with which to begin to explore forms of vulnerability and the role of a country’s relationship with the global economy, as it exemplifies the type of experience faced by many small island economies. Such economies face a number of special disadvantages associated with their size, insularity, and remoteness (Briguglio 1995), making them highly sensitive to economic shocks of any form, including natural hazards. They are often perceived as some of the countries most vulnerable to natural hazards in the world. Small island economies are typically very open, with relatively limited internal forward and backward linkages, instead relying on international trade to market their outputs and as a source of capital goods, inputs to domestic production, and consumables. Such countries often strive to find niche export markets, concentrating the focus of economic activity accordingly. In so doing, many have secured some form of preferential trade agreement; however, the WTO process is currently eroding the protected status of many such exports.

In the case of Dominica, the level of imports stood at equivalent to 65 percent and exports to 25 percent of GDP in 1997, making the economy very open. Since the 1950s the economy has been reliant on a single export crop, bananas, for which it had preferential access to E.U. markets. Agriculture and agro-processing combined continue to be the major productive sector, although agriculture’s share in GDP declined from an average of 37 percent in 1977–78 to 20 percent in 1997–98. Other private sector activity remains small, although experiencing some growth since the mid 1970s. Dominica consistently runs a deficit on its external visible trade account, in part met through tourism earnings. Tourism’s contribution to GDP remains relatively low, but by the late 1990s accounted for an estimated 35 percent of external earnings (GoCD 2000).

Dominica is susceptible to a wide range of natural hazards. The most common, probable, and historically significant are tropical storms and hurricanes. The majority of the population and infrastructure are located along the coast, making Dominica particularly vulnerable to strong winds and high seas. There has been a sequence of disasters since 1978: Hurricanes David and Frederick in 1979, Allen in 1980, Hugo in 1989, the cumulative impact of three tropical storms in 1995, and Hurricane Lenny in 1999. Hurricane David, a Category 4 hurricane, directly hit the island and was extremely devastating, with severe environmental and demographic consequences.

There are significant geophysical hazards, as the island is geologically extremely young and almost completely volcanic in origin. There was a volcanic alert in 1998–99, the first since 1880, and scientists indicate a continuing, significant risk of an extreme event in the twenty-first century with a related possibility of earthquakes.

High rainfall in the mountainous, noncoastal areas of the island also results in frequent localized flooding and landslides, which are recurrent annual problems. Other potential hazards include drought, storm surges, bush fires, and tsunamis.

Agricultural Exports

Over time there have been significant shifts in the nature of Dominica’s vulnerability to natural hazards relating to changing levels of development and capital investment in the island and changes in economic activity. Shifts in the structure and composition of economic activity, in turn, have been closely tied to international political and economic interests and export market opportunities. In the past, as a colonial plantation cum subsistence economy, the impact of natural hazards was heavily dependent on the sensitivity of the prevailing export crop and the associated structure of production and marketing. In the first half of the 20th century, limes were the dominant crop. Limes are relatively insensitive to high winds. They were also grown on plantations owned by U.K.-based companies able to absorb intermittent losses and associated recovery costs occurring in just one of their countries of operation. This production and marketing structure effectively acted as a geographical risk-spreading mechanism. Meanwhile, small-scale farmers produced much of the island’s staple foods, roots and tubers, known locally as “ground provisions.”

From the 1950s banana exports, largely grown by smallholders, progressively displaced plantation agriculture. Bananas were exported to the United Kingdom under a preferential access agreement that continued after the United Kingdom joined the E.U. in 1974. This (structural) change increased the overall vulnerability of
the agricultural sector to natural hazards. Bananas are highly sensitive to damage from winds of 40 or more miles per hour, so that even the fringe impacts of less severe tropical storms can cause serious damage. Smallholders are also less able to bear heavy losses, because of their lack of assets and access to credit. These changes in the type and structure of production implied increased vulnerability.

Hurricane David in 1979, followed rapidly the next year by Hurricanes Frederick and Allen, demonstrated that sensitivity, causing severe damage to banana plantings. However, this sequence of disasters also led to an increase in the dominance of bananas, which offered a fast, low-investment means of restoring agricultural livelihoods in an assured export market. Recovery only takes 9 to 12 months, even where plantings are totally devastated. In contrast, production of copra, the other major commercial crop, took three to four years to recover.

The rapid recovery in export production after Hurricane Hugo in 1989 again demonstrated the resilience of the banana economy. In this case, the compulsory WINCROP banana crop insurance scheme, jointly introduced in 1987–88 by the banana marketing boards of the four Windward Islands (Dominica, Grenada, St. Lucia, and St. Vincent), also effectively encouraged replanting of bananas by offering partial financial protection in the event of a disaster. The E.U., through STABEX, had also provided the government of Dominica and other associate countries with a partial compensation mechanism for fluctuations in agricultural export earnings. So public finances partially dependent on export earnings were also buffered from the effects of disaster shock.

The dominance of bananas in Dominica and similar monocrop agricultural sectors in other small island economies perhaps exemplifies a progressive adaptation to a specific external economic environment, a process often accompanied by institutional innovation. The structural change from estates to smaller commercial holdings in Dominica resulted in production with relatively low overheads and fixed capital at risk. WINCROP—an outcome of regional cooperation—helps to manage the risks associated with an extremely hazard-sensitive crop. Extension, credit, and marketing arrangements are also closely tied to the specifics of this crop and its production structure. These institutional arrangements become embedded within the economy, and it may be extremely difficult for agriculture to adjust to globalization and less assured markets of uncertain profitability. From the mid-1990s, however, external factors resulted in declining banana production, with falling real prices and the loss of guaranteed preferential access to the European market. The WTO ruling against the E.U. is expected to eliminate preferences on bananas within the decade (Schiff 2002; Roberts and others 2002).

Dominica's future, more diversified, agricultural sector will be more sensitive to natural hazards and other risks. Other subsectors lack the risk-spreading arrangements associated with bananas, namely, WINCROP, STABEX, and a protected export market. Some tree crops also lack bananas' capacity for rapid post-disaster recovery. Thus, a future disaster could be associated with a higher rate of default on agricultural loans, increased demand for credit, and slower post-disaster recovery. This difference in risks has been an obstacle in encouraging agricultural diversification, despite it being official policy throughout the twentieth century and despite the intense efforts of government and NGOs to foster a broader economy.

In parallel with shifts within the agricultural sector, the wider economy's sensitivity to natural hazards has also changed over the past two decades as a consequence of changes in its composition accelerated by the WTO process. Agriculture's share of GDP halved to only 19 percent between 1977 and 1997, while manufacturing, tourism, and international financial services—the latter two by definition closely linked to the global economy—grew and increased their share of GDP. These latter service sectors are less sensitive to all except a catastrophic event, such as Hurricane David. Indeed, if the country's recent expansion into international financial services proves successful, then a further decline in broad economic vulnerability can be anticipated in the future. The international financial services sector has little reliance on physical infrastructure and is not linked in any way to the domestic economy (including domestic financial markets).

**Infrastructure**

Development of the island's key infrastructure, in particular harbors and the road system, provides another example of changing long-term sensitivity to natural...
hazards, in this case linked to Dominica’s broad level of development rather than the structure and composition of economic activity. Until the 1950s, sea transport was the primary form of intra-island movement, implying rapid recovery of the transport network in the aftermath of a storm. The more recent emergence of roads as the major form of transport, coupled with the mountainous terrain, which forces much of the road network along the coastline, has effectively exacerbated the direct and indirect impacts of storms. The scale of physical damage to the transport network has become far more severe and the pace of recovery much slower, with knock-on implications for the movement of goods and people. Increasing vulnerability of this nature can have extreme consequences in a country like Dominica, with limited capital resources relative to demand and thus a tendency to select least-cost solutions in meeting infrastructure needs; this vulnerability was exposed by the catastrophic Hurricane David.

Similar issues relating to limited capital investment resources have been encountered in constructing port facilities. The expansion of external trade, including highly bulky, refrigerated bananas, and the growth of cruise ship tourism required more extensive port facilities. Funding such investment at apparently acceptable rates of return, however, resulted in compromises in the storm proofing of new facilities in the 1970s and 1980s, with costly consequences. The 1979 and 1989 hurricanes created severe disruption and high repair costs.

**Changing Risks**

Gradual changes in the character of sensitivity of an economy to natural hazards, such as those described in the case of Dominica, can go unrecognized. Informants for the Dominica study suggested that the impact of Hurricane David in 1979 was in part so severe because the island had not experienced a hurricane for 40 years. Thus everyone was caught unaware. Though Dominica had not experienced a Category 4 hurricane since 1930, however, meteorological records show that there had, in fact, been a number of less severe storms. Instead, it would appear that the changing nature of and apparent rise in the island’s vulnerability to storms had not fully impinged on perceptions of risk. Similarly, there was little awareness in government, in the business community, or among the general public of volcano-seismic hazard until the alert in 1998–99. Awareness was heightened by media coverage of the ongoing eruption in nearby Montserrat and the arrival of some Montserratian evacuees.

Hurricane David in 1979 caused severe damage to the whole of the island’s capital stock. The population loss from out-migration was not up for 20 years. There was a related unquantified loss of human capital. Tourism, largely uninsured and dependent on local finance, did not recover for almost a decade. Following this catastrophe and subsequent severe storms, there has been piecemeal public investment in more hazard-proof infrastructure and private sector investment in industrial and service sector construction. Nevertheless, Hurricane Lenny in 1999 caused considerable temporary disruption and damage to the infrastructure of ports and roads. The pattern of aggregate macroeconomic impacts of disasters in terms of GDP and sectoral product (as shown in figure 1.1) suggests that vulnerability to climatic hazards had peaked around independence, just prior to Hurricane David. Subsequently the impact of storms has become relatively less severe due to disaster-proofing and structural changes in the economy. Public finances were also in disarray and there were problems of governance in 1979.

What were the longer-term development consequences? Dominica probably lost ground to other islands such as Barbados and St. Lucia on the post-independence tourist and financial services front. It also became a source of less skilled labor to neighboring French and Anglophone islands. It is among the poorest of the smaller Caribbean economies.

There are two important qualifications to the conclusion that vulnerability to natural hazards is declining. First, there are the uncertain consequences of climatic change. Second, the scale of the threat posed by volcano-seismic hazard is increasing. Economic and population growth have been increasingly concentrated in the capital, Roseau, which is in a relatively high-risk zone in the event of a severe eruption. Scientific monitoring has indicated a significant risk of an extreme event in the twenty-first century. This is a real dilemma. Land use planning and regulation could reduce volcanic hazard risk. However, in a highly competitive regional economy, with many islands seeking FDI in tourism and trying to develop financial services—Dominica’s own potential growth sectors—investors could easily be
discouraged if attention is drawn to Dominica’s hazard risks.

**Bangladesh**

Bangladesh is one of the most disaster-prone countries in the world. Most of its large, densely settled population of 130 million people is at significant risk to more than one form of natural hazard, making it a test case for international efforts in disaster reduction.

**Hazards and Major Disasters**

In terms of area and number of people directly affected, impact on economic activity, and damage and destruction of assets, the types of hazard that have been most important since independence in 1971 are: exceptionally widespread riverine flooding; severe tropical cyclones and associated coastal storm surges; river bank erosion; and drought. According to official estimates, 139,000 people were killed during the 1991 cyclone, and 31 million directly affected by the 1998 floods. Rapid-onset flash flooding, tornadoes, and landslides are frequent causes of more localized but intense human suffering and loss. Severe earthquakes have been rare but are a potentially catastrophic hazard. Around 45 percent of Bangladesh’s population is classified as poor and some 23 percent live in absolute poverty. These people are typically living and working in areas most at risk from natural hazards. At the household level, poverty is still the single most important factor determining vulnerability.

River flooding: there have been 4 extreme events in 30 years—1974, 1987, 1988, and 1998. Other very high floods in 1976 and 1984, though less severe when measured in terms of height, maximum flow, and proportion of area inundated, caused widespread suffering and losses and elicited an international emergency response. The implied annual risk of an extreme flood is a high 10–20 percent.

Over 100 years at least 14 very severe storms have impacted Bangladesh with an implied annual risk level of more than 10 percent. The worst storms accompanied by storm surges have been catastrophic. The cyclone of...
November 1970 resulted in 300,000–500,000 fatalities; that of May 1991 caused 125,000 deaths.

These events in particular have created a worldwide perception of Bangladesh as one of the world’s most disaster-prone countries, described in the mid-1970s by the U.S. Secretary of State as a nonviable “basket case.”

Economic Performance

Since independence, the Bangladesh economy has achieved impressive rates of growth. It achieved rapid recovery in the late 1970s following the devastating effects of natural hazards, war, and famine in 1970–75; and an average real annual growth rate in GDP of 4.2 percent in the 1980s, rising to 5 percent during the 1990s. Average annual per capita GDP growth rose from an average of 1.7 percent in the 1980s to 3.3 percent in the 1990s, reflecting higher GDP growth and declining population growth. At the same time, there has been a change in the structural composition of the economy: agriculture’s share of GDP has declined while the industrial and service sectors have expanded, resulting in a sharp shift in the composition of the country’s exports. Exports also rose as a share of GDP from 4 percent in 1980 to 14 percent in 2000, while imports rose from 16 percent to 19 percent. A gradual process of structural adjustment and trade liberalization alongside more disciplined monetary management in the 1990s resulted in single-digit inflation and an annual current account deficit below 2.5 percent of GDP. The reforms have also helped increase private sector development and foreign direct investment. Fiscal policy has not been so successful, however. There have been large fiscal deficits, a low tax-to-GDP-ratio, and relatively poor quality spending.

A simple assessment of the sensitivity of Bangladesh’s economic performance to major disasters in terms of fluctuations in GDP and rates of growth in agricultural and nonagricultural-sector product as shown in figure 1.2 highlights some key issues:

- From 1965–75 there was extreme volatility in the largely agricultural economy, clearly linked to catastrophic natural disasters.
- With the notable exception of the most recent 1998 floods, major disasters have resulted in a downturn in the agricultural sector’s annual rate of growth.
- The impact on the nonagricultural sector looks much less significant, but longer-term impacts of disasters are not reflected in inter-yearly fluctuations: if resources are diverted from productive investment to disaster response, the pace and nature of development will be adversely affected.

**Figure 1.2 Bangladesh—real annual fluctuations in GDP, agricultural, and nonagricultural sector product, 1965–2000**

Source: Benson and Clay 2002.
• The sensitivity of agricultural and non-agricultural components of GDP to natural hazards appears to be declining over time, suggesting greater resilience.

**Declining Vulnerability?**

Part of Bangladesh’s greater resilience is attributable to structural change in the agricultural sector. Following the 1987 and 1988 floods, the relaxation of restrictions on private agricultural investment and imports of equipment was associated with a rapid expansion of much-lower-risk dry-winter-season rice and, to a much lesser extent, wheat. Since then, highly flood-prone deep water rice and jute have gradually been displaced, and after the 1998 floods, the main monsoon-season transplanted rice finally lost its primacy as the dominant crop.

As Bangladesh approached self-sufficiency in rice, the national staple, internal prices displayed reduced seasonal volatility and moved closer to import-parity price levels with liberalization of the grain import trade. After the floods of 1998 large-scale private sector imports covered the greater part of the temporary food gap, limiting pressures on prices and the public finances (del Ninno and others 2001).

Urbanization is rapidly creating large urban and peri-urban zones, including the capital Dhaka, which is quickly becoming a sprawling, minimally planned megacity with weak, overstretched infrastructure. Since the severe floods of the late 1980s, there has been a de facto shift in flood control investment and protections from rural and agricultural to urban and industrial. This seems to have been at least partially successful. The 1998 floods, of longer duration and with higher river levels than those of 1987 or 1988, did not severely affect the greater Dhaka metropolitan area or the secondary towns that received enhanced protection.

Export-oriented garment manufacture has been the primary motor of export growth as inward FDI, and some local industrialists exploited the trading niche offered by the MFA. In 1998, there was some disruption to supply and export chains, but the industry, largely based in less-flood-affected urban zones, proved resilient. However, for the future it appears that risks have altered rather than been reduced. The industries’ markets are far from assured and could be lost if there were a major disaster-related disruption. Manufacturing in coastal Chittagong is exposed to possible cyclones and storm surges, such as that of 1991. There are other risks such as fire, outside the scope of this study. Finally, building standards in facilities with a short life expectancy in this and most other new industrial developments largely ignore seismic hazard.

The third major development has been in the financial system, with some important innovations in financial services. After the chaotic hyperinflation that contributed to the famine of 1974, the government has managed to maintain relative financial stability through periods following disasters. Labor migration has played an important role in financing economic growth through the remittances of incomes. For example, remittances increased by 18 percent in the financial year that includes the 1998 floods. Bangladesh has been a leader in developing microfinance for the rural and more recently urban poor. Microfinance played a significant although limited role in enabling the poor to cope with the costs of the 1998 floods (del Ninno and others 2001). Importantly, the (central) Bangladesh Bank was also able to protect this critically important financial sector through massive refinancing.

The economic impacts do not reflect or parallel the severity of disasters in terms of loss of life and human tragedy. Large, unprotected rural and peri-urban populations, increasing rapidly due to unchecked population growth, remain vulnerable to riverine flooding. The exploitation of ground water for irrigation and human use has had its downside in the widespread problem of arsenic poisoning. Urban flood protection on a flood plain with high population densities poses severe drainage and pollution problems that require unprecedented improvements in management of the urban environment, requiring technical sophistication, investment and operational funds, and improvements in governance. Any major failure in urban flood protection would have massive costs in human and economic terms.

Positively, the construction of a system of cyclone shelters and improvement in storm warnings appear to have reduced the considerable risks to human life posed by tropical cyclones and accompanying storm surges from the Bay of Bengal. But this threat to large populations settled in high-risk coastal areas is by no means eliminated. There are still considerable institutional problems concerning control and access to shelters.
and the maintenance of coastal embankments that could mitigate the impacts of storm surges (IFRC 2002).

There are also two major sources of increased hazard vulnerability. First, the scale of the threat posed by seismic hazard is increasing. Rapid economic and population growth has been increasingly concentrated in the capital, Dhaka, and other urban centers that would be devastated by a major earthquake. Bangladesh is part of a high-risk region. Minor tremors are common and one of the most extreme events, the 1897 earthquake (8.8 on the Richter scale), had its epicenter in the nearby Shillong Plateau of the Indian State of Megalaya. Local assessments provide only highly tentative risk zoning within the country in map form because of the inadequacies of available data (Ali and Choudhury 2001).

Second, there are the uncertain consequences of environmental change, some recorded and others only so far identified as possible consequences of global climatic change. Human activity in Bangladesh and the immediate region may also be altering the likelihood of specific events as well as the associated effects.

Malawi

Since 1990 Malawi and other countries in Southern Africa seem to have experienced increased economic volatility that is linked with climatic variability (figure 1.3). This apparent increase in vulnerability has occurred during a period of many complex interacting developments in the region—some positive, such as the political reintegration of South Africa and the end to conflict in Mozambique, and others negative, such as the increasing problems of governance in Malawi, Zambia, and Zimbabwe and the HIV/AIDS epidemic, which are undermining the capacity to cope with shocks. These developments are highlighted by what has happened in Malawi.

Malawi, small and landlocked, recorded a population of 10.8 million in 2000. It is one of the poorest countries in Africa, with per capita GDP of US$170 in 2000. Health and social indicators are also among the lowest and declining: average life expectancy fell from 43 in 1996 to 37 in 2000 and Malawi is one of the countries most

Figure 1.3 Malawi—real annual fluctuations in GDP and agricultural, industrial, and services sector product, 1980–98

![Graph showing year-on-year percentage change in GDP and sector products from 1980 to 1998.](image)

Source: Clay and others 2003.
severely affected by HIV/AIDS. The loss of human capital and ill health among the economically active population are likely making the country more disaster-prone.

Malawi still has a largely rural economy, with 89 percent of the economically active population classified as rural. Agriculture accounted for some 40 percent of GDP in 2000, compared with 44 percent in 1980. Its share in GDP was declining but rose again in the 1990s, with industrial stagnation and contraction in the public service sectors. Export earnings are dominated by agricultural commodities, largely rainfed tobacco, making the economy sensitive to climatic variability and commodity price shocks.

Although there has been internal liberalization and a reduction in tariffs, the Malawi economy has become relatively less open over time. Exports have declined as a proportion of GDP from 28 percent in 1980 to 24 percent in 2000. Imports fell from 43 percent to 40 percent.

The main source of natural hazard vulnerability in Malawi is climatic variability. The major food staple, rainfed maize, accounting for more than 70 percent of energy intake, is extremely sensitive not only to drought or low rainfall, but to erratic rainfall within the growing season and, as the 2001 season showed, to abnormally high rainfall. There were only two clearly defined droughts in the twentieth century: the drought that caused a famine in 1949 and another that reduced maize production by 60 percent in 1991–92. However, relatively unfavorable conditions such as the widely reduced and erratic rainfall of 1993–94, extremely high rainfall as in 2001, or locally erratic rainfall as in 2002 pose increased food security and wider economic threats to a more vulnerable, less resilient economy.

Riverine flooding is an annual, relatively predictable hazard in the lower-population-density southern districts. Even in 2001, flooding did not have a widespread, catastrophic impact. There are apparently no other significant forms of natural hazard.

Sources of Increasing Vulnerability

A variety of influences has interacted to make the economy and society increasingly sensitive to climatic variability, not just the extreme “drought” events that are widely but simplistically perceived to impact Southern Africa. These influences have included some relating to changes in the external economic environment.

Agricultural development has stalled. Demographic growth averaging 2.6 percent in the 1990s has placed increasing pressure on agricultural systems that are an adaptation of shifting cultivation. Declines in soil fertility on holdings of shrinking size are barely compensated for by increased fertilizer use and other technical improvements that could increase productivity. Liberalization of internal agricultural markets has been relatively unsuccessful. The private sector has been unable to take on and efficiently handle functions that were previously the responsibility of parastatals, especially the agricultural marketing agency, ADMARC.

Conflict in neighboring Mozambique, and more recently, the process of reintegration of South Africa into the regional polity and economy have contributed to the failure of industrialization or service subsectors such as tourism to provide alternative sources of economic growth and employment.

The relative deindustrialization of Malawi shows the need for caution in assuming that regional development will be consistent with broader global trends. The disruption to external communication because of the war in Mozambique from the late 1970s increased transport costs, reducing export parity and raising import parity prices. This favored low-input, self-provisioning rather than export-oriented agriculture, encouraging the development of small-scale manufacturing enterprises, although growth was checked by limited domestic demand. However, the more recent progressive reintegration of South Africa into the regional economy has exposed small-scale manufacture and processing of tradables in Malawi and other “front line states” to a larger-scale, absolutely more efficient competitor. This adjustment effect amounts to de-industrialization, making the economy more exposed to agricultural sector volatility.

Malawi and some neighboring countries have been beset with problems of conflict, governance, and weak public financial management. These have amplified the difficulties caused by economic sensitivity to climatic variability. In 1991–92, the economic effects of drought were intensified by the effects of an influx of displaced people from Mozambique and the halt of bilateral assistance other than emergency relief. In 1994, the effects
of an agricultural-sector shock were compounded by weak fiscal and monetary management in a hyperinflationary situation. In 2000–01, there was donor pressure to reduce parastatal debt by reducing grain stocks. Then, as the food security situation deteriorated after the 2001 harvest, there was donor reluctance to respond to aid requests from the government, which could not account for revenues from its grain marketing operations, including local currencies generated by the sale of aid commodities. It is debatable whether the food security crisis that emerged in Malawi during 2001–02 should be categorized as the consequence of a natural hazard. Rather, climatic variability over two years within a range that had not previously been regarded as disastrously destabilizing contributed to a crisis in an economy made more vulnerable by structural changes and other developments that had reduced resilience at all levels. Unfortunately, the onset of an El Niño event in 2002, with its prospect of low and erratic rainfall, increases the risk of a third, disastrous year.

**Conclusions**

The sensitivity of an economy to natural hazards is determined by a complex, dynamic set of developmental, economic, and societal influences, including powerful external factors. The evidence presented in this paper suggests that increasing integration of economies around the world has significant implications for the nature of sensitivity to natural hazards. In particular, globalization has expanded opportunities for risk diversification and, for nations as a whole, it seems to be a positive trend. However, the question of whether globalization ultimately exacerbates or reduces sensitivity, both of particular economies and individual households, is complicated and depends on specific country circumstances, including public action to reduce vulnerability.

On the downside, globalization exposes countries to new forms of risk, possibly exacerbating the impact of natural hazards when different risk events coincide. Writing about financial globalization specifically, Schmukler and Zoido-Lobatón (2001:18) ask: “Is the link between globalization, crises, and contagion important enough to outweigh the benefits of globalization?” They caution that “in open economies, countries are subject to the reaction of both domestic and international markets, which can trigger fundamental-based or self-fulfilling crises.” However, they also note that, although the evidence on the impact of globalization is still very scarce, any observed increase in volatility seems to occur in the short run only, and that volatility decreases in the long term. Indeed, they conclude that there is scope for much deeper globalization, given its potential benefits, but that efforts are also required to seek to minimize associated risks.

This paper draws upon a limited number of in-depth country studies. As such, its findings should be considered as hypotheses for wider testing. Nevertheless, it is striking to note that most of the findings confirm and elaborate conclusions and policy presumptions in the wider globalization literature, which focuses on market-related and financial risks rather than natural hazards.

From a natural hazards perspective, an important objective is to seek ways of using global markets to improve risk management. There may be opportunities in the area of smaller enterprises and consumers, as well as in larger corporations and government. The Montserrat case (box 1.1) and potentially similar risks to narrowly based, locally important, and highly successful financial institutions in Dominica and other smaller, hazard-sensitive economies imply an urgent need to spread risks. Increasing global integration may create opportunities for spreading risks borne by micro-finance institutions as well. Exploiting such opportunities may require international encouragement and support.

In the context of the December 2002 ProVention conference highlighting urban disaster reduction, the country studies suggest that different types of natural hazard risk have distinctive economic dynamics. Developing countries responding more successfully to the opportunities and challenges of globalization are showing some reduction in relative sensitivity (measured as a proportion of GDP or sector product) to more predictable, relatively frequent, climatic hazards such as tropical cyclones in Dominica and extreme riverine flooding in Bangladesh. An important qualification to such trends is the highly uncertain implication of global climatic change for the frequency and severity of natural hazards.

In contrast, the exposure to geophysical hazards appears to be rising. Rapid urbanization—a process
often associated with globalization—creates large concentrations of people and physical capital, mostly built with little regard for natural hazards either in choice of location or design. These geophysical hazards typically have relatively low but difficult-to-determine risks, less than 1 percent annually for an extreme earthquake in Bangladesh or a disastrous volcanic event in Dominica. Globally, such increasing hazard exposure implies rising disaster-related losses.

The most worrying position is that of countries and even regions that are apparently being marginalized in the process of globalization. In re-examining the consequences of climatic variability in Southern Africa after almost a decade, there is substantial evidence of greater vulnerability to natural hazards. Natural hazards, in turn, may well be at least indirect compounding factors limiting opportunities and potential for globalization for certain economies, although the precise nature of their role is complicated and, again, often highly country-specific.

For those countries that are becoming more closely integrated into the global economy, risks emanating from all types of natural hazards should be considered in assessing the impacts of reductions in trade barriers and related changes in the composition of economic activity, security of livelihoods, and measures taken to help protect vulnerable groups. More broadly, risks emanating from natural hazards should be taken into account in the determination of priorities, policies, and strategies, with enhancement of resilience to natural hazards as one of the basic objectives of government in hazard-prone countries. It should also be recognized that successful risk management requires not only technical, structural solutions, but also a broader awareness of underlying socioeconomic causes and appropriate action.

Notes


2. Previous studies have included Benson and Clay (1998) on the economic consequences of drought in Sub-Saharan Africa with a more detailed country study of Zimbabwe (Benson 1998). More recently the economic effects of climatic variability in southern Africa have been reinvestigated in a study focusing more specifically on Malawi (Clay and others 2003). There have been three studies of small island economies: Dominica (Benson and Clay 2001), Fiji (Benson 1997a) and Montserrat (Clay and others 1999) as well as three studies for larger Asian economies, Bangladesh (Benson and Clay 2002), Philippines (Benson 1997c) and Vietnam (Benson 1997b).

3. For example, an official assessment of the costs of the 1998 Bangladesh floods aggregated capital losses, such as damage to infrastructure with rice crop losses. An assessment of Hurricane Lenny in 1999 in Dominica included costs of physical damage and reductions in income from small-scale fisheries.

4. International companies operating in the sugar sector are attempting to take climatic forecasts into account in this way. Private communication from Dr. M. Evans. See also Bohn, forthcoming.

5. In both these cases flows from outside the country contributed to the disaster, and these flows were influenced by the actions of public agencies responsible for water management. There were inadequate warnings to those responsible for flood response in the affected areas. A contributory factor was insufficiently precise understanding of system dynamics and links to exceptionally high rainfall (Akter Hossain 2001; Christie and Hanlon 2001).

6. For example, there was underfunding of volcano-seismic monitoring in Dominica in 1998 at the outset of a volcanic emergency and no proper wave level monitoring even during Hurricane Lenny in 1999. Bangladesh has effectively been without a seismic monitoring system since the separation of Pakistan and India at Partition in 1947. The meteorological system in Malawi lost access in 1991 to its historical database of climatic information, impeding investigations for over a decade.

7. However, Roberts and others (2002) note that the rural non-farm sector has also been expanding and thus some labor released from farming may remain in rural areas.

8. Even had this analysis been undertaken, the literature on globalization indicates a number of analytical difficulties that arise in comparing relative integration across countries, implying that any findings would have been very approximate at best.

9. After Quah (1993), ratios of per capita income relative to the global average were discretized into intervals at 1/4, 1/2, 1 and 2. Annual one-step transition matrices were then estimated by averaging the observed one-year transitions over every year from 1960-61 to 1992-93. The one 33-step transition between 1960 and 1993 was also analyzed. Analysis was undertaken on the full data set and three subsets (more hazard-prone, more hazard-prone...
excluding Sub-Saharan African (SSA) and less hazard-prone countries).

10. A more sensitive ranking according to disaster impact is fraught with difficulties, relating in part to incomplete data.

11. In the Philippines, for instance, the 1990 earthquake and 1989–90 drought were reported to have contributed to a 6.7 percent increase in total external debt, and a 22.4 percent increase in debt from official creditors alone, in 1990 (Ernst and Young 1991). An examination of the impact of the mid-1980s drought on external borrowing in six countries in sub-Saharan Africa revealed that the growth rate in total debt stocks accelerated during the year of most severe drought in five of the countries (Benson and Clay 1998). The one exception, Zimbabwe, had been pursuing a deliberate long-term policy of debt reduction. Disasters can also create additional external debt pressures to the extent that they also destroy infrastructure and other assets funded with still-outstanding external loans.

12. Brahmbhatt (1998) also discusses the role of various structural factors in determining levels of international trade, including country size, factor endowment structure, geographical isolation, and the stage of development. Geographically large countries tend to undertake less trade, in part because of the typically greater diversity of domestic resources and a large home market, the latter implying some reaping of economies of scale even by producing for domestic consumption alone. Countries with a highly specialized structure of factor endowments, for example a relative abundance of natural resources such as oil, will tend to specialize in its production and export, while importing more of their other needs. Meanwhile, richer countries tend to devote a higher share of their output and consumption to services.


14. Singh and Jun (1995) report that empirical evidence on the importance of political stability reported by others is inconclusive, in part depending on how political stability is defined. It has been variously defined as the number of changes in government, internal armed attacks, riots and so forth.

15. See, for example, Atkins and others 2000; UNDRO 1990; and the authors’ case studies for Dominica (Benson and Clay 2001), Fiji (Benson 1997a) and Montserrat (Clay and others 1999).

16. Some 24 percent of the total population resided in the Roseau city area at the 1991 census (GoCD 1999).

17. The historical incidence since 1886 of tropical storms impacting directly on or passing very close to Dominica implies an annual risk of 17 percent of one or more Hurricane Category 1 or above and of 4 percent for Hurricane 4 or above.

Bibliography


Munich Re. 1999. “A Year, a Century, and a Millennium of Natural Catastrophes are all nearing their End.” Press release of December 20, 1999. Munich: Munich Re.


