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THE ECONOMIC IMPACT OF NATURAL DISASTERS IN VIET NAM

Charlotte Benson

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Preface

Figures on the 'cost' of natural disasters abound. Such figures are generated by, for example, governments as part of their relief appeals or by the insurance industry in counting its losses. However, they are typically based on only the direct, visible impacts of a disaster, such as damage to homes, hospitals, schools, factories, infrastructure and crops. Meanwhile, less easily quantifiable effects, such as the loss of personal belongings or jobs, widening trade or government budget deficits or the increasing scale and depth of poverty are typically ignored. Similarly, positive benefits of disasters – such as post-disaster construction booms or the opportunities disasters can present to upgrade machinery and equipment – are seldom reported.

From an economic, rather than financial, perspective, the impacts of disasters can be divided into three categories: 'direct' costs, 'indirect' costs and secondary effects (e.g., see Andersen, 1991; Bull, 1992; OECD, 1994; Otero and Marti, 1995). Direct costs relate to the physical damage to capital assets, including buildings, infrastructure, industrial plants, and inventories of finished, intermediate and raw materials, destroyed or damaged by the actual impact of a disaster. Crop production losses are sometimes also included in estimates of direct costs. Indirect costs refer to damage to the flow of goods and services including lower output from damaged or destroyed assets and infrastructure; loss of earnings due to damage to marketing infrastructure such as roads and ports and to lower effective demand; and the costs associated with the use of more expensive inputs following the destruction of cheaper usual sources of supply. They also include the costs in terms of both medical expenses and lost productivity arising from increased incidence of disease, injury and death.[1] Secondary effects concern both the short- and long-term impacts of a disaster on overall economic performance, such as deterioration in trade and government budget balances and increased indebtedness as well as the impact on the distribution of income or the scale and incidence of poverty. They can also include shifts in government monetary and fiscal policy to, for example, contain the effects of increased disaster-induced inflation or to finance additional government expenditure. Direct losses can therefore be roughly equated with stock losses whilst indirect costs and secondary effects both constitute flow losses.

Reflecting the difficulties in analysing economy-wide flow impacts and a preoccupation with the financial costs of disasters, most assessments of disasters concentrate on more easily measured direct 'stock' losses, as already noted. Yet such data are often of little value in informing broader policy-makers about the nature and

[1] For example, droughts can result in an increased incidence of water-borne diseases such as diarrhoea, skin diseases and trachoma whilst floods and tropical cyclones can lead to outbreaks of water problems such as diarrhoea and cholera.

scale of natural hazard risks faced by an economy. Similarly, they say little about the role of various underlying factors in either exacerbating or minimising the economic impact of disasters such as the size and structure of the economy, including the relative importance of various sectors and inter-sectoral forward and backward linkages; the sectors affected by the disaster; economic performance in the period prior to the disaster; the international economic climate; the frequency and magnitude of other recent disasters; or government economic policy. Current disaster damage assessments are therefore of only limited value in helping to design appropriate mitigation, or risk management, strategies to minimise the adverse economic consequences of disasters. Indeed, the mere attempt to measure the economic impacts of disasters in a single figure reflects a naive conception of the economic impact of disasters. Moreover, by potentially considerably under-estimating the true economic impacts of disasters, they may have resulted less than economically-optimal levels of investment in disaster prevention and mitigation measures.

This paper forms part of a wider investigatory study on the economic impacts of natural disasters in south-east Asia and the Pacific.[2] The paper is one of three case studies, examining recent experiences in Fiji, the Philippines and Viet Nam. Each case study is based on a two-week country visit in late 1995 or early 1996 and subsequent desk-based analysis.

The case studies focus on the disaggregated impacts of natural disasters on various sectors of each economy and the role of government policy. They assess the factors determining the extent of vulnerability of each economy and whether and why that vulnerability has changed over time. They also consider how the economic consequences of disasters could be mitigated and the degree of attention currently attached to natural disasters in economic policy-making and planning. The case studies also briefly touch on the relationship between economic poverty and disaster vulnerability.

The case studies are necessarily exploratory given the relatively limited research to date on the economic impacts of natural disasters. This implies that some lines of investigation may reveal relatively little. However, these conclusions are findings in themselves.

[2] The study explicitly excludes pestilence, environmental and technological hazards as well as civil disturbances.

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Charlotte Benson
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Abstract

There has been relatively little research on the economic impacts of natural disasters to date. This paper reports findings of a study of Viet Nam which is intended as a contribution in filling that gap. Findings include the following:

- Natural disasters have important economic impacts in Viet Nam, particularly in terms of development opportunities foregone and, more recently, in exacerbating regional and occupational income inequalities and reinforcing poverty.

- Various factors suggest that economic hazard vulnerability could increase further in the future, both at the macroeconomic and household level.

- Viet Nam remains an essentially agrarian economy to date. Natural disasters have clear adverse implications for the agricultural sector, both damaging crops and agricultural infrastructure and also influencing cropping decisions. Reflecting household adaptive mechanisms to minimise the impacts of natural hazards, more hazard vulnerable areas achieve lower levels of production even in disaster-free years.

- The significant financial scale of the country's structural flood protection requirements raises serious concerns about the future funding of disaster-related activities following a decline in the state's control over extensive resources, particularly labour, with the transformation from a centrally planned to a market economy.

- Overall government and donor policy and strategy documents have typically failed to identify natural disasters as a major threat to sustainable economic growth or as an obstacle to development. Although economic prospects appear favourable, future growth is by no means guaranteed. Instead, sustainable, equitable growth will partly depend on efforts to address the broader macroeconomic impacts of natural disasters.

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Acronyms

ADB	Asian Development Bank
BOOT	Build, Own Operate and Transfer
CCFSC&DP	Central Committee for Flood, Storm Control and Disaster Preparedness
CMEA	Council for Mutual Economic Assistance
DMU	Disaster Management Information and Training Unit
ESAF	Enhanced Structural Adjustment Facility
ESCAP	Economic and Social Commission for Asia and the Pacific (UN)
FAO	Food and Agriculture Organisation (UN)
GDP	Gross Domestic Product
GSO	General Statistical Office (Viet Nam)
IFI	International Financial Institutions
IMF	International Monetary Fund
MSK	Medvedev - Sponheuer Kárník
NGO	Non-Governmental Organisation
PIP	Public Investment Programme
SCF-UK	Save the Children Fund (United Kingdom)
UK	United Kingdom
UNDP	United Nations Development Programme
UNESCO	United Nations Education, Social and Culture Organisation
VLSS	Viet Nam Living Standards Survey
VNC IDNDR	Viet Nam National Committee for the International Decade for Natural Disaster Reduction
VND	Vietnamese Dong
WFP	World Food Programme (UN)

1. Introduction

Viet Nam has a land area of 330,000 km^2 and an extensive coastline measuring some 3,260 km. The country had an estimated population of 72.5m in 1994, of which 40% was under 15 years of age. The population is forecast to increase by 2.1% per annum between 1993 and 2000 whilst the urban population alone, which stood at 20% of the total in 1993, is expected to grow by 3.5% (UNDP, 1996). Viet Nam is a low income economy, ranking 128th out of 130 countries in terms of per capita income in 1993 (World Bank, 1995b). However, it is also categorised as a medium human development country, ranking 121st out of 174 countries on the UNDP human development index (UNDP, 1996).[3] For administrative purposes the country was divided into 53 officially designated units, comprised of 3 cities and 50 provinces until 1997.[4] For statistical purposes, these units, are grouped into seven major economic regions (Figure 1.1).[5]

Viet Nam experiences a range of natural hazards, particularly floods and typhoons. In response to these threats, the country has undertaken structural flood mitigation measures for centuries and the concept of disaster prevention or mitigation is far from new. It currently has some 5,000 km of river dykes and 3,000 km of sea dykes, stretching along most of its coastline. Moreover, there is a deep understanding of the country's extensive water resources and the risks as well as the opportunities that it presents. At the household level, coping strategies to deal with the impacts of often annual floods are similarly well developed as much of the population lives in areas susceptible to flooding.

Despite such adaptations in behaviour, between 1980 and 1994 some 6,862 lives were officially lost as a consequence of floods and typhoons alone. Meanwhile, average

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[3] Such contradictions are illustrated by its health indicators, with infant and life expectancy rates similar to those of a middle-income country but high child malnutrition rates comparable to those for Bangladesh (ADB, 1995).

[4] This administrative division was begun in 1989 and completed in 1992. The code numbers shown in Figure 1.1 and used for the classification of the 53 units are based on Viet Nam General Statistical Office (GSO) regulations issued in June 1993. The three cities are numbered from 01 to 03 and the provinces from 10 to 59. However, in practice this system of classification is not very commonly applied as yet. In November 1996, the Viet Nam National Assembly decided on further divisions splitting 8 existing provinces into 15 new ones and creating a new city. These changes will come into effect in 1997, further complicating the task of compiling provincial time-series data.

[5] For example, as in the Statistical Yearbook of the Viet Nam General Statistical Office (GSO).

Figure 1.1: Economic Regions of Viet Nam

PROVINCES

NORTH

North Mountain and Midlands

10	Ha Giang
11	Cao Bang
12	Lai Chau
13	Lao Cai
14	Tuyen Quang
15	Lang Son
16	Bac Thai
17	Yen Bai
18	Son La
19	Vinh Phu
20	Quang Ninh
21	Ha Bac
24	Hoa Binh

Red River Delta

01	Hanoi
03	Hai Phong
22	Ha Tay
23	Hai Hung
25	Nam Ha
26	Thai Binh
28	Ninh Binh

Central Coast of Northland

27	Thanh Hoa
29	Nghe An
30	Ha Tinh
31	Quang Binh
32	Quang Tri
33	Thua Thien-Hue

SOUTH

Central Coast of Southland

34	Quang Nam-Da Nang
35	Quang Ngai
37	Binh Dinh
39	Phu Yen
41	Khanh Hoa
44	Ninh Thuan
46	Binh Thuan

Central Highlands

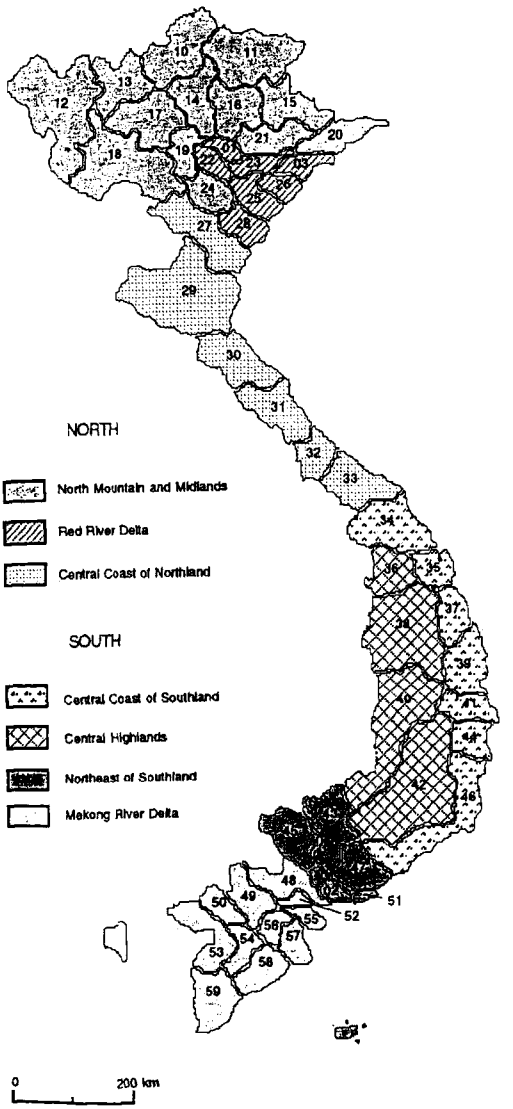
36	Kon Tum
38	Gia Lai
40	Dac Lac
42	Lam Dong

Northeast of Southland

02	Ho Chi Minh City
43	Song Be
45	Tay Ninh
47	Dong Nai
51	Ba Ria-Vung Tau

Mekong River Delta

48	Long An
49	Dong Thap
50	An Giang
52	Tien Giang
53	Kien Giang
54	Can Tho
55	Ben Tre
56	Vinh Long
57	Tra Vinh
58	Soc Trang
59	Minh Hai



Source: Nestor (1995)

annual flood losses in, for example, the Red River Delta and along the Central Coast are estimated at US$130m. A reputedly more rigorous study even estimated average annual flood damage costs in the area protected by the dyke around Hanoi alone at well over US$50m (UNDHA et al., 1994).

However, there are certain difficulties in measuring the wider economic impacts of natural disasters because typhoons and floods occur almost annually, even if with varying degrees of severity in different regions of the country.[6] At the national level, their impact should be measured more in terms of the overall constraints they pose to potential growth, both directly via reduced gross domestic product (GDP) and indirectly via lost investment opportunities, than in terms of inter-annual fluctuations in output. Even this is far from straightforward as central elements of the economy have been developed around its water resources, particularly in the Red and Mekong River Deltas. Most significantly, historically intensive wet-rice cultivation in the flood-prone low-lying river deltas and coastal lands has been the country's primary economic activity. Indeed, water is apparently viewed as a 'national treasure' because of its importance in rice cultivation.[7] Water resources have also formed a central part of the country's transportation network and are increasingly being exploited for power generation.[8] The exploitation of the country's water resources to an economic advantage thus suggests that it is helpful to distinguish between hazard-prone and hazard-vulnerable regions or households as the two are not synonymous. Hazard-prone regions or households may experience regular natural hazards but are not necessarily highly vulnerable to such risks because they may have adjusted behaviour – for example, in terms of the design and materials of buildings or the nature of productive activities – to accommodate them.

Nevertheless, the fact remains that natural hazards do have adverse economic implications which could be mitigated by certain adjustments in socio-economic

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[6] On a more practical note, there are also certain data and methodological limitations in examining the economic impacts of natural disasters. Methodological limitations relate to the substantive structural economic reforms, the collapse of the Council for Mutual Economic Assistance (CMEA) and the more recent removal of the US-led trade and aid embargo, all of which have had major economic ramifications often over-riding any discernible impact of natural disasters on, for example, overall rates of growth or investment. Any analysis is further hampered by the paucity of long run, reliable data, a shift in reporting practices and restricted access to much data. For example, annual data is sometimes published before the end of a year and is not subsequently revised, as in the case of GNP data for 1996 which was published in September of that year. Both data constraints and structural economic changes have obscured a valid quantitative analysis.

[7] Personal communication with T. Jeggle, December 1996.

[8] For example, some 36% of goods (in volume terms) were moved by inland water transport in 1992, providing the least expensive, if slowest, means of transport (Viet Nam SPC, 1995).

policies. Furthermore, the incidence and severity of natural disasters is reported to be increasing as a consequence of environmental degradation and this trend could continue as rapid industrialisation and urbanisation place further pressures on the country's resource base. Rapid economic growth and diversification also implies an increase in physical assets and a change in the relative importance of various economic activities, again altering the scale and nature of vulnerability as well as the extent of availability of adequate financial resources to maintain disaster prevention and mitigation measures. Meanwhile, the varying extent of hazard vulnerability between different occupational groups and regions could imply widening income and geographical disparities, at least in the shorter term, as some are better placed than others to take advantage of the new opportunities presented as a consequence of the economic reform process.

These various factors demand an integrated development strategy, incorporating natural hazard risk assessment and management into broader economic policy. This fundamental need has been partly recognised by the government and international community. For example, the United Nations Development Programme (UNDP) Resident Representative speaking on the occasion of the International Day of Natural Disaster Reduction, 12 October 1994, stated that 'it is now generally accepted that most floods are not only natural phenomena, but consequences of human activities such as inappropriate natural resources management and poor planning of economic development'. Thus, for example, the same speaker stated that 'UNDP is... adopting an integrated approach to natural disaster mitigation that links it with environmental degradation, socio-economic development, and institutional capacity building' (Viet Nam CCFSC and VNC IDNDR, 1994: 10). However, further progress is needed.

2. Natural hazards in Viet Nam

Viet Nam is located in both the monsoon tropical zone of South-East Asia and the typhoon area of the South China Sea. The country experiences a hot rainy season between May and October with a cold dry season during the rest of the year. Annual rainfall totals some 2,000mm of which around 80% falls in the summer months. This causes rivers to flow full and potentially results in flooding in the river deltas. The north of the country experiences a greater proportion of annual rainfall in the dry season than the remainder of the country.

The Viet Nam National Committee for the International Decade for Natural Disaster Reduction (VNCIDNDR) ranks the relative frequency of floods and typhoons as high, droughts as medium and earthquakes as low. More specifically, the country can be divided into five regions in terms of hazard risk (Table 2.1).

Table 2.1 Hazard Zones of Viet Nam[9]

Disaster zone	*Principle water hazards*
Northern Mountain	Flash floods; landslides
Red River Delta	Monsoon river floods; typhoons
Central Provinces	Typhoon storms; flash floods
Central Highlands	Flash floods; landslides
Mekong Delta	River flooding from upstream; typhoons

Source: DMU, 1996.

Floods Over 70% of Viet Nam's population is vulnerable to riverine, flash and seawater floods. Flooding occurs almost every year, particularly in the central provinces, as frequent typhoons typically coincide with the monsoon whilst the country's terrain, which includes steep high mountains and narrow low plains, implies a potentially high risk of flash flooding. The two main delta regions also experience annual riverine flooding. Major floods of the Red River are reported to have occurred

[9] The ADB (1994) climatic change study focuses on the Red River and Mekong Deltas as being the two most hazard-vulnerable regions of the country. Presumably, this partly reflects their higher shares in total population.

in about 100 years between 977 and 1990 – equivalent to one every 10 years. Heavy rainfall combined with poor drainage facilities can also cause urban flooding.[10]

Defining floods as events where discharges are three or more times the annual mean level, Pho and Tuan (1994) calculate that Viet Nam experiences some 3 to 8 floods every year. The flood season is typically earlier in the north than the south of the country, with flooding most probable in July and August in the Red River Delta and in late September or early October in the Mekong Delta. Since 1900, severe floods inundating of over 300,000 hectares of land have occurred in 1913, 1915 and 1945, 1971 and 1986 (ESCAP, 1990; ADB, 1994) whilst the 1994 floods in the Mekong River Delta were the worst this century (Viet Nam MWR et al., 1994).[11] Less extensive but nevertheless major floods have occurred in other years, with 30 major floods between 1979 and 1989 alone (ESCAP, 1991).

Flood flows in the Red River and Mekong Deltas have also tended to increase over the past century, largely as a consequence of deforestation. In addition, gradual deforestation has increased the rapidity of flash flooding in the central provinces and northern mountainous areas. For example, in the district of Duc Tho (Ha Tinh Province) heavy rain in the adjacent mountains resulted in floods within 10 hours in 1990 compared to after 36 hours some 25 years earlier (Gupta, 1990). Meanwhile, increased siltation has implied that the water levels of rivers in the Red River system are now several metres above ground level, although contained within embankments making all areas of the delta potentially vulnerable to flooding (Viet Nam MWR and UNDP, 1992). Expansion of the irrigation network has also contributed to the flooding of new, previously unaffected areas.

Typhoons The country experiences an average of four to six typhoons annually although in some years there are none and in others considerably more (Viet Nam MWR et al., 1994).[12] According to Viet Nam MWR and UNDP (1992), some 62% of the population and 44% of the country are frequently affected by typhoons, with 250 persons killed annually. The worst typhoons this century are reported to have

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[10] For example, particularly heavy rains in November 1984 in Hanoi resulted in flooding in parts of the city which did not finally subside for two or three weeks (SWECO, 1993).

[11] Other recent large floods in the Mekong Delta occurred in 1966, 1978, 1984 and 1991 (Viet Nam MWR et al., 1994).

[12] For example, ESCAP (1984) reports that Viet Nam experienced a total of 13, 12 and 11 storms respectively in 1960, 1973 and 1978. Viet Nam MOSTE (1994) also reports 12 typhoons in 1993 as well as 10 in 1980, 1984, 1985 and 1989 whilst Pho and Tuan (1994) report more than 10 storms in 1909, 1910, 1929 and 1964 as well. However, none of these sources provide a definition of 'typhoon' or 'storm'.

occurred in 1904, killing and injuring 5,000 people; and in 1985, leaving 900 dead (VNCIDNDR, 1994).

The occurrence of typhoons is highly seasonal, typically affecting the north of the country between June and September, the centre from August to October and the south between October and December. However, typhoons are predominantly concentrated on the centre and north of the country, particularly the central provinces between Thanh Hoa to Quang Nam Da Nang. The south experiences fewer typhoons, about once every five years.[13]

As already noted, typhoons are typically associated with heavy rainfall, as well as very strong winds. Each typhoon accounts for some 10–15%, and sometimes even more, of annual rainfall and may cause flash floods, landslides and mudflows as well as erosion and siltation of river beds.[14] Typhoons can also cause sea level rises of up to 3.5 metres (Lustig, 1992), resulting in seawater intrusion as dykes are overtopped or breached. Particular salination problems may be encountered if the seawater intrusion does not coincide with riverine flooding which washes the seawater out, potentially preventing agricultural production on unirrigated land and destroying drinking water sources for several years. In fact the likelihood of such events may be increasing as seasonal rates of river flows are gradually altered by deforestation, destruction of natural coastal protection, such as that provided by mangroves, and reservoir construction. For example, the DMU (1996) reports that 'for the first time in the recent history of Viet Nam, severe water shortages and seawater intrusion into groundwater and up the coastal estuaries have been recorded' (p.4).

Droughts By drought, this study refers to infrequent rather than regular annual water shortages during the dry season.[15] The incidence of drought appears to have risen over

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[13] The ADB (1994) reports an apparent southward shift in the relative incidence of typhoons in 1961–90 as compared to 1921–50: between the two periods, the proportion of total typhoons landing in the Red River Delta and the Northeast coastal areas fell from 36 to 26% whilst the share landing in the north-central and south-central coasts increased from 34 to 38% and from 30 to 36% respectively.

[14] One typhoon striking Hoa Duyet in 1985 was reported to be accompanied by total rainfall of 1,680mm (Viet Nam MOSTE, 1994).

[15] Droughts are notoriously difficult to define and there is an extensive literature on their definition. For example, Glantz (1987) in a widely cited review, distinguishes meteorological, hydrological, agricultural and social drought. A general working definition of meteorological drought is 'a reduction in rainfall supply compared with a specified average condition over some specified period' (Hulme, 1995). Hydrological droughts pertain to the impacts of a reduction in precipitation on surface or sub-surface water shortfall and so may lag behind periods of agricultural or meteorological drought (Wilhite, 1993). Meteorological drought may result in hydrological conditions that have a direct impact on non-agricultural production, including

the past century, largely as a consequence of deforestation and thus increased rates of river run-off and lower water absorption. Over the past 20-odd years, droughts have occurred in 1976, 1979, 1981, 1983, 1986 and 1993 (ADB, 1994; Pho and Tuan, 1994). The 1993 drought alone, which occurred in Central Viet Nam spreading from Nghe An to Binh Dinh provinces and lasting some 8 months, damaged some 150,000 ha of rice and resulted in losses in the order of 200bn VND. Droughts can also be associated with problems of increased salination to the extent that they effectively facilitate the propagation of the tidal influence further upstream.

Earthquakes Seismic records for Viet Nam only date back to the beginning of the twentieth century. Since then, Viet Nam has experienced three earthquakes of magnitude 7+ on the Richter scale, in 1935, 1942 and 1983. A number of much smaller tremors are also experienced every year. Seismic activity is greatest in the north-east although there are fault lines across much of the country, particularly along the coastline. One estimate suggests that Viet Nam can expect an earthquake of magnitude 6.6–7 on the Richter scale every 80 years and of magnitude 5.6–6 every 9 years (Xuyen, 1994).[16] According to the Institute of Geophysics, Hanoi itself could experience an earthquake of maximum 6.1–6.5 on the Richter scale or 8 on the Modified Mercalli scale. An earthquake macrozonation exercise is currently being undertaken on various scales to provide more systematic and accurate information on seismic risks. Particularly detailed mapping is being undertaken for some of the potentially more economically-vulnerable areas, in part to provide factual evidence upon which appropriate building codes can be based (see section 7.4).

Global warming There is considerable concern about the impact of global warming particularly in terms of the implications of a rise in sea level as a large part of the country is low lying, including much of the most fertile and densely-populated lands of the Red River and Mekong Deltas. Some 58% of the Red River Delta is less than 2 metres and 72% less than 3 metres above sea level. Similarly, much of the Mekong Delta's total area of 2.8m ha is less than 2 metres above sea level whilst other parts

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hydroelectric power generation, and on human water supply. Agricultural drought is defined as a reduction in moisture availability below the optimum level required by a crop during different stages of its growth cycle and resulting in impaired growth and reduced yields. Social drought relates to the impact of drought on human activities, including indirect as well as direct impacts. However, it is difficult to establish a common basis for comparing different droughts because 'drought' as a concept is derived from recognition of impacts. Furthermore, the relationship between rainfall variability and impacts depends on the specifics of a particular agro-ecological zone or economy.

[16] Earthquakes of maximum magnitude 6.6–7 can occur in the fault zones of Lai Chau-Dien Bien, Ma river and Son La; and of maximum magnitude 6.1–6.5 in the fault zones of the Red-Chay river, Ca river and west of the East Sea. Lesser earthquakes with more frequent return periods can also be expected in other parts of the country.

of the coastline are also low lying. Thus even relatively modest sea level rises will have profound implications, involving loss of land, increased vulnerability to flooding, accelerated coastal and river mouth erosion, increased salination and changes in the physical characteristics of tidal rivers (Granich et al., 1993). Global mean sea level is forecast to increase 32–64 cm by 2100, with a rise of 45 cm most likely. This constitutes a two- to three-fold increase in the rate of change in sea level along Viet Nam's coast, implying a rise in the sea level of up to 64 cm in Hondau, North Viet Nam, the station with the longest and most reliable record on historical sea levels (ibid.). Assuming a somewhat faster rise of 70cm by 2070, as well as no sedimentation which could partly counteract submersion, the Asian Development Bank (ADB) estimated that without commensurate increases in the height of sea dykes, some 0.5m ha in the Red River Delta and 1.5–2m ha in the Mekong River Delta would face greater risk of tidal flooding whilst 2.2–2.5m ha would be affected by seawater intrusion, with profound economic and social consequences (see Box 2.1) (ADB, 1994).

Projections of climate change are uncertain because of the limited understanding of the effects of the change in the composition of the atmosphere. Nevertheless, there are also concerns about the natural hazard implications of global warming. The frequency and intensity of typhoons may increase as a consequence, also implying a rise in the incidence of flooding (Granich et al., 1993; ADB, 1994; Viet Nam MOSTE, 1995b).[17] The impacts on rainfall are less clear although rainfall will most likely increase slightly, particularly in the north of the country. However, the level of moisture could decline due to increased evaporation as the temperature increases, in turn increasing the frequency of drought.

Environmental degradation and natural hazards The incidence and severity of most types of natural hazard are integrally linked with prevailing environmental conditions. It is widely acknowledged that Viet Nam has entered a period of rapid economic growth with an already depleted environmental whilst its expanding population continues to exert additional pressure on the country's natural resources. There is therefore particular concern to ensure that the process of rapid development and industrialisation is not achieved through, nor results in, further environmental degradation (e.g., Viet Nam Government, 1995b; UNDP, 1995c). Ultimately, increased industrial and manufacturing job opportunities in rural areas are, indeed, expected to relieve some of the pressure on environmental resources. However, in the shorter term, the environmental trend remains negative, with implications for the incidence and severity of natural hazards (UNDP, 1995a).

[17] It has been suggested that Viet Nam is already experiencing an increasing number of typhoons and floods as a consequence of global warming (for example, Viet Nam MOSTE, 1994; Pho and Tuan, 1994). However, the evidence is inconclusive to date.

Box 2.1 Vulnerability assessment of a rise in sea level

A vulnerability assessment has been undertaken with the financial support of the Netherlands Government to assess the impact of a rise in sea level for Viet Nam. It is envisaged that the database developed as part of the study will offer policy-makers an opportunity to consider the various merits of retreat, full protection or intermediate options.

Preliminary findings of the study included some estimates of the impact of a 1 metre sea level rise by the year 2025, assuming certain demographic and socio-economic changes. In the coastal province of Thua Thien Hua, for example, the rise in sea level with no change in the level of protection was estimated to imply that some 109,000 people and land and capital assets to the value of US$386m would be at risk of flooding although no land would be lost. In the coastal province of Thanh Hoa, a 1 metre rise in sea level would necessitate the relocation of 522,000 people whilst some US$714m of land and capital assets would have been lost. A further 51,000 people and US$78m of capital assets and land would be at risk of flooding. The true economic costs could be even higher than these estimates suggest if multiplier impacts through the economy are also taken into account, together with the costs of resettling and rehabilitating displaced populations.

This link between environmental conditions and natural hazards has already been recognised and incorporated into government policy (e.g. Viet Nam SCS et al., 1991). For example, the draft Public Investment Programme states that a strategy will be formulated which recognises the inter-relationship between environmental protection and the occurrence of natural disasters and which aims to mitigate their consequences (Viet Nam SPC, 1995). However, the challenge will be to implement such a strategy successfully.

Deforestation is one of the most significant aspects of increased environmental degradation, contributing to increased run-off and thus to a greater incidence of flash flooding, landslides, mudflows and siltation. At the same time, less water is being absorbed into the soil, reducing dry-season flows and increasing the incidence of severe water shortages and seawater intrusion as well as drought (Viet Nam MWR et al., 1994). Forest areas are reported to have declined from 60% of total land mass in 1943 to under 30% in 1987 and 26% in 1993, a process accelerated by war as well as demographic pressures and limited land availability which have resulted in the clearing of forests to create arable lands (Viet Nam SCS et al., 1991 and Viet Nam

MOSTE, 1994).[18] In the early 1990s, forests were being lost at a rate of 200,000 ha per year, a quarter of which was due to forest fires as shifting cultivators cleared land (Viet Nam SCS et al., 1991). Rural energy demands have been another major cause of deforestation, with fuelwood providing some 60% of rural energy supply (ibid). The biggest decline in forest cover has occurred in the Northern Mountains, falling from about 95% in 1943 to under 20% in 1991 (Viet Nam Government, 1995b).

Meanwhile, poor watershed management, in part related to deforestation, is reported to have resulted in the drying up of a number of reservoirs and irrigation canals whilst water tables have fallen steeply in some areas, in turn contributing to an apparent increase in the incidence of drought (Viet Nam SCS, 1991). Poor watershed management together with increasing siltation of reservoirs and rivers is also reducing the country's hydroelectrical power generating capability. In addition, increasing siltation is becoming a problem for harbour entrances and navigational channels.

Continuing destruction of both mangroves and coral reefs has increased the exposure of coastal areas to typhoons, sea surges and seawater intrusion. Mangrove forests have been destroyed to make way for various forms of coastal development such as shrimp farming (particularly in the southern Mekong Delta province of Minh Hai[19]), tourism development or ports. They have also been cut for use as firewood and damaged by chemical warfare. Thus, mangrove forests are reported to have declined from 400,000 ha in 1950 to only 252,000 ha by 1983 and 200,000 ha by 1992 (Viet Nam MOSTE, 1994; Viet Nam Government, 1995b). Meanwhile, coral reefs have been mined to provide building materials or items for direct sale to tourists; destroyed by fishing activities; and eroded by increased river run-off, in turn due to deforestation and increased sedimentation.

Ironically, human activities involving the deliberate destruction of mangroves or coral reefs are often of little net economic benefit to the wider community. For example, destruction of mangroves to make fish and shrimp ponds is estimated to result in a loss in marine fishery approximately equivalent to the gain in pond fishery as it destroys marine fishery breeding grounds (Viet Nam SCS et al., 1991). If the additional cost of increased damage from typhoons is also taken into account, then the destruction of mangroves entails a net economic loss, underlining the need for increased regulation of land use.[20]

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[18] The UNDP (1995a) reports slightly different figures, with a decline in forest cover from 48% of total land area in 1950 to under 20% in 1990.

[19] This one province alone lost 55% of its total 110,000 ha mangrove forest between 1983 and 1992.

[20] For example, Robakiewocz and Ziedler, 1995) report that in parts of the district of Hue shrimp farmers can earn 10–15 times as much as crop farmers.

Indeed, Viet Nam has begun to respond to its environmental challenge by developing an overall legal, policy and regulatory framework for environmental protection and sustainable management. A Law on Environmental Protection came into force in January 1994 while various studies have also been undertaken to design measures to arrest the process of environmental degradation. For example, in 1995 a draft National Environment Action Plan was prepared which identifies both a series of environmental priorities and a number of programmes to help meet these priorities (Viet Nam Government, 1995b). The programmes include several which will have a direct or indirect beneficial impact on the incidence and severity of natural disasters, including ones to protect, rehabilitate and manage mangroves and inland marshes; to improve protection of the coastline against typhoons (through both sea dykes and mangrove forests); and to improve watershed management. Other documents call for an intensified programme of reforestation and afforestation (Viet Nam SCS et al., 1991; Viet Nam SPC, 1995).[21] Considerable efforts now need to be undertaken to implement these various environmental protection and regeneration policies and laws.

Further work is also required in promoting environmental awareness amongst the general public, the level of which is currently very low. As the National Environment Action Plan notes, 'the challenge of integrating environmental management into the functioning of the economy will remain unmet until there is both much wider appreciation of the issues and a suitable incentive structure to respond to them' (Viet Nam Government, 1995b: 17).

[21] The figures on planting and re-planting are inconsistent and include the planting of exotic (imported) trees as well as indigenous ones. However, some figures would suggest that reforestation is keeping pace with deforestation.

3. The macro-economy and natural disasters

3.1 Recent economic reforms

It is important to place an analysis of the economic impacts of natural disasters in Viet Nam within the broader context of the country's political economy and recent reforms. In December 1986 a policy of *doi moi* or economic, institutional and political reform was introduced, involving a shift from a highly centralised, planned economy to a market-orientated one, although retaining some element of state management and a socialist orientation. These reforms aimed to promote economic growth and stability through the development of a market economy, guided by the principles of socialism with a particular emphasis on the achievement of equitable growth.

Initial implementation of the reforms was slow but it rapidly gathered pace following the outbreak of famine in parts of the country in late 1987. The famine was the consequence of both a severe drought and, more fundamentally, very low nominal rice contract prices, in turn reflecting rampant inflation. The famine emphasised the urgent need for an improvement in agricultural productivity. It also underlined the fact that semi-price liberalisation and financially undisciplined reforms did not work. These factors prompted the implementation of much bolder reforms in 1988 and 1989, including the decollectivisation of agriculture; sweeping price liberalisation, with only a few products remaining regulated; the dismantling of centralised control over output and the transfer of responsibility for employment, investment and most output decisions to individual firms; unification and devaluation of the exchange rate; the deregulation of external trade; the introduction of hard budget constraints; the rationalisation of the public sector, including state owned enterprises; and trade reform. A further phase of major reform was prompted in 1990–91 by the collapse of the CMEA trade system, the halt of Soviet assistance and a disintegration of the cooperative system. By 1992, a relatively balanced fiscal situation and a moderate rate of inflation had been achieved although the reform programme is still continuing.

The reforms have resulted in high annual growth rates, averaging 3.9% in 1986–90 and over 8% in 1991–5, thus well in excess of growth targets of 5–6% per annum. Growth in the second half of the 1980s was led by the agricultural sector. In contrast, non-agricultural sectors have performed most strongly in the first half of the 1990s, with industrial growth of 13–14% per annum (including energy and mining) and of 9–10% in the services sector although the agricultural sector has also achieved strong annual growth rates of 4–5%. Admittedly, these rates of growth were achieved from

a very low base and reflect structural change supported by higher levels of investment. Nevertheless, they are most impressive, as widely acknowledged, given the country's limited access to external financing over much of the period, the loss of major ex-CMEA exports markets and the contemporaneous achievement of a sharp reduction in the fiscal deficit together with high growth rates (ADB, 1995).

Since 1991, considerable emphasis has also been successfully placed on macroeconomic stabilisation. Achievements include the curtailment of extremely high rates of inflation; an increase in the level of investment from around 15 to 22% of GDP between 1991 and 1994, in part due to foreign direct investment inflows; an increase in levels of domestic savings from negative values in 1989–90 to 15% of GDP by 1994; a reduction in the fiscal deficit, due to a combination of tax reforms, the elimination of subsidies and restraints on expenditure; substantive increases in the levels of exports as well as imports; maintenance of a relatively stable exchange rate; and an increase in external reserves to a more secure level (IMF, 1995; Viet Nam Government, 1995d).

However, various challenges remain, including the achievement of a reduction in the level of unemployment and underemployment and even higher levels of saving and investment. UNDP (1993b), for example, views unemployment and the resulting social problems as possibly the biggest threat to the reform process. High rates of unemployment and underemployment reflect low productivity in the predominantly traditional agricultural sector, which provides 80% of total employment; the consequences of the recent streamlining of state enterprises and the public sector; the partial demobilisation of the army; and the return of workers from former CMEA countries and the Gulf States.[22] New jobs will have to be generated in non-agricultural sectors as the agricultural sector cannot absorb much more labour.

In terms of the relative balance of economic activities, the industrial sector has gradually shifted from an emphasis on heavy industry towards the production of processed food and fish, textiles and garments, wood products, chemicals, fertilisers, mechanical equipment and electronics. The country has also begun to exploit its considerable oil, coal, gas and mineral resources and its hydroelectric power potential. In particular, although oil production only began in 1986, crude oil exports have rapidly grown to 1.5m tonnes by 1989 and 7.5m tonnes by 1995, making them the country's principal export.

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[22] In 1995, an estimated 6% of the total labour force was unemployed (ADB, 1995), the majority of which were located in rural areas. A further 25–29% of agricultural workers were underemployed to varying degrees whilst total rural underemployment was estimated at perhaps 30–35% (Viet Nam Government, 1995a) or 30–40% (Viet Nam Government, 1995c). Urban underemployment was estimated at 12% (Viet Nam Government, 1995a).

Nevertheless, Viet Nam remains a predominantly agrarian economy to date, characterised by low levels of both technology and labour productivity. The agricultural sector accounted for 35% of GDP in 1994 (compared to 42% in 1989)[23] and for around 73% of employment and 50% of exports in 1993. Agricultural activities are particularly important in rural areas where much of the population is engaged in crop production, particularly rice cultivation, and where agro-processing is the single most important industry, accounting for 17% of total rural industrial enterprises (World Bank, 1995c). Food and foodstuffs also accounted for 34% of gross industrial production in 1994 (and 38% in 1987), with additional output based on other agro-processing industries.[24]

With regard to natural disasters, recent impressive rates of economic growth make it difficult to isolate adverse impacts of natural disasters.[25] However, although real GDP has consistently grown in every year at least since 1986[26], there is some evidence that major floods have had some impact. For example, the slow down in growth and the decline in exports experienced in 1991 was partly attributed to adverse weather conditions as well as to other factors such as the loss of CMEA markets and external assistance (see Chapter 10). Furthermore, as discussed below, the economy looks set to remain vulnerable to natural disasters in the medium-term, in part because of the continuing importance of the agricultural sector.

3.2 *Future economic performance and implications for disaster vulnerability*

Prospects for strong, sustainable growth are considered good. Viet Nam's most notable comparative advantages include 'a low cost, highly disciplined and literate labour force, a diverse natural resource base and a strategic regional location for doing business and trading' (UNDP, 1995b: 1).

GDP is targeted to increase by 9–10% per annum over the period 1996–2000, with sectoral annual growth rates of 4–5% in agriculture, 13–14% in industry and 11–12% in the services sector. By the year 2000, industry is expected to account for some

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[23] Based on preliminary International Monetary Fund (IMF) data for 1994.

[24] Data on gross industrial production include value-added in other sectors. Figures on net output are not available.

[25] This could also reflect the fact that disaster-related agricultural losses are to some extent hidden in annual GDP data by planting or compensatory increased production operations which make up at least part of the losses.

[26] Data for earlier years are not available under the same reporting system.

34–35% of GDP, agriculture for 19 –20% and the services sector for 45–46% (Viet Nam Government, 1995d). The government also aims to double per capita income between 1990 and 2000 and to establish a sustainable basis for further growth.

However, although non-agricultural growth rates are expected to be higher, strong performance of the agricultural sector is considered essential in meeting both overall growth targets and another government objective of higher rural incomes (Viet Nam SPC, 1995). Viet Nam's comparative advantage lies in agro-based industries such as livestock, fisheries and cash crops, particularly rubber, and these industries offer good growth potential. Thus, the country is likely to develop an industrial sector which is in part dependent on agricultural inputs, implying that poor performance in the agricultural sector – for example, due to natural disasters – could have much wider negative implications. This underlines the need for risk assessment and mitigation policies during the current period of rapid growth.

Future growth also requires both the consolidation of macroeconomic stability, including the continued maintenance of low rates of inflation and careful fiscal management, and mobilisation of domestic and foreign resources to finance investment and growth (World Bank, 1995b), all of which factors could be undermined by severe natural disasters (for example, see Box 3.1 and Chapter 6). Disasters could also, for example, reduce levels of domestic savings, another vital component in ensuring equitable and sustainable growth as savings are required to help finance the government budget deficit and thus to avoid either external borrowing or monetary expansion.

Indeed, as it expands, Viet Nam's economy could become increasingly vulnerable to natural disasters. Although careful hazard risk assessment could help minimise this trend, some increase is perhaps almost inevitable to the extent that successful development is partly dependent on growth in some of the more disaster-prone sectors of the economy. A number of factors could contribute to this increasing vulnerability although, because natural disasters occur in some part of the country every year, they could be felt more as a constraint to growth than in terms of significant inter-yearly fluctuations in GDP, at least at the national level:

- **Growth of agro-processing industries.** At the end of the 1980s there was relatively little integration between different sectors and sub-sectors of the economy, even between agriculture and industry. The development of agro-industries, such as fruit and vegetable processing, rice-milling, vegetable oil processing, sugarcane extraction and processing, and slaughtering and meat processing was therefore identified as a high priority, potentially both creating employment and generating foreign exchange (Viet Nam SPC and UNDP, 1990). Part of the country's subsequent economic growth has been based on the

Box 3.1 Inflation

Since the late 1980s, Viet Nam has made a concerted effort to lower its rate of inflation from very high annual rates of 700–800% in 1986–8. These rates had largely reflected wide fiscal deficits financed through monetary expansion as well as consumer goods shortages, particularly of rice. The gradual reduction in the rate of inflation achieved since then has reflected reduced fiscal deficits and strict monetary policy, aided by increasing harvests and consumer good imports as well as more realistic exchange rates. High interest rates and tight credit conditions rather than price and wage rigidities, have been used to contain demand, in effect avoiding a fall in output seen in a number of other transitional economies. Meanwhile, aggregate demand has been sustained by an increase in oil production and agricultural export earnings (IMF, 1995).

Continued maintenance of a low rate of inflation is widely viewed as an essential prerequisite for sustainable growth, encouraging savings and domestic and external investment through real positive interest rates as well as maintaining the country's international competitiveness. Indeed, UNDP identifies the need to restrain inflationary pressures as 'the most pressing need' on the macroeconomic policy front (UNDP, 1995b: 17). Similarly, the World Bank states that in terms of consolidating the recent achievement of macro-economic stability, 'the most pressing challenge for policy makers is to ensure that last year's acceleration of inflation ... does not continue' (World Bank, 1995b: xvii).

However, there is evidence to suggest that the achievement of low inflation targets could be threatened by natural disasters with knock-on implications for fiscal and monetary policies. More specifically, the rate of inflation rose from 5.2 percent in 1993 to 14.4 percent in 1994, with an even higher increase of 20 percent in the first half of 1995. This rise was partly due to an increase in food prices, particularly of rice, following extensive flooding in eight northern provinces in August 1994 and the consequent destruction of some one million tonnes of rice and other crops. A one-off adjustment in rice prices towards international levels and a rise in illegal exports of rice to China, which also faced floods, further contributed to the rise in food prices. Increased rice prices were not compensated for by a fall in demand for, and thus prices of, other consumer items as households responded to the higher rice prices by reducing savings and increasing total expenditure instead, effectively fuelling inflation (IMF, 1995). The lagged impact of a 58 percent increase in credit in 1993, in part following the conversion of import quotas into tariffs, created further inflationary pressures. Tighter monetary and credit policies were introduced to control the inflation and it subsequently began to decelerate from July 1995.

Box 3.1 (cont'd) **Inflation**

This example demonstrates the potentially inflationary impact of natural disasters. Indeed, improved market integration in the future could effectively increase the impact of disaster-related rice shortages on national rice prices and thus, since foodstuffs account for 40 to 50 percent of the consumer price index weighting, the overall rate of inflation. Currently, the north and south of Viet Nam are relatively poorly integrated with, for example, high rice production in the south doing little to alleviate rice price increases in the north in 1994. More generally, rice farmgate and retail prices as well as fertiliser prices have been lower generally in the south, reflecting more sophisticated private markets (IMF, 1995). The International Monetary Fund (IMF) believes that 'this potential for narrowing the North-South dichotomy, when realised, would tend to dampen any pressure for monetary accommodation, including through a trend reduction in price mark up' (ibid.: 41). However, this perhaps ignores the impact of the integration of more remote areas of the country into the wider economy, connecting not only the north and south but also the particularly disaster-vulnerable central regions which may experience particularly substantial fluctuations in rice prices as a consequence of natural disasters.

Any disaster-related inflationary pressures will be exacerbated to the extent that they coincide with increased pressures from other factors. Indeed, the country could continue to face various inflationary pressures as, for example, government budgetary pressures continue and domestic demand gradually builds up. This implies that any additional inflationary pressures exerted by natural disasters will need to be handled very carefully.

development of these industries and this trend is expected to continue.[27] Rural growth, which will be critical in alleviating poverty, absorbing the expanding rural labour force and avoiding increasing environmental degradation, is expected to be particularly dependent on the expansion of such industries, linked to local agricultural production (Viet Nam Government, 1995d). However, this trend also effectively increases the multiplier effects of disasters through the economy to the extent that agro-processing industries rely on disaster-vulnerable agricultural inputs.

- **Improved market integration** Currently, the availability of marketed products remains limited in rural areas, with food self-sufficiency still dominant (Doanh and

[27] For example, Viet Nam MOSTE (1995a) identified growth prospects for frozen fish and meat, canned fruits and vegetables, rush and jute products, tea and silk.

Nguyen, 1995). However, major investments in the transport sector are being undertaken, including the development of links to rural and mountainous areas as well as main thoroughfares. Various other efforts are also being made to strengthen the marketing infrastructure, together contributing to increasing market integration. Over time, this will imply that a food deficit in one region is more likely to result in compensatory food transfers from another rather than, as before, going largely unmet. This could conceivably contribute to price increases, particularly of rice, as shortages in one part of the country are translated into higher demand in others. Furthermore, it could imply lower rice exports during more disaster-prone years, with potential knock-on implications for other economic variables (see Chapter 10). Improvements in the marketing infrastructure could also encourage regional specialisation, with basic food staple production increasingly concentrated in certain regions of the country whilst others switch to cash crops. This would effectively imply that certain crops could experience much higher losses as a consequence of a particular natural disaster precisely because of their greater geographical concentration. It is not inconceivable that production of less profitable food crops could also be increasingly concentrated in the hands of poorer farmers as richer ones exploit more profitable alternative agricultural opportunities, again increasing the overall disaster-vulnerability of such food crops to the extent that poorer farmers themselves are more vulnerable to disasters, reflecting either their broad geographical location or the quality of the land they farm.

- **Financial deepening** There have been substantial financial sector reforms since 1988, including the introduction of a two-tier banking system and the development of a number of private banks as well as the transfer of state-owned banks into multi-purpose commercial ones. The non-state sector, including the private sector, cooperatives and joint ventures, has also been granted increasing access to credit whilst credit associations have been established (IMF, 1994). The country's increasingly sophisticated and widespread financial system could also play a role in spreading the effects of more severe disasters to the extent that they result in both increased demand for credit and higher default rates, perhaps forcing up interest rates.

- **Inequitable patterns of growth** As discussed below, there are certain reasons to believe that differences in levels of hazard risk are contributing to widening income disparities, both between regions and occupational groups. Such disparities undermine government efforts to secure equitable patterns of development and could ultimately impact on the pace of growth by, for example, impeding the development of a strong domestic consumer market.

Increasing capital investments could also imply higher levels of direct damage as a consequence of natural disasters if appropriate prevention and mitigation measures are not put in place. For example, preliminary estimates from a Dutch-funded study

suggest that even with no sea level rise, capital losses as a consequence of floods will increase some 10–15 fold between 1995 and 2025 because of demographic growth and increasing capital asset stocks. Moreover, new areas of investments could also entail new forms of hazard vulnerability if, once again, appropriate disaster-proofing measures are not taken.

In addition, future changes in the management of the Mekong River, which passes from China via a number of countries to the delta region in Viet Nam, is also likely to have significant implications for both the nature of hazard risks and economic vulnerability. Various international commissions, committees and forums have been created to plan and promote the development of the river, which is considered to offer many economic opportunities. However, as various dam and irrigation structures are built along its length as part of these developments, the flow of water into the delta as well as the river's sedimentation pattern will alter. Reduced downstream flows would result in greater seawater intrusion up the delta, perhaps requiring increased coastal protection structures. The construction of various dams and reservoirs, in connection with hydroelectric power generating stations, would also alter the rate of flow of the river, perhaps reducing dry season flows even further. The development of the river will also have implications for north-west Viet Nam by changing the flow regimes of Vietnamese tributaries of the Mekong. Meanwhile, the gradual economic development of the river will also increase its economic vulnerability to floods and other disasters.[28]

3.3 *The role of natural disasters in widening regional inequalities*

The government has been anxious to ensure that all groups benefit from Viet Nam's rapid economic growth. In practice, however, there is already certain evidence of widening regional and urban: rural disparities, with some areas of the country expanding faster than others whilst containing a lower incidence of poverty. These disparities seem to be partly disaster-related as some of the more hazard-prone regions appear to have received disproportionately small shares in private and public investment and external assistance and have fewer opportunities for growth. In terms of accentuating income disparities, natural disasters may, for example, limit opportunities for crop diversification, both in agro-ecological terms and because farmers prefer to adopt risk-minimisation rather than profit-maximisation strategies if the latter potentially imply severe impoverishment in some years. More detailed studies at the commune or district level could throw up even sharper disparities whilst any such inequalities could widen even further in the future, as the country continues to develop.

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[28] Personal communication with D. Oakley, November 1996.

One of the country's less disaster-vulnerable regions, the South-East, experienced particularly high rates of growth during the initial stages of reform, averaging 14.4% per annum between 1986 and 1993 (Table 3.1). These growth rates partly reflected existing advantages such as a better infrastructure and transportation system and an important entrepreneurial base, in turn a legacy of its previous market economy regime (Lipworth and Spitäller, 1993). Nevertheless, its relatively lower vulnerability to natural disasters may also have played a role, effectively implying fewer constraints to growth. Meanwhile, the Central Coast and the particularly typhoon-vulnerable North Central regions achieved the lowest growth rates, averaging 3.4 and 3.5% between 1986 and 1993 in the two areas respectively.[29] Similarly, the incidence of poverty is particularly high in the North Central region, standing at 71%, as compared to 59% in the Northern Uplands (making it the second poorest region), 33% in the South East and 48–50% in the other regions (World Bank, 1995a).[30] The North Central and Northern Uplands regions contain 29% of the country's population but 40% of the country's poor.

Indeed, UNDP et al. (1995) partly attributes these regional differences in the incidence of poverty to deforestation, flooding and drought in the mountains and to typhoons and poor soil along the North Central Coast region, in turn frustrating any rural-based solutions to poverty. The important inter-relationship between the degree of vulnerability to natural hazards and the extent of poverty is confirmed by that fact that, in terms of occupational groupings, farmers, who are currently the largest single group directly affected by natural disasters in Viet Nam, are also the poorest group. Of the total farming community, 60% is classified as poor whilst farmers account for 76% of the total poor population (World Bank, 1995a).

The government already recognises that certain occupational groups and regions of the country are likely to achieve more rapid growth than others. As of 1995, it was therefore intending to enact a series of policies on the provision of assistance and support to poor households, 'with the aim of lifting all households above the poverty line and ensuring that the gap between rich and poor is gradually narrowed', based upon the creation of favourable economic conditions rather than the provision of subsidies (Viet Nam Government, 1995a). It is critically important that any such programmes also aim to reduce hazard vulnerability, thus breaking the hazard vulnerability-poverty syndrome, if they are to be successful.

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[29] The Northern Mountains region achieved an average growth rate of 3.7% per annum. However, this was largely due to a rapid average annual growth rate of 10.9% in 1991–3 whilst it had had by far the lowest regional growth rate before 1991.

[30] These estimates are based on Viet Nam Living Standards Survey (VLSS) data.

Table 3.1

Viet Nam regional growth rates and distribution of income

	Northern Mountains	Red River Delta	North Central	Central Coast	Central Highlands	South-east	Mekong Delta	National
Real index of gross output (1986=100)								
1986	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1987	102.00	109.00	102.40	104.40	114.20	110.30	107.40	107.00
1988	104.04	118.81	104.86	108.99	130.42	121.66	115.35	114.49
1989	104.25	117.86	106.85	113.24	133.68	140.15	121.92	120.79
1990	104.46	116.92	108.88	117.66	137.02	161.46	128.87	127.43
1991	104.67	115.98	110.95	122.25	140.44	186.00	136.22	134.44
1992	116.07	133.38	118.83	124.33	156.17	218.55	145.89	148.69
1993	128.73	153.39	127.26	126.44	173.67	256.79	156.25	164.45
Distribution of population by income level and region (%)								
Level 1	33.7	23.53	40	42.2	32.15	15.48	21.64	28.42
Level 2	23.88	21.48	28.57	16.73	23.32	8.69	17.06	19.69
Level 3	16.58	19.44	15.07	10.83	11.33	10.09	16.5	15.28
Level 4	17.25	18.22	10.08	14.68	20.55	17.82	18.06	16.58
Level 5	4.85	8.27	2.3	7.3	6.59	15.48	10.91	8.26
Level 6	2.7	4.98	2.76	5.54	5.27	12.75	9.73	6.43
Level 7	0.74	2.34	0.72	1.98	0.79	14.59	4.37	3.77
Level 8	0.3	1.74	0.49	0.74	0	5.09	1.73	1.58
Total	100	100	100	100	100	100	100	100

Source: Estimated from UNDP et al, 1995 and Viet Nam SPC, 1994

In terms of the pattern of investment, more disaster-vulnerable areas also appear to be receiving lower levels of per capita investment than certain other parts of the country. This could be due to fewer investment opportunities in the former, in turn reflected in lower growth rates as already noted. It could also reflect lower levels of infrastructure, itself the consequence of greater hazard risks, as a certain infrastructural base is often one of the primary prerequisites for other types of investment. The limited availability of public investment resources could reinforce any such biases, particularly to the extent that the government wants to maximise returns from scarce investment resources. In fact, the government is making some effort to ensure balanced regional development although at the same time recognising its financial limitations by focussing on the development of three growth triangles in the north, centre and south of the country. These zones avoid the most hazard-prone North Central Coast but do include one relatively high hazard risk area in the centre.[31] There has also been an uneven spatial distribution of foreign joint venture investment both between and within different regions, again contributing to increasing regional disparities and again, at least implicitly, possibly partly reflecting relative natural hazard risks. Such imbalances could be accentuated as foreign investment picks up.[32]

[31] The northern triangle incorporates Hanoi, Hai Phong and Quang Ninh; the central one, Quang Nam-Da Nang and Quang Ngai; and the southern one, Ho Chi Minh City and Can Tho. Each triangle will consist of one regional centre and two satellite cities/provinces, incorporating export processing zones. The triangles were selected on the basis of five criteria: development of basic infrastructure such as transportation, power and water supply; availability of raw materials; access to airport and seaport; quality and availability of labour supply; and level of urbanisation (World Bank, 1995c). It is not clear whether detailed hazard risk assessments of the chosen sites were undertaken although their choice implicitly takes account of hazard risks to the extent that natural disasters affect the five factors listed above.

[32] To date, rates of foreign investment have been slower than anticipated, partly due to the cumbersome and lengthy licensing process. However, the government is now undertaking efforts to speed matters up.

4. Agriculture and natural disasters

Viet Nam has a total land area of 33m ha of which 10–11m ha is potential agricultural land but only 6–7m ha is currently cultivated. This implies 0.1 ha of cultivated land per capita, one of the lowest levels in the world, although double- and triple-cropping raises gross acreage by as much as two-thirds. The distribution of agricultural land is also uneven, in part reflecting the pattern of contamination from seawater intrusion and chemical warfare as well as differing terrain. Some 1.7m ha of the total 2.8m ha in the Mekong Delta alone, was affected by seawater intrusion in 1994, following particularly serious floods (ADB, 1994), whilst some land in the delta is affected by salination every year. The saline conditions are exploited to some advantage by shrimp farmers but agricultural production can be curtailed for several years, as already indicated.

Options for crop production and yields achieved also vary considerably between regions reflecting the incidence of natural hazards and the relative vulnerability of various crops as well as highly varied agro-climatic conditions. Indeed, there is considerable regional variation and the country supports a wide range of crops. In the north of the country, which experiences a hot rainy summer and a cold dry winter, crops such as grapes, cotton and cashew are grown (Pho and Tuan, 1994). The mountainous Northern Uplands, in particular, support a wide range of crops whilst the Red River Delta, which is largely under irrigation, is an important rice-growing region, achieving high levels of productivity. The Central Coast, particularly the North Central Coast, faces a difficult climate, including a hot dry spell from late winter to early summer and heavy rainfall, accompanied by frequent storms and typhoons from late summer to early winter. The principal crops are rice, sweet potato, groundnut and other tropical crops whilst fishing and salt-making are also important. The Southern Highlands has a better climate, appropriate to the cultivation of both annual and perennial crops. Finally, the South East and Mekong Delta have a particularly favourable hot humid climate with few typhoons and no cold periods, suitable for the cultivation of crops such as rice, coconut, pepper and rubber. The Mekong Delta is particularly productive and is the only region of the country which consistently produces food surplus to requirements (WFP, 1995). Overall, the proportion of land under irrigation is currently relatively low, accounting for 80% of rice but only 20% of industrial crop production (Viet Nam SPC, 1995).

Before considering patterns of agricultural production and vulnerability to natural hazards further, it is important to consider the series of organisational changes which have played a fundamental role in determining longer-term trends in the agricultural sector. In fact, the sector has undergone a number of major reforms over the past 40 years involving varying degrees of collectivisation and private enterprise. Briefly, following defeat of the French, a programme of gradual agricultural cooperativisation

and collectivisation was introduced in north Viet Nam from 1954 and extended to much of the south of the country following unification in 1975. However, this structure proved unsustainable, largely because it provided little incentive to individual farmers to improve productivity. Instead, following wide scale collapse of cooperatives and production teams, accompanied by substantial declines in agricultural production, the policy was reversed in 1981 and a form of contractual agriculture introduced. Under the new system, individuals were made responsible for planting, caring and harvesting of crops and cooperatives for other stages of production. Farmers were allowed to retain production in excess of contracted tonnages, encouraging agricultural investments as well as multiple cropping and resulting in a rise in gross food production (Cuc, 1995). However, from about 1986 output began to level off again, leading to food shortages and finally forcing further fundamental reform in 1989. Households now became autonomous economic units, the contractual mechanism for households was improved, prices were decontrolled, and quantitative controls and marketing restrictions abolished. Private ownership of machines, buffaloes, oxen and agricultural instruments was also permitted whilst land was allocated to households under 10–15 year leases, together providing an important impetus to investment (ibid.). Although farmers still had to pay agricultural taxes and contribute to cooperative funds, they were free to use the remainder of their output as they chose (ibid.) as well as, at least in theory, to make their own cropping decisions. These reforms prompted another increase in output and even the emergence of an exportable surplus of rice, in part as price and trade liberalisation led to a marked improvement in prices, providing an important incentive to producers.

In 1993, a further Law on Land was passed granting farmers flexible land-holding rights for 20–25 years although all land remained under state ownership on behalf of the people. Users' rights were extended to include the rights of land use change, transference of land rights to individuals and enterprises, lease, heritage and collateral. The new law has effectively encouraged farmers to invest in land reclamation, land replenishment and land improvement and resulted in an increase in the incidence of multiple cropping (ibid.). However, implementation of the law has been relatively slow and farmers without certificates have been unwilling to make intensive investments (ibid.).

Rice Rice is the single most important agricultural crop as well as the main dietary staple, accounting for an average 90% (in tonnage terms) of total food production in 1993–4.[33] It is also the main feed source and fluctuations in rice and pork production are reported to be closely correlated, with a failure of the rice crop resulting in a

[33] The importance of rice production is underlined by the fact that the word for "food" is the same as that for "rice" whilst those for "eat" and "eat rice" are also identical. The population is currently being encouraged to diversify its diet.

decline in both pig raising and the availability of manure for crop cultivation (Hoang, 1995).

There are four basic kinds of rice grown in Viet Nam: irrigated, rainfed lowland, deep water and floating, and upland rice. The choice of variety reflects differing agro-climatic conditions whilst each produces varying yields. Two crops are grown each year in the north of the country with the land then turned over to a third vegetable crop. Three rice crops are common in the central and southern regions. However, in the more flood-prone areas farmers tend to produce only one rice crop per year whilst rainfall may be insufficient to produce even one rainfed crop in parts of the country, such as certain sections of the central coastal areas.[34] The highest yields are obtained in the Red River and Mekong Deltas and these areas are the highest producing regions in the country. Both delta regions are extensively farmed, reflecting availability of water coupled with fertile soils deposited by the river systems, one of the benefits of flooding. Production in the Red River Delta also benefits from an extensive irrigation network. In both areas there is scope for further increases in yields, particularly in the Mekong Delta which is already viewed as the rice bowl of Viet Nam, as well as for agricultural diversification. Indeed, in the south rice is part of the natural vegetation and most of the country's marketable surpluses are produced here.

Until the late 1980s, the Viet Nam Government placed an over-riding priority on the attainment of national and, where possible, regional self-sufficiency in rice, as both the extended war and then inadequate marketing and transport structure restricted the movement of food between regions. Despite this, Viet Nam did not achieve national rice self-sufficiency until 1989, following fundamental reforms in the same year. Since then, Viet Nam has rapidly emerged as a rice exporter, shooting into position as the world's third largest rice exporter by 1992.

In fact, increases in productivity date back to 1982 and are attributable to the combined effects of increased acreage and inputs, expansion of the irrigation network and wider uptake of modern varieties as farmers responded to improved agricultural incentives whilst continuing to focus on production of rice. Modern varieties have the advantage of being both higher-yielding and, in some cases, requiring shorter-growing periods, permitting increased cropping intensity. Between 1980 and 1994 area under rice production increased 18%, with a 40% increase in spring and 131% increase in autumn rice but a simultaneous 18% decline in acreage under winter rice as farmers diversified into other crops. Over the same period, average annual yields increased 71% whilst total rice production more than doubled, from 11.6 to 23.5m tonnes. In per capita terms, rice production increased from 217 to 324 kg per capita.

[34] Rainfed rice production requires 3 consecutive months of rainfall exceeding 200mm, whilst 2 crops are possible with 7 months and 3 with 10 months of consecutive rainfall.

However, there are considerable regional differences underlying this spectacular growth, in part reflecting climatic differences and natural hazard vulnerability. Indeed, there is clear evidence of increasing regional disparities (Table 4.1). For example, although average annual yields in the particularly typhoon-prone North Central Coast doubled between 1980 and 1993–4, in 1994 the average yield was still only 28.1 quintal/ha compared to yields of 40.1 and 39.9 quintals/ha in the Red River and Mekong Deltas respectively.[35] Indeed, it will be particularly challenging to maintain per capita levels of production in the coastal strip between the two deltas, where around half of the country's population and 40% of its rice-growing area is located (WFP, 1992).

Further disaggregation at the provincial level between more and less disaster-prone provinces helps to highlight the degree of extent of regional disparities (Table 4.1). For example, highly disaster-prone areas of the North Central Coast achieved average rice yields of 23.8 quintals/ha in 1991–4 compared to yields of 29.6 quintals/ha for the relatively less disaster-prone provinces of the same region. Admittedly these estimations are somewhat crude, with further disaggregation to the district level required before firm conclusions can be drawn. Nevertheless, they highlight the fact that more disaster vulnerable areas do achieve lower yields, even in disaster-free years, as farmers are more reluctant to undertake yield-enhancing investments (see below).

The data also highlight the particular complexity in considering the impact of natural disasters in the two main delta regions, where there are certain benefits as well as disadvantages of flooding. Provinces largely or wholly located within the deltas have typically achieved higher rice yields than neighbouring, less disaster-vulnerable provinces but inter-yearly fluctuations in yield have also been greater in the former, indicating greater uncertainty. For example, over the 4-year period 1991–4, yields averaged 40 quintals/ha in the Red River Delta provinces but annual average yields ranged from 31–48 quintals/ha. In contrast, they averaged only 34.9 quintals/ha in the less disaster-prone provinces of the same region[36] but varied over a much narrower range of 27–39 quintals/ha. Indeed, although the Red River Delta is particularly fertile, the north of the country has experienced intermittent food shortages as a consequence of natural disasters.

Non-rice crops Over the past 15 years, there has been a gradual diversification into non-rice food and industrial crops as market opportunities have expanded.

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[35] Average bi-annual data was used where possible to help avoid distortions caused by data for abnormal years of very high or low production and yields. However, data were not readily available for either 1979 or 1981.

[36] Less disaster-prone provinces were defined as Hanoi and Hai Phong.

Table 4.1

Viet Nam rice production, acreage and yield, 1980 -94

	Production				*Acreage*				*Yield*				*Per capita production*	
	Actual	Increase			Actual	Increase			Actual	Increase			Actual	Increase
	1994	1980 to 1985-6	1985-6 to 1993-4	1980 to 1993-4	1994	1980 to 1985-6	1985-6 to 1993-4	1980 to 1993-4	1994	1980 to 1985-6	1985-6 to 1993-4	1980 to 1993-4	1994	1990-1 to 1993-4
Unit of measurement	000 t	000 t	000 t	000 t	000 ha	000 ha	000 ha	000 ha	quinal/ha	quinal/ha	quinal/ha	quinal/ha	kg/p.c.	kg/p.c.
Spring rice														
North Mountain & Midland	888	239	213	452	280.5	24	32	55	31.6	8	5	12	71.6	24.7
Red River Delta	2,533	420	749	1,169	509.8	6	5	10	49.7	8	14	22	180.1	76.8
North Central Coast	1,010	366	121	486	317.2	3	0	3	31.8	11	4	15	103.8	11.2
South Central Coast	640	159	-35	124	176.8	-3	4	1	36.2	10	-3	7	84.6	-17.2
Central Highlands	133	47	44	92	30	7	5	13	44.4	13	9	22	44.4	3.2
North East South	189	51	44	95	56.8	-8	13	4	33.3	15	0	16	21.3	2.3
Mekong River Delta	5,112	1,006	2,479	3,484	1010.3	66	498	564	50.0	17	3	20	322.5	38.0
Winter rice														
North Mountain & Midland	1,320	181	362	543	519.3	45	44	88	25.4	2	5	7	106.5	8.3
Red River Delta	1,588	446	723	1,169	517	103	-19	84	30.7	5	15	19	112.9	0.7
North Central Coast	569	135	79	213	245.4	-38	-47	-85	23.2	6	7	13	58.5	2.8
South Central Coast	565	215	-2	213	201.1	12	13	26	28.1	8	1	8	74.7	-8.7
Central Highlands	316	51	57	109	151.9	-3	22	19	20.8	4	1	5	105.2	-6.7
North East South	538	12	36	48	228.9	-36	20	-16	23.5	4	-1	4	60.6	-0.9
Mekong River Delta	2,501	-257	-375	-632	776.6	-229	-384	-613	32.2	2	7	9	157.8	-30.2
Third rice crop														
North Mountain & Midland	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red River Delta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North Central Coast	335	123	84	207	117.5	27	27	53	28.6	10	2	12	34.5	-2.4
South Central Coast	584	164	109	274	140.9	23	9	32	41.4	8	5	13	77.2	1.9
Central Highlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North East South	201	82	37	119	67.3	21	11	32	29.9	6	1	7	22.7	1.6
Mekong River Delta	4,509	925	2,519	3,444	1251.2	138	631	769	36.0	10	3	13	284.5	58.6
Total rice														
North Mountain & Midland	2,207	417	575	992	799.8	67	75	142	27.5	4	5	9	178.2	33.3
Red River Delta	4,121	865	1,472	2,337	1026.8	107	-14	93	40.1	6	15	21	293.0	77.2
North Central Coast	1,914	623	283	906	680.1	-8	-20	-29	28.1	9	5	14	196.8	11.6
South Central Coast	1,788	538	72	611	518.8	32	27	59	34.2	9	-0	9	236.6	-24.0
Central Highlands	449	98	102	200	181.9	4	28	32	24.7	6	2	8	149.6	-3.5
North East South	928	145	117	262	353	-23	43	20	26.3	6	0	6	104.6	3.1
Mekong River Delta	12,121	1,674	4,622	6,296	3038.1	-25	745	720	39.9	8	8	15	764.7	66.4

Source: Viet Nam GSO, various.

Some non-rice food crops were already grown, including maize, sweet potato and cassava. These were, and are, often cultivated as subsidiary crops to rice and, in some cases, offer greater tolerance to the impacts of particular natural disasters.[37] For example, cassava is a drought-tolerant crop grown throughout the country, mostly on degraded soils, although it can be destroyed by floods or high winds. Sweet potatoes require some moisture but, unlike most other crops, can be grown on saline lands. Such crops are typically used as livestock feed as their salty taste renders them unpopular for human consumption.

Recent national production gains in non-rice grain crops have not been considerable, with the noticeable exception of maize which has benefited from increased application of inputs and the introduction of hybrid varieties (Cuc, 1995). Nevertheless, there have been some significant increases in output and yields of certain other crops in particular regions of the country. Fruit and vegetable production has also increased, with most households growing vegetables for their own consumption, as animal feed and, in some cases, as a cash crop. However, vegetable and horticultural activities are fewer in the Central Coastal provinces due to problems of soil infertility, salination and the higher risk of natural disasters. For example, natural disasters are reported to have been an effective disincentive to investment in fruit trees in this area (Anh et al., 1993).

Production of industrial crops – for example, of coffee, peanuts, mulberry, cotton and sugarcane – has also increased substantially, with total acreage expanding almost threefold between 1980 and 1994. Coffee has emerged as the country's second largest agricultural export after rice, with a doubling in yield between 1980 and 1994 to one of the highest levels in the world (Hoang, 1995). The government also has particularly high hopes for sugarcane which it eventually envisages becoming the country's second largest crop.

These developments have partly reflected a gradual relaxation of the government's policy on 'food self-sufficiency at all costs' as well as greater incentives in the form of increasing marketing opportunities (Viet Nam SCS et al., 1991: 83). The change in policy, in turn, appears to have been partly motivated by the need to bring cultivation patterns more in line with local agro-ecological conditions; the need to satisfy the requirements of the country's expanding agro-processing industries; and the concern that it may not be desirable, or even feasible, to maintain high levels of rice production because of the continuous pressure this places on multiple-cropped

[37] For example, in the Red River Delta around 7% of agricultural land, mostly outside the dykes, is used for the production of subsidiary crops such as soybeans, maize and vegetables. Rice production, which requires irrigation in the north is grown within the dyke system (Viet Nam MOSTE, 1995a).

lands.[38] In consequence, 'a more comprehensive food strategy has now been formulated, taking into account all facets of the problem, including the inter-relations between ecological conservation and agricultural expansion, between cultivation and animal husbandry, between food crops and industrial crops, and between agriculture and industry' (Viet Nam SPC and UNDP, 1990: 90). Increased rice output may also have played a role. For example, the draft Public Investment Programme states that as the country is now a surplus rice producer, some marginal food production areas will be encouraged to switch into industrial crops (Viet Nam SPC, 1995). However, it is not clear to what extent the diversification strategy has stretched beyond consideration of the most obvious agro-climatic differences to include local natural hazard risks. Diversification may also have begun to accentuate regional disparities as more fertile, less disaster-prone areas face greater diversification opportunities as well as often benefiting from higher rice yields. Meanwhile, agricultural production in, for example, the Central Northern Coast is constrained by the high incidence of natural disasters as well as the relatively hilly terrain and sand dune encroachment. As already suggested, poorer households could also be less inclined to diversify out of rice and other food crops into cash crops because they are preoccupied with attaining self-sufficiency.

Vulnerability to disasters Natural disasters reduce agricultural productivity, both directly via the damage inflicted to standing crops and indirectly via their impact on cropping decisions. There are additional multiplier effects for other sectors which source the agricultural sector or are dependent on agricultural inputs. Broader macro-economic impacts may also be felt in terms of, for example, lower government revenue and export earnings, the potentially inflationary implications of higher agricultural prices (see Box 3.1) and lower agricultural sector earnings, in turn reducing aggregate demand. The extent of damage partly depends on the timing of a disaster relative to the agricultural cycle and the crop mix, as well as the severity of the hazard itself. Floods and typhoons typically occur within certain months of the year, as already noted, and agricultural patterns have been adapted to accommodate these patterns (see below). Disasters occurring earlier or later than normal can therefore be particularly damaging, whilst slight variations in weather patterns forcing adjustment in agricultural behaviour can also increase vulnerability. For example, delayed planting of summer crops due to a late start to the rains implies that crops are more vulnerable to floods, which typically occur from the autumn.

[38] In the past, areas which were highly unsuited to rice production were nevertheless expected to grow other food crops, again reflecting the government's over-riding concern to ensure food self-sufficiency. For example, in some areas high-value tea was replaced with low-value sorghum (UNDP, 1993b). However, diversification out of food crops has now been permitted in these areas as well.

In Viet Nam, most disaster-related agricultural losses occur as a consequence of floods, which, in turn, may accompany typhoons. Floods destroy both standing crops and agricultural infrastructure, including irrigation systems. Damage to stored rice, and presumably other crops, is reported as an additional problem.[39] Floods can also have an adverse impact on future crops. For example, prolonged floods can delay the planting of new crops as, for example, occurred following the 1993 floods in the Mekong Delta. Floods can result in water logging if drainage facilities are inadequate, sometimes implying that farmers have to wait a full year before the next harvest. The deposit of sediment in unwanted areas, such as in irrigation channels, can also reduce future productivity at least temporarily, although deposits of silt can also play an important role in fertilising cultivated land. Meanwhile, coastal flooding can prevent production of annual crops for several years and destroy perennial crops and trees, in turn resulting in increasing aridity. For example, Lustig (1993) reports that large areas of the Central Provinces are inundated by seawater every 3–5 years.

The strong winds associated with typhoons can also uproot crops and trees whilst breaking the branches of and defoliating remaining trees. Meanwhile, droughts reduce yields of most crops, with the notable exception of sugarcane which, to some extent, performs better under poorer rainfall conditions. Both floods and droughts are also associated with an increased incidence of pestilence and crop disease, with further adverse implications for crop yields. For example, floods are associated with increased outbreaks of golden snails, which eat young rice plants. Crops in the north of the country can also be destroyed by particularly cold spells.

Disaster-related losses Available data indicate that since 1971 Viet Nam has lost well over 6 million tonnes of rice as a direct consequence of water-related disasters alone, while almost 83,500 km^2 of rice fields have been submerged and nearly 22,000 km^2 have remained unharvested (Table 4.2).[40] Moreover, true losses are probably considerably higher. Unfortunately, however, strong upward trends in agricultural production over the past 15 years make it difficult to isolate the impact of natural hazards on crop yields or even to compare relative disaster-related losses in different regions of the country.

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[39] Rice is normally stored in the upper part of houses and so is not damaged by low-level flooding. However, higher floods as well as flash floods can destroy both houses and rice stores (Gupta, 1990). Even if the rice is not washed away, it may nevertheless have to be discarded if it is too wet to be milled.

[40] It is not clear whether rice production losses refer to total losses as a result of unharvested and reduced yields or only to losses in stored paddy or rice which has already been harvested. Data for other crops are not readily available.

Table 4.2

Estimated flood and typhoon damage in Viet Nam

Year	Value of losses (US$m)	Deaths (units)	Rice fields submerged (km2)	Unharvested rice (km2)	Lost rice production ('000 tons)	House damage ('000s)
1971	78	594			289	158
1973	57				400	18
1977	5	153	928		223	163
1978	20	676	12,976	6,359	1,343	652
1979		46	1,642	1,076		35
1980	10	403	27,783	1,864	324	225
1981		274	1,056	404		49
1982		97	1,044	704		175
1983	19	818	3,932	798	187	357
1984		464	4,174	2,284		282
1985		1,013	5,304	2,195		344
1986	110	797	3,543	321	1,098	787
1987	28	140	1,332	78	166	242
1988	35	292	1,429	626	170	284
1989	74	484	6,428	1,642	806	1,290
1990	17	354	1,722	455	169	220
1991	44	480	2,019	767		398
1992	62	352		456		277
1993	82	387	2,300	896		257
1994	260	507	5,739	892	1,000	634

Source: DMU, 1995.

These constraints to formal analysis are underlined by regression analysis undertaken by Tran (1994), exploring the role of fertiliser availability[41] and cooperativisation[42] in determining total grain and rice yields over the period 1976–90. Adopting a logarithmic form, Tran found that these two factors alone explained 99% of variation in grain yields and 98% in rice yields. Tran thus concluded that 'weather can be considered a random factor which explains only 1% of the variation in the expected yield' (p.42). For the purposes of this study, Tran's analysis of rice yields was extended out to 1993 and similar results obtained, with fertiliser availability and the cooperativisation dummy together explaining 97% of variation in yields over the period 1976–93. However, Tran's conclusion about the insignificance of weather variability is questionable. Both his analysis and the extended version conducted for the purposes of this study cover a period when agricultural sector performance has been heavily dominated by underlying structural changes, resulting in strong upward trends in productivity which have more than compensated for the impacts of any adverse factors such as natural disasters. For example, rice production was 3% higher in 1994 than in 1993 whilst yields were 2.3% higher, despite the particularly severe flooding in the latter year.[43] Tran also failed to distinguish between regions and his results may, in fact, be heavily biassed by trends in productivity in the less disaster-prone, high rice-producing Mekong Delta, which alone accounted for half the national output in 1994. Disaggregated analysis could reveal more pronounced inter-yearly fluctuations in yields, particularly in the more disaster-vulnerable North Central Coastal region.

Natural hazards can also result in heavy livestock losses, with both shorter- and longer-term impacts on affected households. Some 60% of cultivated land is prepared by draught animals (Viet Nam MOSTE, 1995a). Furthermore, since 1986 livestock production has grown rapidly, becoming an important source of cash income for farming households.[44] Livestock losses therefore potentially reduce agricultural productivity in the shorter-term, until livestock can be replaced. They also deprive households of a major source of cash income, which might otherwise have been used

[41] Although not explicitly acknowledged by Tran, fertiliser availability effectively acts as a proxy for the availability of all yield-enhancing factors, including other agro-chemical inputs, improved crop varieties and increased labour input.

[42] Tran constructed a cooperativisation dummy which was set at 1 in 1976–88 and 0 for subsequent years.

[43] For example, bad floods in 1994 resulted in the loss of 200,000t of rice in the Mekong Delta as well as 500,000t in the north of the country.

[44] For example, a recent survey in the Red River Delta revealed that up to 60% of cash surpluses are derived from small-scale livestock production (Viet Nam MOSTE, 1995a).

for, perhaps, the purchase of seeds or to meet schooling or health care expenses. Livestock production itself is also temporarily reduced.

Floods and typhoons also have an indirect impact on agricultural productivity via their impact on investment decisions, as already suggested. In areas where structural flood control measures are weak, investment in irrigation is effectively inhibited even where such investments could result in significant gains in yields or permit multiple-cropping. For example, in the Central Provinces a more extensive irrigation network would both limit the duration of any salinity problems and improve productivity, particularly in areas which can currently support perhaps only one rice crop per year. However the risk of destruction of irrigation infrastructure as a consequence of flooding is also relatively high, effectively limiting the scale of investment in irrigation as well as in other yield-enhancing agricultural inputs.[45] In fact, there is strong support for an expansion of irrigation at all levels of government in Viet Nam (Vo-Tong Xuan and Timmer, 1990) as one of the principal ways of increasing agricultural production. The World Bank (1995a) also stresses the importance of an expansion of the irrigation network in both increasing agricultural productivity and helping to address problems of poverty. However, although there is considerable potential for further irrigation in most provinces, neither the government nor farmers are willing to undertake such investments without adequate flood protection. In the meantime, it is likely that efforts to increase agricultural productivity will be focussed on areas with existing flood protection and therefore existing irrigation networks, again potentially increasing regional disparities.

Coping mechanisms Coping mechanisms effectively complement structural disaster mitigation and prevention strategies, reducing the impact of disasters at both the household and, by implication, national level. Indeed, current agricultural practices in Viet Nam to some extent reflect household efforts to reduce their vulnerability to natural hazards, although any such strategies were to some extent limited in the past by the government's efforts to promote rice production.

Evidence of household coping strategies is perhaps most obviously reflected in the choice of rice varieties and the extent of use of agricultural inputs, revealing good local understanding about the suitability of different varieties to local growing conditions. In more hazard-prone areas of the country, rice varieties and levels of agricultural inputs are selected to minimise risks both in terms of a variety's growing season relative to normal peak flood and dry periods and its relative tolerance to flood, drought and saline conditions. For example, Anh et al. (1993) report that in the

[45] In other parts of Viet Nam, including large parts of the Mekong Delta, the potential for irrigation is limited because of the risk of salinity intrusion during the low river flow season. This could become an increasingly widespread problem as more water is extracted for irrigation and other purposes further upstream.

Central Coastal region agricultural inputs are largely concentrated on the winter-spring rice crop because the summer-autumn crop faces the risk of drought during the planting period and of typhoons and sea intrusion around harvest time.

In terms of crop varieties, some newer high-yielding varieties of rice offer the advantage of shorter growing seasons, in theory permitting possible cultivation as a summer-autumn crop which can be harvested before the normal onset of the typhoon season. However, such varieties are also less tolerant of floods, salination and drought, making them more vulnerable to the risk of early floods. They are therefore most commonly used for the winter-spring crop, when hazard risks are lower, although the International Rice Research Institute has been asked to develop taller varieties which are better able to withstand the effects of floods. In the meantime, traditional taller varieties are favoured for the summer-autumn crop in more flood-prone areas, although high-yielding varieties are used in irrigated areas as they can be planted slightly earlier, permitting harvesting before the cyclone season begins. Summer-autumn crops are not grown at all in the most flood- and typhoon-prone regions of the country.

More generally, recent reforms would be expected to reduce the overall vulnerability of the agricultural sector to natural disasters by providing farmers with the opportunity to diversify into crops more appropriate to local growing conditions, including natural hazard risks. For example, mango production has recently begun in the drought-prone Lao Bao province as marketing opportunities have improved (UNDP et al., 1995). However, various factors have limited the extent of diversification to date. For example, there have apparently been some recent moves to restrict the ability of farmers to move out of rice production (ibid.). The physical isolation of some communities may also have limited crop diversification, with farmers choosing to concentrate production on rice and other crops for home consumption. Improved transport infrastructure together with the lifting of regulations on the movement of goods should permit greater diversification in the future. In some areas, diversification is also being delayed until other types of supportive investment are put in place. For example, the drought- and typhoon-prone climate of Gio Thanh commune, Quang Tri province in North Central Viet Nam is not very suitable for rice production, particularly since there is little technical scope for irrigation, but could support pineapple cultivation. However, given the limited local demand for pineapples, the construction of a local pineapple canning factory and a lowering of the currently regulated sugar price are required before many farmers can begin to produce pineapples on a profitable basis (UNDP et al., 1995).

Furthermore, diversification does not necessarily imply an immediate reduction in vulnerability because knowledge about the relative suitability of new crops and varieties to local conditions may be limited. Indeed, some farmers could become increasingly vulnerable to natural hazards in the shorter-term. For example,

Christoplos (1996) reports that fruit growing is becoming increasingly widespread in the Mekong Delta yet that 'this may be where economic losses have affected families most severely. Orchards can usually withstand short floods, but if the trees remain inundated for a longer period of time, the major, long-term investment in the trees will be lost' (p.4).

However, increasing vulnerability is not inevitable. Instead, it can be overcome by the provision of appropriate agricultural extension services and back-up research. For example, farmers have been encouraged through such services to alter their planting and harvest times to reduce susceptibility to typhoons (UNDHA et al., 1994). Unfortunately, however, agricultural extension services are still in some turmoil following the break-up of the cooperatives, through which they were previously provided. Furthermore, agricultural extension workers themselves may require increased training in hazard-management strategies rather than, as UNDP et al. (1995) report is currently the case, focussing their efforts on relatively high input and more complex technologies which largely benefit better-off farmers.

Adequate disaster warnings can also provide farmers with an opportunity to minimise disaster-related losses by undertaking certain measures immediately prior to a the onset of a hazard (see section 7.5). They can allow farmers time to move livestock and agricultural equipment to higher ground and, depending on the timing of the disaster relative to the agricultural cycle, to harvest crops. For example, the severe 1994 floods in the Mekong Delta occurred whilst crops were still in the fields but the warning system permitted some premature harvesting, even if the yields obtained were only half normal levels. More generally, emergency harvesting operations can be particularly successful in saving crops in the north of the country where average farm sizes are considerably smaller than in the south.[46] High school pupils and the army may also be seconded into such operations whilst increased mechanisation could improve future capability for rapid harvesting in expectation of an imminent disaster in the south as well.

In terms of national coping mechanisms, emergency rice stocks are maintained which can be drawn upon to make up production shortfalls, to some extent averting rice shortages and, thus, major price increases in the aftermath of a disaster. However, it is not clear what size of stocks is maintained. Moreover, the maintenance of food reserves is very costly and some commentators have therefore argued that part of the reserves should perhaps be held in a monetary form instead. However, some level of in-kind reserves should be maintained as emergency imports can take some time to organise whilst the international rice market is itself prone to fluctuations.

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[46] Using manual labour, a single person can harvest 0.25 ha of paddy in about 3–4 days.

Government agricultural policy The government continues to attach considerable importance to the agricultural sector in its medium-term planning, in part to eliminate food shortages and help increase rural incomes but also as a fundamental component of more general economic growth, as already noted. However, the government has not made much progress in reducing the vulnerability of the agricultural sector to natural hazards or even, it would appear, in recognising the importance of so doing. For example, the draft Public Investment Programme (1996–2000) outlines four priority tasks for the sector over the period of the programme, none of which directly relate to efforts to reduce its hazard-vulnerability other than in the context of structural flood control measures and irrigation and drainage.[47] Another official document does go further, calling for measures 'to change the cultivation system and select crops which are suited to the natural conditions of each region' and 'to heighten the awareness of the population so that they can combat natural disasters more effectively' as part of its policies to reduce vulnerability to natural disasters (Viet Nam Government, 1995a: 25). However, there is little indication that the government is, for example, developing detailed regional crop strategies which take account of local hazard risks. Indeed, the Ministry of Agriculture is planning crop diversification in areas which have surplus food crop production rather than aiming to exploit comparative agro-climatic advantages (Viet Nam MOSTE, 1995a), a strategy which suggests little appreciation of the scope for mitigating the impact of natural disasters by perhaps encouraging diversification out of food crops such as rice in some areas.

It has also been suggested that agricultural intensification, taking advantage of opportunities for substantial increases in agricultural production, will (presumably, in the longer-term) 'help reduce the need to cultivate in areas less suited to such use and thus more prone to degradation' (Viet Nam SCS et al., 1991). Whilst this proposal offers one way of reducing agricultural vulnerability to natural hazards simply by reducing the scale of cultivation in more hazard-prone and thus, by definition, less suitable areas, any such policies need to be considered extremely carefully, particularly in terms of the alternative income-generating opportunities for local communities.

More fundamentally, the government urgently needs to undertake a careful assessment of the agro-ecology of the country, including a hazard risk assessment, as a basis for the formulation of a more appropriate agricultural strategy. This is by no means a new suggestion. For example, Pho and Tuan (1994) point to the agricultural sector's vulnerability to natural disasters and call for both further studies of their effects, in order to determine selection of appropriate cropping patterns, and also for

[47] Similarly, a Viet Nam SPC and UNDP report (1990), for example, only mentioned natural disasters indirectly in the context of future policy issues for the agricultural sector, in terms of identifying an urgent need for a secure supply of food in traditional food deficit areas. The report failed to identify natural disasters as a possible constraint to future productivity increases.

constant surveillance to allow time to undertake timely disaster prevention or mitigation measures. Similarly, a recent report on climate change called for various measures to adapt to more irregular climatic conditions including: further investigations of the country's agro-climatology, with findings disseminated amongst farmers; flexible crop portfolios which can be adjusted to factors such as early/late starts of different seasons; and development of more appropriate varieties (ADB, 1995) . Such measures would also help minimise the economic consequences of natural disasters, assuming hazard risk assessments are included as part of any research. However, such a programme has yet to be developed.

5. External sector and natural disasters

In theory, major disaster shocks would be expected to create balance-of-payments difficulties to the extent that they reduce the availability of goods for export whilst increasing the level of imports to meet disaster-related shortages and to repair or replace damaged capital infrastructure. Depending on the level of foreign-exchange reserves, this could necessitate external borrowing, with implications for future levels of debt-servicing and, ultimately, economic growth. Any worsening of the balance of payments could also exert pressure on the exchange rate and thus undermine a country's international competitiveness, again with potentially serious consequences. In addition, there are certain budgetary implications in so far as government revenue is derived from various export and import duties and tariffs. Indeed, in Viet Nam import and export taxes accounted for 24% of government revenue in 1994. However, to the extent that natural disasters have a domestic recessionary effect, demand for non-essential imports could decline, at least alleviating some of the pressure on the balance of payments if not on budgetary resources.

In practice, any analysis of the impact of natural disasters on Viet Nam's balance of payments is again complicated by major reforms since 1988 as well as by the fact that the country experiences disasters on some scale every year. Prior to 1988, exports had been discouraged by overvalued exchange rates and low procurement prices whilst imports had been limited by an extensive system of quotas and licences. However, the government has since adopted a market-orientated export-led growth strategy, in part to compensate for the adverse effects of declining CMEA trade and aid.[48] These reforms have helped restore the country's international competitiveness and opened the doors to international trade. The subsequent lifting of the US-led trade embargo in 1993 has provided an additional impetus to external trade. In consequence, the country has experienced a rapid increase in levels of trade, in part boosted by rising domestic productivity, accompanied by substantial changes in both the composition of exports and major trading partners. Exports increased almost five-fold between 1988 and 1994 while imports rose three-fold.[49] Moreover, there is little evidence of any slowdown in trade, with even higher annual growth rates forecast for both exports and imports in the second than in the first half of the 1990s.[50]

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[48] Trade from CMEA countries rapidly declined from half of total trade in 1988 to only 8% by 1991 alone. This trade had been on a largely barter, rather than hard currency, basis.

[49] As a percentage of GDP, exports rose from 18 to 23% of GDP between 1989 and 1994 whilst imports rose from 23 to 29%.

[50] Exports are forecast to increase by 24–28% per annum between 1996 and 2000 and imports by 22–24% (Viet Nam Government, 1995d).

As already noted, the increase in the overall levels of exports has been accompanied by a significant change in their composition. There has been a particularly dramatic increase in petroleum exports, which rose ten-fold (in both value and volume terms) between 1988 and 1994 to become the country's single most important export. Handicrafts and light industrial exports have also taken off following large investments in the textile industry, to become the country's second largest export by 1993, with rice in third and tin in fourth position. Despite continued pockets of domestic food shortages, Viet Nam began to export rice from 1989 as domestic production rapidly expanded (see Chapter 4). By 1994 rice exports formed 11.9% of total export earnings. The market reforms have also encouraged rapid growth of other exports including of coffee, rubber and marine products (particularly shrimp) as well as a range of other forestry and agricultural products. Despite growth in non-agricultural exports, agricultural, fisheries and forestry exports still accounted for about half of total exports in 1994.

The importance of rice as well as of agricultural, fisheries and forest product exports more generally raises questions about the disaster vulnerability of the country's exports. In fact, there appears to be little correlation between levels of rice exports and the incidence and severity of natural disasters to date. For example, rice exports increased from 1.7 to 2.2m tonnes between 1993 and 1994 as strong underlying growth in rice production more than compensated for any losses as a consequence of serious flooding in the latter year. Multi-cropping of both rice and other crops could also have implied that annual data hid shorter-term crises in foreign exchange earnings. However, as annual productivity gains ease off, the impact of disasters on lost rice export opportunities will become more transparent, potentially creating balance-of-payments difficulties. Levels of rice exports could also become more prone to disaster-related inter-yearly fluctuations as the country's transport infrastructure improves and the domestic market becomes more closely integrated, implying that shortages in one region of Viet Nam will be met by transfers from another, rather than going at least partly unmet as in the past, effectively reducing export surpluses. In the longer-term, however, rice exports could decline in both relative and absolute terms as, as some commentators have suggested, current levels of rice exports may be too high relative to the country's domestic consumption and reserve requirements whilst, anyhow, the country may be unable to sustain its currently high levels of rice production (see Chapter 4). Indeed, rapid growth of some other exports as well as the rise in external assistance flows imply that the country could sustain a decline in rice exports (WFP, 1996).

A decline in rice exports would not necessarily reduce the vulnerability of the export sector to natural disasters, however, as other agricultural exports as well as aquacultural and agro-processing products and even, to some extent, oil exports could be adversely affected by natural disasters. Thus, natural disasters could create

potential foreign exchange difficulties in the future, particularly as recent dramatic increases in exports tail off.

The external sector is already relatively vulnerable to any such export shock since, with the exception of 1992, the balance of payments has been in deficit in every year since at least 1989 as imports have consistently exceeded exports. External deficits have been financed by a large accumulation of arrears, based on a mixture of official and commercial lending. Although the debt-servicing ratio has fallen in recent years, as a consequence of both higher export receipts and some debt rescheduling in 1994, there is considerable concern on the part of both the government and donors to avoid the accumulation of further debts[51] and thus to help to ensure external viability. However, a severe natural disaster could partly undermine such efforts.

[51] In 1994, Viet Nam had a debt of some $4.2bn in hard currencies plus an additional 10bn rubles debt which has to be re-paid in US dollars at a rate of exchange yet to be determined (ADB, 1995). The hard currency debt-service ratio was reduced from 26.8 in 1993 to 12% in 1994 as a consequence of debt rescheduling.

6. Government budgetary aspects of natural disasters

Natural disasters can have several important implications for government budgetary resources. Public-financed mitigation and prevention measures exert continual and potentially significant demands on limited budgetary resources whilst relief and rehabilitation operations can imply additional unplanned expenditure or the partial redeployment of prior allocations. Meanwhile, government revenue may also be adversely affected in the event of a disaster as lower levels of economic activity, possibly including a decline in imports and exports, reduce direct and indirect tax revenues. In consequence, a government may face increasing budgetary pressures which it will be obliged to meet by increasing the money supply, running down foreign-exchange reserves or increasing levels of domestic and/or external borrowing. These various financing options, in turn, have potentially significant knock-on effects. The creation of base money is inflationary. Domestic borrowing exerts upward pressure on interest rates and can result in a credit squeeze. Foreign borrowing can result in an appreciation of the exchange rate, reducing prices of imports and increasing those of exports. It can also place future strains on the economy via higher debt-servicing costs. A run-down of foreign-exchange reserves is limited by the very size of those reserves and, again, entails an appreciation in the exchange rate, with possible associated risks of capital flight and a balance-of-payments crisis.

In the case of Viet Nam, the budgetary implications of the country's frequent natural disasters appear to have been relatively easily overcome in the past, even if demands for structural flood control measures were not fully satisfied, reflecting the government's control over considerable financial, capital and labour resources. More recent reforms have resulted in a decline in the government's direct control over resources, particularly labour. Thus, disaster-related activities, which have traditionally been very labour-intensive (see section 7.2), now have to compete more directly with the full spectrum of other public investment and recurrent cost requirements.

Despite these changes, it remains difficult to isolate the impact of natural disasters on either government expenditure or revenue at the aggregate level, although it is important to stress that this does not imply that natural disasters do not have important budgetary implications. For example, despite serious floods, the government achieved an overall budget deficit of 1.7% GDP in 1994 (excluding external grants and loans and domestic borrowing) compared to an equivalent figure of 4.8% the previous year. However, such observations need to be placed within the context of overall fiscal objectives and budgetary trends. Maintenance of a manageable fiscal deficit has been considered fundamental to continued macroeconomic stability and deliberate efforts have therefore been made to reduce the deficit, including measures both to restrain public expenditure growth and ensure buoyant tax receipts. As a consequence, the

government has achieved a gradual decline in its budgetary deficit, from 7.5% of GDP in 1989 to 1.7% in 1994 (Viet Nam SPC, 1995) making it difficult to isolate any budgetary impacts of natural disasters over the same period. However, as the economy enters a more stable period, with fewer structural changes, the budgetary impacts of natural disasters at a more disaggregated level could become increasingly apparent. This is particularly likely to be the case given that tax revenues are now nearing 25% of GDP and so are unlikely to rise much further in the immediate future, even though the tax reform process is continuing.

Disaster-related expenditure A more detailed examination of disaster-related expenditure indicates that natural disasters do impose a considerable strain on public resources. Budgeted government spending on directly disaster-related activities totalled slightly over 150bn VND (US$14.4m) in 1993 and 240bn VND (US$21.9m), or 0.5% of total preliminary expenditure estimates, in 1994 (UNDHA et al., 1994) (see Chapter 8).[52] Other areas of government expenditure – for example, environmental preservation, drainage, irrigation and housing – also incorporated various disaster mitigation- and prevention-related activities.[53] In addition, Viet Nam has a very extensive programme of social protection, including social relief measures, which are made available in the aftermath of a disaster.[54] Moreover, although there are certain budgetary reserves at the level of both central and provincial government which can be used in the event of a disaster, in all likelihood other budgetary allocations are also probably squeezed in the event of a severe natural disaster. Thus, total disaster-related expenditure is probably considerably higher than direct figures alone suggest.

Nevertheless, despite the considerable budgetary drain which natural hazards pose, there is certain evidence that disaster mitigation and prevention investment requirements are not anywhere near being fully met, reflecting broader budgetary constraints. Central government funding accounts for around two-thirds of capital expenditure (at least as of 1992). Provincial allocations are determined annually, based on expenditure requests and individual negotiations with each province. Standardised per capita rates are applied in calculating allocations for certain items such as education and health whilst for other items, such as infrastructure, expenditure

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[52] Data for earlier years is not available.

[53] For example, in 1989 about 20% of total national investment was allocated to irrigation and water control projects, including irrigation (Viet Nam SPC and UNDP, 1990).

[54] Expenditure on pensions and social relief, which are reported as a single item, amounted to 6.9% of the discretionary budget in 1989 and 9.4% in 1993, of which perhaps slightly under a tenth could be assumed to be spent on natural calamity relief. Available data for 1994 indicate that expenditure on natural calamity relief constituted 7.9% of total budgeted expenditure on pensions and social relief in that year (World Bank, 1995a).

is projected using specified norms. In practice, however, norms are set too low and capital expenditure allocations, including for disaster-related investments, may be grossly insufficient. For example, the World Bank (1995a) reports that:

> 'in Thanh Hoa province, where cyclones are a recurring phenomena, the sanctioned budget for strengthening and maintaining 937 km of embankments is generally only about 10% of what is requested by the province – which itself is only a fraction of what is actually needed for its proper maintenance. Even after mobilizing community help by way of voluntary labour (through embankment protection committee), the province is thus able to select only the very weakest segments of embankment every year for strengthening. The current rigidity of provincial budgets prohibits reallocation of funds between line items. Thus, provincial resources are spread too thinly across too many items, and services most important for that locality remain underfunded' (p.42).

Furthermore, pressures to cut disaster-related expenditure, in particular, could intensify in the future as direct income-generating investment is increasingly emphasised. Tighter management of budgetary resources has already implied that all government expenditure is being increasingly closely scrutinised. Furthermore, the government has been unwilling to reduce social spending too far because of its particular concerns about the social dimensions of reform, effectively placing additional pressures on other categories of expenditure.[55] These combined pressures have forced a considerable streamlining and rationalisation of government activities at the same time that efforts to institute a rapid growth market economy have underlined an acute need for public investment in basic infrastructure (UNDP, 1995c). The government has therefore decided to focus particularly on essential economic infrastructure and human capacities which support the expansion of productive activity.[56] This, in turn, demands careful assessments of the opportunity costs of various investments. Yet there are particular difficulties in measuring the true

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[55] Overall spending on social sectors rose from 15% of discretionary government expenditure in 1989 to 25% in 1991, 23% in 1992 and 25% in 1993, according to World Bank (1995a) data, with further rises, at least in real absolute terms, in 1994 and 1995. Real social services expenditure per capita increased by 117% between 1989 and 1993 and by a further 20% between 1993 and 1995. Per capita pensions and social relief alone rose by 79% between 1989 and 1993.

[56] As part of the efforts to rationalise its investment expenditure, the government has drawn up a draft Public Investment Programme (PIP). The PIP outlines investment priorities totalling 460,000bn VND (US$40.3bn) over the period 1996–2000, including allocations for disaster-related activities. However, it is difficult to ascertain the total share allocated to these activities alone as they are scattered across a range of sectors whilst a detailed disaggregation of allocations is not readily available. Difficulties in estimating total investment resources allocated to disasters are further compounded by the fact that the PIP includes all medium and large projects but smaller provincial ones are excluded to avoid over-centralisation and, thus, implicit decision-making and administrative delays.

returns to disaster-related investments, reflecting considerable non-quantifiable benefits. This suggests a need for the upward revision of estimated cost-benefit ratios of disaster-related investments to take account of indirect as well as direct benefits.

There is also some evidence of pressures to reduce post-disaster relief expenditure. For example, the activities of the Viet Nam Red Cross, which plays an important role in such operations, used to be almost entirely funded by the government. However, the organisation is increasingly having to seek private funding for its relief work instead, particularly from overseas.

Revenues The complexity of the tax system would make it difficult to assess the impact of natural disasters on government revenue, even if such data existed in the public domain.[57] There are four tiers of government, with revenue collection, transferral and disbursement occurring at various levels. The situation is further complicated by the fact that local governments have the right to levy certain fees for their own purposes, some of which do not even have to be recorded as local government revenue.

Nevertheless, natural disasters almost certainly reduce government revenue, both via their direct impact on economic productivity and trading activity and due to the practice of granting tax exemptions in the event of a disaster, with the objective of alleviating pressure on affected communities. For example, turnover and enterprise taxes are based on assessments of the scale of a business (rather than reported turnover or profits). Each public and private enterprise is visited every three months and a provisional rate of taxation determined for the forthcoming quarter based on both the size and nature of the business. This implies some opportunity to adjust taxes in the aftermath of a disaster, if considered appropriate. Similarly, agricultural tax exemptions appear to be granted in the event of crop damage. Although agricultural taxes are relatively unimportant in national tax revenue, generating a mere 2.7% of the total in 1994 (IMF, 1995), they are much more significant as a source of rural revenues, implying potentially significant implications for the availability of both communal- and provincial-level funding.[58]

As already noted, Viet Nam operates a system of resource transfer, whereby certain provincial revenues are reallocated by central government, effectively entailing some redistribution between provinces and so offering some possible mechanism for

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[57] There is some apparent divergence of opinion about how the tax system functions. ADB (1995: 9.19) reports that in the past the fiscal system was 'essentially unitary and all taxes were centrally set and collected'. However, evidence from other sources suggests that there was, and remains, a certain degree of flexibility.

[58] Communes are also allowed to retain some taxes and levies, including 10% of income from agricultural taxes which they use as discretionary funds (World Bank, 1995a).

compensating disaster-stricken provinces. However, in practice it appears that a province which suffers declines in revenue in a particular year as a consequence of a natural disaster will not be compensated. To the extent that more disaster-prone provinces are also relatively poorer this can exacerbate inequalities.[59] It can also curtail particular government activities, with potential multiplier effects through the local economy.[60]

[59] Viet Nam operates some system of resource transfer, whereby part of the revenues raised at the commune, district and provincial level are passed up to central government and reallocated on a more equitable basis, effectively entailing some redistribution between richer and poorer provinces and communes. However, this system of transfers fails to redress imbalances fully and per capita expenditures remain approximately twice as high in some provinces than in others (ADB, 1995). The World Bank (1995a) reports that although per capita expenditures in the low-income provinces were generally slightly higher than in the middle-income ones, in turn reflecting some redistributional effects of intergovernmental transfers, per capita expenditure in the high-income provinces were considerably higher.

[60] Unforeseen increases in provincial expenditure can be met from a contingency fund established by the province but this must be recouped during the year. In practice this implies that most provinces have little flexibility with the exception of some of the more prosperous and rapid growth provinces where revenue targets are most likely to be exceeded.

7. Disaster management policy and practice: reducing the economic impact of disasters

Appropriate disaster management policies and practices are crucial in reducing the economic impacts of natural disasters. The mitigation of floods and typhoons has been an important concern of government for centuries in Viet Nam. Historically, particular emphasis was placed on structural flood mitigation measures, effectively incorporating certain aspects of typhoon mitigation. Structural measures include the construction of dykes and reservoirs, diversion channels, retarding basins groins, drainage systems and water pumps as well as dredging and clearing operations.[61] More recently, at least since 1971, the importance of non-structural measures has also been recognised, particularly in the face of limited public resources and thus the drive for more cost-efficient methods of protection. Non-structural measures comprise an array of essentially non-engineered activities including reforestation of mountainous, coastal and upstream areas (see Chapter 2); public education and training; vulnerability assessments; land-use control; the drawing up and promulgation of building codes; insurance; the operation of forecasting and warning systems; and the management of structural features. Viet Nam also validated a Strategy and Action Plan for Mitigating Water Disasters in November 1994, making it one of only a handful of countries worldwide to have adopted such a strategy (UNDP, 1995a) (see Box 7.1).

Although the emphasis has been very much on flood mitigation, some water disaster-related activities are also appropriate in overcoming the impacts of drought. These include increasing the reservoir capacity of waterways, construction of dams, afforestation and improved irrigation management. However, efforts to mitigate the impact of earthquakes have generally received less attention.

7.1 Management structure

The sheer number of organisations both affected by natural hazards and involved in mitigation, preparedness or relief efforts together with the increasing emphasis being placed on non-structural measures, the limited availability of public financial resources for disaster-related activities, the accumulating evidence on certain adverse implications of structural flood-control measures and the rapid pace of economic

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[61] Retarding basins are used to store water when flood waters exceed critical levels. Water pumps are used to remove water from land within the dyke system and from polders (or reclaimed land).

Box 7.1 Strategy and Action Plan for Mitigating Water Disasters

Viet Nam's Strategy and Action Plan for Mitigating Water Disasters was drawn up in response to the increasing frequency and severity of natural disasters; the threat of global warming; and recent social and economic changes, which were felt to have brought the need for a concerted effort to address the problems of water disasters to a head. The Plan outlines a three-pronged approach to water disaster mitigation: (i) forecasting and warning systems; (ii) preparedness and mitigation; and (iii) emergency relief and response (Table 7.1) (Viet Nam MWR et al., 1994). The Plan seeks an integrated approach, encompassing social, economic and environmental objectives as part of its broader aim of fostering the sustainable development of areas prone to water disasters. It also aims to ensure that all aspects of water disasters are addressed; that duplication is avoided; that activities are coordinated; and that activities combine a range of structural and non-structural measures.

As already indicated, the strategic approach indicated by the Plan is an important advance in itself. Moreover, progress has already been made under many of the Plan's 18 tasks (Table 7.1), However, the implementation of non-structural mitigation measures appears to have been less successful, with little headway to date in the design and introduction of new schemes to provide self-financed mitigation and disaster insurance schemes or in the introduction of land-use planning and building codes. Careful analysis is required to ascertain why these measures have not been implemented and to identify factors hindering their adoption. More generally, the Plan also contains one major weakness in failing to call for the incorporation of hazard risks into broader economic strategic planning.

change, in turn altering the nature of the country's vulnerability to natural hazards, together make strong coordination of disaster-related activities essential. Similarly, the complex issues surrounding water resources, which constitute both a resource and a potential hazard, demand careful management (see Box 7.2).

In fact, Viet Nam has a well-developed national and provincial disaster management structure, particularly with respect to typhoons and floods. This structure dates back centuries and is supported by various laws establishing powers and responsibilities.[62] Resources and responsibilities for disaster prevention and mitigation are spread across a wide range of institutions and organisations ranging from central government down to individual communes whilst also involving the international community. The current structure, is based around the Central Committee for Flood, Storm Control

[62] A flood fighting department was apparently amongst the first three government departments ever created in Viet Nam, the other two being agriculture and civil defence.

Table 7.1 Viet Nam: Suggested strategy for water-disaster mitigation

Forecasting and Warning Systems		Preparedness and Mitigation		Emergency Relief and Response	
Non-physical	Physical	Non-physical	Physical	Non-physical	Physical
1. Public Awareness. Training and Education -School programmes -Radio programmes -TV programmes -Print programmes	**2. Warning and Communication Systems** - National level - Provincial level - Local level	**6. Water laws and regulations** - Land use planning - Dikes - Flood and Typhoon - Building codes - Watershed management and forest law	**12. Watershed Management and Deforestation** - Remedial construction. - Modelling and monitoring.	**17. Institution Building for Relief** - Establish Disaster Relief Management Unit	**18. Emergency repair** - Equipment - Technology - Materials
	3.River Flood Forecasting - Weather radar - Hydro-meterological stations - Data transmission - Data base - River models	**7. Flood Insurance: and Self Financing** - Flood insurance - Revolving Fund	**13. Emergency Communication System** - Disaster Communication		
	4. Flash Flood Forecasting - Weather radar - Hydromet stations - Data transmission - Data base - River models	**8. Institution Building for Water-Disaster Preparedness (at the Provincial Level).** - Manuals - Procedures - Training - Facilities (computer, communications, etc.)	**14. Sustainable Management of the River Dikes** - Under - seepage - Overtopping design (Includes changing conditions and rehabilitation)		
	5. Typhoon Forecasting - Satellite ground station - Sea buoy system - Weather radar - Meteorological stations - Data transmission -Typhoon models	**9. Area Specific Studies (Master Plans and Watershed Studies)** - Basins - Geographic features - Flash flood prone areas - Reservoirs - Wetlands	**15. Sustainable Management of the Sea and Estuary Dikes.** - Overtopping design - New materials - New designs		
		10. Sea-water intrusion and Greenhouse Effect - Sea level rise (Greenhouse Effect) - Sea-water intrusion	**16. Sustainable control of the Rivers.** - Training - Sediment minimisation and control - Silting control - Erosion		
		11. Dike and Dambreak Studies - Emergency action plans			

Source: UN-DMT. 1995

Box 7.2 Water resources management

There are a number of potentially conflicting demands for water resources in Viet Nam. For example, the water requirements of coastal farmers and brackish-water aquaculture producers are at odds with one another. Similarly, the fresh-water requirements of farmers could conflict with the deep navigational requirements of sea and river vessels, possibly necessitating dredging and thus increasing the scale of seawater intrusion. To date, any such conflicts have typically been dealt with locally. However, the number of unresolved disputes is apparently increasing as no specific group or individual has been given clear responsibility for the management of water distribution and the maintenance of canals and structures since the breakdown in the cooperative system (Egan et al, 1994). Indeed, even in the past, the administration of the flood control and irrigation systems was apparently largely separate and there were some instances where the installation of one system impinged on the other (UNDHA et al., 1994).

These issues are particularly pertinent in the context of Viet Nam's slowly diminishing water resources and rising demand. Viet Nam is reported to have considerable, although as yet not fully investigated, groundwater reserves which have been better preserved than the country's surface water (Viet Nam MOSTE, 1994). Nevertheless, groundwater resources have been gradually depleted, resulting in increasing salination and a deterioration in quality. Meanwhile, demand for water looks set to expand with demographic growth, rising standards of living and continued expansion of the water reticulation network. Competition for water will also increase with the commissioning of additional hydro power stations (see Box 7.3). Pho and Tuan (1994) estimate that by the year 2000 the combined water requirements of the agricultural sector, industry and domestic households will amount to 35% of the total 260 km^3 water generated annually (presumably through precipitation) within Viet Nam and 12.5% of total river run-off. Furthermore, these water generation figures are based on annual averages when, in practice, run-off rates will be lower in the dry season, potentially implying future water shortages as well as restricting hydroelectric power generation and water transport if supplies are not well-managed. Any shortages could be compounded by increased water consumption in neighbouring countries, where two-thirds of Viet Nam's water resources are generated.

These various factors underline a clear need for a single integrated water resources strategy. Indeed, the government has already recognised the need for clear policies and strategies to identify the country's long-term water priorities (for example, Viet Nam Government, 1995c and Viet Nam Ministry of Construction et al., 1995). The government also needs to promote water conservation practices, set water charges at levels equivalent to the long-run marginal cost of supply and to adopt a coordinated water resources investment strategy.

and Disaster Preparedness (CCFSC&DP), which has ministerial status, the Viet Nam National Committee for the International Decade for Natural Disaster Reduction

(VNCIDNDR) and the Disaster Management Information and Training Unit (DMU).[63] Other government institutions, such as the Hydrometeorological Service, provide additional support whilst many are represented on one or more of the various committees, implicitly acknowledging the fact that disasters can have an adverse impact on many aspects of the economy. However, institutional arrangements specifically with respect to the management of earthquake hazards are much weaker. The Institute of Geophysics plays the lead role, with responsibility not only for research and the drawing up of seismic hazard maps but also for mitigation and post-disaster reconstruction.

Each ministry and government agency also 'has the responsibility, within its particular area of expertise, competence and mandate, to prepare for disaster control and management ... (and) each ministry has a special disaster preparedness unit that cooperates with the National Committee' (Viet Nam SCS et al., 1991: 59). Again, these arrangements implicitly acknowledge the multi-sectoral requirements of good disaster management although it is not clear how effective some of these units are in practice, particularly in incorporating disaster risks into overall sectoral strategic planning.[64]

Finally, there are various structures at the provincial level with responsibility for flood mitigation and relief activities. Indeed, much of the responsibility for water-disaster mitigation is delegated to provincial and, in turn, to district and commune authorities. For example, once a new dyke structure has been completed, it becomes the responsibility of the commune, which must maintain the structure and will only receive further assistance if there is a major breach of the dyke.

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[63] The CCFSC&DP was created in 1991 to coordinate water-related disaster preparedness and response, succeeding the Central Committee for Dyke Maintenance which had been in operation since 1946. The VNCIDNDR was also established in 1991, with responsibility for preparing communities and relevant agencies for a wide range of disasters, including earthquakes as well as floods and typhoons. Several ministries are involved in both the CCFSC&DP and the VNCIDNDR. These include the Ministries of Agriculture and Food Industry, Construction, Marine Products, Commerce, Energy, Transport, Finance and Science, Technology and the Environment as well as the State Planning Committee, The DMU was subsequently formed in late 1994 to strengthen national disaster management capacity, with particular emphasis on water disasters. Its objectives include the establishment of a disaster information system, enhancing the country's operational response capacity. The newest disaster-related institution, the Ministry for Flood and Storm Control, was created in October 1995 as a single administration with responsibility for all aspects of water-disasters, including the promotion of flood mitigation measures (DMU, 1996). The ministry chairs both the CCFSC&DP and the VNCIDNDR.

[64] Similarly, most ministries and state agencies have appointed a department with responsibility for environmental affairs, in response to the Law on Environmental Protection of January 1994 (UNDP, 1995c). It could be useful to compare and contrast the relative structure and effectiveness of the disaster and emergency units to identify how each could be strengthened.

7.2 *Structural mitigation and prevention measures*

The implementation of structural flood mitigation measures, such as river dykes and canals, dates back some 2,000 years. According to Phan Khanh (no date), the first law on the building of dykes was promulgated in 1103. By the mid-13th century, the mobilisation of the population, including the army, for the construction of dykes had become obligatory. Mass participation was endorsed under village regulations of the 15th–17th centuries whereby group support had to be provided if an individual was unable to repair the collapse of a dam or dyke by himself while those who failed to attend repair parties were fined. In the 19th century, strict legislation was enacted introducing the death sentence for those found guilty of damaging dykes or cutting bamboo grown in the dyke protection fences. In the event of the breach of a dyke, village and commune authorities held responsible received corporal punishment whilst rewards were given for the construction of dykes which performed particularly well. More recently, the importance of adequate flood mitigation measures was once again reindorsed in 1945, following a particularly severe flood, when the government adopted dyke maintenance and flood control as one of its highest priorities (Viet Nam MWR et al., 1994). As before, the mitigation efforts continued to rely on the annual mobilisation of the entire workforce to repair and maintain dykes, a practice which had been a normal feature of Viet Nam society for centuries (Viet Nam MWR et al., 1994).

As a result of these centuries of efforts, Viet Nam currently has some 5,000 km of river dykes and 3,000 km of sea dykes, stretching along much of the country's 3,260 km coastline and well into estuaries.[65] The dykes are managed by teams, each of which is responsible for 20–30 km of dykes. Without these dykes the area of cultivated land would be much reduced whilst the city of Hanoi, for example, would not exist as it does today.[66] Structural flood mitigation measures are particularly well developed in the densely populated Red River Delta, where demographic pressures, and, therefore, the need for increased agricultural production, have played an important role in increasing the spread of the dyke system. Without this structure, cultivation of the summer crop would not be possible due to water shortages whilst the spring crop would be threatened by early rains.[67]

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[65] In the Central Provinces, the coast is mostly protected by sand dunes rather than by dykes (UNDHA et al., 1994).

[66] Particular attention has been paid to the protection of Hanoi from major flooding of the Red River. These measures have included the construction of a new reservoir, Hoa Binh, with total capacity of 9.45 billion m^3, on the Da (Black River).

[67] Pho and Tuan (1994) report that in parts of the Red River Delta rainfall exceeds 200 mm in only two months each year, implying that rainfall is insufficient to meet the water requirements

However, despite the vast network of dykes, it is widely believed that the existing structures do not provide adequate protection and that further measures would be both economically and socially beneficial. There are two basic problems: (i) the dyke system does not cover all parts of the country; and (ii) much of the dyke structure which does exist is of a low quality, implying high maintenance costs. With respect to the former, some 250,000 ha of coastal areas in the Red River Delta, for example, are frequently threatened by typhoons and storm surges. Meanwhile part of the Mekong River is totally unprotected, leaving around 1m ha affected by tidal flooding and 1.7m ha by seawater intrusion. Sediment deposits have also expanded parts of the coastline, in turn generating even further demands for sea dykes as demographic pressures result in the economic development of this new land.

The quality of dykes has also not been particularly high traditionally, with emphasis on local labour-intensive initiatives involving the construction of earthen structures. This reflected an abundant supply of 'free' labour combined with limited financial resources. Labour is still mobilised very rapidly following the failure of a dyke to undertake emergency work, with repairs typically completed within a few days. However, at least in the case of sea dykes, these efforts normally simply entail the replacement of any earth, sand and stone which has been washed away rather than the upgrading of structures (Viet Nam MWR and UNDP, 1992). The poor quality has been effectively reinforced by the lack of regulations on standards of construction and by piecemeal building-up and repair of certain parts of the dyke system. Construction of roads and buildings along the top of the dykes has further weakened the structures whilst destruction of mangroves has increased the direct exposure of the dyke system to sea surges. Thus, for example, one survey of dykes in 12 northern provinces and cities reported that 14% were in a bad condition, 73% in 'average' condition and only 13% in good condition (Viet Nam MWR et al., 1994). Many sluice gates are also reported to be in poor condition (Viet Nam MWR and UNDP, 1992) whilst existing sea dykes are often too low (WFP, 1992).

The flood control system itself has also played some role in exacerbating, rather than reducing, the extent of flooding on some occasions. The gradual expansion and strengthening of the dyke system has gradually confined flows of water, implying that sediment is being increasingly deposited in the river channels rather than on the deltas. This has raised the height of the river channels, placing greater strain on the dykes and implying that when floods do occur they tend to be higher – and therefore more damaging – than in the past (Viet Nam MWR et al., 1994). In some parts of the river dyke system, flood ways are now some 5–6 metres higher than the land

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of even one rainfed rice crop.

protected by the dykes (UNDHA et al., 1994).[68] Similarly, even moderate storms can now cause extensive flooding in the Red River Delta towns where the river bed is now higher than the surrounding land (Viet Nam Government, 1995b) and so where the disposal of storm waters presents a particular problem. The situation is worsening as gradual urbanisation places increasing pressures on already inadequate drainage systems (Viet Nam MOSTE, 1995a). Indeed, in some areas, inadequate storm drainage has been viewed as a possible constraint to industrialisation (Viet Nam SPC and UNDP, 1990).

The gradual extension and strengthening of the dyke network may have also increased gross flood damage in the longer-term as improved dykes have instilled a false sense of security in the local population, encouraging them to undertake higher levels of investment than are possibly economically justified by the remaining level of risk. The correct balance also needs to be achieved between the degree of flood protection and the ability to allow the run-off of riverine and sea flood waters into the dyke system. Indeed, it is now thought that a careful cost-benefit analysis would reveal that some dykes are too high. In the light of the above problems together with improved warning systems and increased identification of alternative non-structural measures, UNDHA et al. (1994) even goes as far as to suggest that whenever a dyke is breached it should be considered whether, in fact, the dyke should be lowered or removed rather than repaired.

Reservoirs, a relatively new form of structural flood control in Viet Nam, can also create certain difficulties, reflecting their multi-functional purpose (see Box 7.3). In practice, they have also increased the length of duration of flooding because of the release of retained flood water.

River cut-off practices, which are undertaken to prevent seawater intrusion and permit irrigation, have also created additional problems by reducing sediment deposit at the mouths of rivers and so contributing to coastal erosion. For example, in one part of Hanam Province, the coastline is slowly retreating inland following the closure of the mouth of one waterway, in turn forcing the inward shift of villages and flood control measures, with the construction of new dyke and sluice gates every 5–6 years (Lustig, 1993). The most severe coastal erosion is reported in the Hai Trieu vicinity of Nam Ha province where erosion is estimated at 8–30 metres per annum, already claiming two successive lines of dykes. This, too, is believed to have been caused by sediment

[68] In fact, the destruction of dykes was proposed as early as the 19th century by a governor of Ha Ninh province, who recognised that the dyke system was slowly raising the bed of the Red River, a problem which could be averted if higher river flows were allowed to spread out over the flood plains.

Box 7.3 Electricity

Viet Nam has considerable hydroelectricity potential, derived primarily from the country's two river delta systems. In 1994, installed capacity accounted for only 24% of the country's estimated hydroelectric potential of 300bn kwh per year (ADB, 1994) whilst in 1995 hydroelectric power accounted for 70% of total electricity. Further increases in capacity are planned, with a number of hydroelectricity plants currently under construction. These developments will have the added advantage of reducing rates of deforestation for fuel wood purposes, thus helping prevent further increases in the incidence of natural disasters related to environmental degradation. However, forecast increases in demand imply that electricity production from all sources will have to increase by over 100% between 1995 and 2000 (Viet Nam SPC, 1995) and it is anticipated that increases in demand will out-strip those in supply, at least at peak-times.

Any shortages are likely to be compounded by the multi-functional, but in part conflicting, purposes of reservoirs to store water for power generation, to function as part of the flood control system and to increase dry season water flows to support irrigated agriculture, permit inland navigation and limit salt intrusion. For example, the Hoa Binh hydroelectric power station in north Viet Nam, which alone accounted for almost half of the total electricity generated in 1993 (IMF, 1994), can generate 1,400–1,600 MW of electricity in the dry season but only 1,200 MW in the wet season, once water levels in Hanoi reach 12.5 metres, because the reservoir then has to assume its flood control role. Reliance on hydroelectricity also implies that during periods of extended drought, certain conflicts could arise between the storage of water for power generation and its release for irrigation and other purposes. Alternatively, water could be deliberately retained in the reservoir as part of efforts to ration usage, in turn reducing hydroelectric output. This demands the careful management of both water and electricity resources, including early recognition of and appropriate responses to any changes in longer-term rainfall patterns.

deficit due to river cut-off practices. (Ziedler et al., 1995).[69] Such practices clearly entail high economic costs which should be taken into account in the design of flood protection schemes.

[69] Some coastal erosion is also reported to have resulted as a consequence of the destruction of mangrove forests as the coast has been incapable of fixing alluvial soil (Viet Nam MOSTE, 1994). Strong freshwater outflows, floods and typhoons can also contribute to coastal erosion.

Meanwhile, the benefits of diversion channels have been reduced by land pressures as areas within the flood plains have been settled for agricultural production, indicating the sometimes complex interactions between livelihood needs and longer-term flood protection requirements. For example, the construction of a channel to deviate flow from the Red River some 35 km upstream of Hanoi is reported to have resulted in intensive cultivation and inhabitation of the flood plain. A powerful lobby, representing the interests of some 500,000 residents, would now resist the operation of the flood diversion (Viet Nam MWR et al., 1995).

7.3 Non-structural measures

As already indicated, there has been a recent surge of interest in non-structural prevention and mitigation measures, in part driven by overall funding constraints and thus the need to achieve greater cost-efficiency. These measures have focussed particularly on floods and typhoons whilst other hazard risks – namely, drought and earthquakes – have been largely ignored.

Particular attention has been paid to mangrove re-planting, an interest driven by both the disaster mitigation and environmental lobbies. A number of non-governmental organisations (NGOs) and donors have also provided support in this area, often in conjunction with dyke construction and repair projects (see Chapter 10). Mangroves can protect sea and estuary dykes dissipating wave energy and reducing both the required degree of technical complexity of dykes and operational and maintenance costs. For example, the World Bank has estimated that well-planted mangrove forests can reduce annual sea dyke operation and maintenance costs by 20% in the Central provinces (Viet Nam MWR and UNDP, 1995).[70] However, further research is needed on the most appropriate varieties of mangrove, in terms of the protection they offer against strong winds as well as other characteristics. Alternative plants also need to be researched. For example, the World Food Programme (WFP) has been encouraging the use of Nipa palm, a dwarf palm with many branches which can also generate an appreciable additional household income from sales of roofing thatch.

The rate of uptake of other non-structural measures appears to have been relatively limited to date, reflecting limited local knowledge and indicating a need for public education. For example, Viet Nam SCS et al. (1991) reports that there have been few attempts by villagers to plant windbreaks around buildings although bamboo is reported to have been planted alongside some dykes, as, for example, in the vicinity of Hanoi, reducing erosion during the flood season (SWECO, 1993). Standards of

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[70] Mangroves also improve the ecological environment (including by providing suitable breeding and nesting places for certain fish, birds and mammals), promote aquacultural activities and potentially generate new sources of income (Viet Nam MWR and UNDP, 1995).

construction and levels of conformity to legislation on land use, particularly outside the dyke system could also be improved (see Section 7.4).

However, the need for greater local community involvement in disaster mitigation activities has been recognised, particularly in view of the important linkages between disaster mitigation and sustainable development (Viet Nam MWR et al., 1994). The DMU, for example, is planning a project to increase public awareness of non-structural solutions. Such efforts could be particularly pertinent in view of the increased mobility of the population, with newcomers to a region perhaps not fully cognizant of appropriate mitigation techniques in keeping with localised risks. UNDHA et al. (1994: 74) also points to the difficulties in 'maintain(ing) a political commitment to water-disaster mitigation, if there is not sufficient awareness of the hazard among the community at large'.

In the more impoverished coastal areas where disaster vulnerability is deeply intertwined with limited livelihood opportunities, there has been some discussion of improving the socio-economic conditions as part of efforts to reduce the impact of natural disasters. Even more fundamentally, efforts to adopt non-structural disaster mitigation and prevention measures need to be taken up at a broader policy level, incorporating disaster risks into sectoral planning for various aspects of the economy (see section 7.7).

7.4 Building structures and land use codes

Poor housing is reported to be the most important single cause of risk, broadly defined, for poorer urban households (UNDP et al., 1995). Viet Nam Living Standards Survey (VLSS) data indicate that 53% of the urban poor have flimsy, non-permanent housing, much of which is in low-lying areas with poor drainage facilities and thus vulnerable to flooding (Viet Nam SPC, 1994). Rural housing is also in a generally very poor condition and, again, often highly vulnerable to natural hazards. For example, in the Mekong Delta lower-income groups face the collapse of their homes every year during the annual flood season (Christoplos, 1996). Unsurprisingly, disaster-proofing of building structures has therefore been identified as an important non-structural disaster mitigation measure which should be widely adopted against water-related disasters (e.g., Viet Nam MWR and UNDP, 1992), wind (e.g., Viet Nam SCS et al., 1991) and earthquakes (e.g. Viet Nam MOSTE, 1994). The need for increased land zoning and promulgation and implementation of building regulations has also been recognised (see Box 7.4). In addition, systematic hazard risk mapping is required (e.g. Viet Nam MWR et al., 1994).

In fact, there is considerable traditional knowledge of appropriate building techniques and designs to reduce hazard-related damage, particularly with respect to floods and

Box 7.4 Seismological mapping and the Hoa Binh reservoir

The confusion created by the limited seismological mapping of Viet Nam is demonstrated by the example of Hoa Binh reservoir, located 70 km southwest of Hanoi, on the Da river. The reservoir is one of the largest artificial hydraulic reserves in south-east Asia. It was completed in 1989, with Soviet assistance, to supply water to the Hanoi delta regions, to protect the Hanoi region from flooding and to generate 8,400 GWh of power. However, certain concerns have subsequently been expressed about the seismic vulnerability of the reservoir and thus about the enormous potential threat posed to Hanoi should the reservoir be damaged. Some geologists hold that it is located in a very complex multiform geological area, comprised of several plates of differing ages and lying between two structures through which the Red River and Ma River fault lines run (e.g., Chuong et al., 1994). There have been many earthquakes in the area during the past century. However, it has been suggested that the weight of the reservoir has increased tectonic stresses, with a suggested ten-fold increase in seismic activity (Xuyen et al., 1994). In May 1989, there was an earthquake of magnitude 4.9 on the Medvedev-Sponheuer-Kárník (MSK) scale, the largest on record in the area, which was believed to be related to the construction of the dam. Furthermore, it has been estimated that an even more severe earthquake of magnitude 5.3 could occur (ibid.). However, a UNDP-commissioned investigation concluded that neither the dam nor related structures crossed the fault line and that the 1989 earthquake was probably related to partial rupture related to the reservoir impounding (Winter et al., 1994). Furthermore, since the dam was apparently designed to withstand an earthquake of around a seismic intensity of 8, (which Winter et al. believe, but are not certain, relates to the MSK scale), the earthquake does not pose a major economic or social risk. Nevertheless, lay-people continue to speculate about the safety of the dam.

typhoons. Traditional buildings combine good joints, small structural units and large timber sections, enhancing their typhoon-resistance (Norton and Chantry, 1993). Houses in typhoon-prone areas have also often been built using lighter materials which blow away during typhoons, rather than heavier ones which could potentially collapse and cause serious injuries. Meanwhile, in areas liable to flooding houses have been built on elevated platforms. In terms of earthquake proofing, Viet Nam adopted the Soviet seismic building codes in 1969 (and subsequently the revised 1981 Soviet codes) for the construction of major industrial plants and other important

public structures.[71] As of early 1996, Viet Nam was also planning to draw up its own set of codes.

Despite these efforts, there appears to have been a recent increase in the hazard vulnerability of the housing stock, reflecting a gradual shift towards the use of modern building designs and materials in combination with more traditional ones, producing structures referred to as transitional buildings. These houses are often built using sub-standard materials by the prospective occupiers themselves who, in turn, lack the necessary skills to use modern materials correctly. Different parts of a house may be built sequentially, as and when a household can afford to enlarge its property, further increasing its hazard vulnerability. Moreover, these trends have been accelerated by a building boom precipitated by the privatisation of the building sector.[72] Transitional buildings now form some 46% of the national housing stock; and 58% in the particularly typhoon-prone North Central coast alone (Cuc, 1995).

Households, particularly poorer ones, also face important cost constraints in building more disaster-proof structures. State housing subsidies have gradually been reduced since the late 1980s and households have had to bear a greater share of construction costs themselves. Even buildings which would fare poorly in the event of a typhoon are expensive to build whilst the incremental 10–30% required for disaster proofing can be prohibitive. Strengthening of existing properties may also be costly and thus, even in the aftermath of a disaster, houses are often repaired with little regard to enhancing their disaster resistance. For example, Christoplos (1996) notes that in the Mekong Delta retrofitting, such as the raising of a foundation or the construction of building pillars, requires a major lump sum investment. Indeed, Christoplos (1996: 8) observes that 'disaster preparedness with regard to shelter must be seen as a socio-economic structural issue, rather than as a technical problem or as an effect of ignorance'.

However, as already noted, the need to improve the hazard-proofing of buildings is well-recognised and various initiatives have been undertaken. For example, UNDP has supported several activities to promote the construction of simple, low-cost typhoon resistant housing, including the provision of training courses for the Ministry of Construction and local builders (Norton and Chantry, 1993). The UNDP project also entailed the drawing-up of a provincial Action Plan involving the creation of cyclone-resistant construction units which would provide relevant support and

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[71] These codes are considered to have been broadly appropriate as the maximum risk of earthquake in the two countries is approximately the same.

[72] The urban housing supply is rapidly expanding, with as much as 80% of all land transactions and small-scale building occurring outside of the normal government structure (Viet Nam Ministry of Construction et al., 1995). A 1989 survey of 29 provinces revealed that over 30% of new houses were constructed by the residents themselves in 1984–9.

training at the provincial level.[73] Somewhat earlier, following repeated appeals for disaster assistance in the wake of typhoons, the United Nations Education, Science and Culture Organisation (UNESCO) organised a workshop and training course on the construction of disaster-proof school buildings to address one of the root causes of the problem. It also mobilised limited resources to support research and development activities in this area (UNESCO, 1987). Meanwhile, a Building Code was being drawn up as of early 1996, according to a government official interviewed for this study. However, it is not clear how many provinces have set up cyclone-resistant construction units nor how widely disaster-proofing measures are now being adopted as a result of these various efforts.[74] Scope also remains for training and for the development of guidelines which focus on retro-fitting rather than the construction of new disaster-proof structures (Norton and Chantry, 1993).

Although there are some land-use regulations and planning laws in place, further legislation in this regard is also required whilst all existing legislation needs to be enforced more heavily. Existing regulations include an Ordinance on Dyke Protection of 9 November 1989, prohibiting the use of dykes for construction as well as cultivation and restricting their use for transport. Certain districts are also reported to have prepared regulations on housing construction in flood way areas as, for example, in Ba Dinh District of Hanoi (UNDHA et al., 1994). However, the current rapid and chaotic growth in the informal housing sector combined with demographic growth and extreme land pressures in certain areas has made it extremely difficult to implement such regulations, let alone any building codes. Thus, although 45% of the population located outside the dyke system were resettled between 1971 and 1981, the numbers have gradually increased again, contradicting land use regulations. For example, some 175,000 people are reported to be living in non-sanctioned beds outside the Hanoi Dyke system and some houses have been constructed on the dyke itself, raising serious concerns about the safety of the dyke (Viet Nam MWR et al., 1995). In certain places, people have even tunnelled inside the dykes. Such malpractices demand a 'more rigorous enforcement of the legislation . . . in relation to land use management and infrastructure development in the flood plains and encroachment on flood dykes'(Viet Nam MWR et al., 1995: 8).

Further hazard risk mapping is also required, as already noted. Some hazard mapping is currently being undertaken in the north and this exercise should be extended to the rest of the country as the currently limited availability of information makes it difficult for either individual investors or policy-makers to take proper account of

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[73] The Ministry of Construction also held a seminar on disaster mitigation in around 1994 but the precise scope of this seminar is not clear.

[74] As of 1992, example designs and constructions of flood and typhoon resistant buildings were reported to be available but had apparently not been widely adopted (Viet Nam MWR/UNDP, 1992).

hazard risks (for example, see Boxes 7.4 and 7.5). Furthermore, the results of the mapping exercises should be placed in the public domain, in a form comprehensible to the lay-person, to help facilitate the adoption of appropriate proofing measures.

7.5 *Disaster warnings and preparedness*

Adequate warnings are important, providing vulnerable communities an opportunity to minimise the impacts of impending hazards and, more fundamentally, to prevent loss of life. For example, immediately prior to floods or typhoons, households can harvest crops (see Chapter 4); move their families, livestock and transportable assets (such as agricultural implements, boats and rice and salt stores) to safer places; temporarily reinforce dykes (for example, with sand bags and bamboo mats); strengthen houses by securing roofs and supporting walls; and erect temporary barriers around fish ponds. Manufacturing, industrial and services enterprises can undertake similar measures to protect their properties and assets. Power supply and telecommunications authorities are also encouraged to cut down tree branches in order to reduce damage to overhead lines.[75] [76]

Indeed, the Viet Nam Government attaches considerable importance to improved forecasting and warning systems in mitigating the effects of tropical cyclones and floods, although the current state of scientific knowledge does not allow the prediction of earthquakes whilst flash floods are also difficult to forecast. Three to five day typhoon warnings may be provided depending on the origin of the typhoon. Meanwhile, dykes are monitored 24 hours/day during the flood season and emergency supplies and repair materials are stockpiled close to sections considered most at risk. The Hydrometeorological Service is responsible for more general flood forecasting, using data collected from some 300 rainfall and 200 hydromet stations (Viet Nam MWR et al., 1995). Warnings are disseminated by radio and loudspeakers and the overall record on evacuating the most endangered areas is apparently good.

However, simple preparedness measures, such as moving livestock to safer areas, are apparently often not practised because of limited public disaster awareness (DMU, 1996). This suggests considerable scope for reducing the direct damage created by disasters relatively simply and inexpensively. Moreover, flood warning equipment is both out-moded and insufficient whilst procedures for issuing warnings could be improved by the installation of modern communication technology, with important

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[75] It would be too costly to place power and telecommunication lines underground.

[76] In Hanoi, where many of the bigger trees have small, shallow root systems and so are liable to topple over during typhoons, some of the older trees in poorer condition have also been replaced by trees with short trunks and deep root systems (SWECO, 1993).

Box 7.5 Implications of failure to disclose flood risk information: an example

A golf course constructed on the edge of a reservoir in Hay Tay Province, near Hanoi, was flooded for several weeks following heavy rains which caused the reservoir's water level to reach its maximum level of 25 metres. At the request of the golf course operator, the Provincial Governor finally agreed to lower the level of the reservoir temporarily to reduce flooding on the golf course. However, the discharged water, in turn, flooded 300 ha of rice fields, destroying the standing crop and presumably causing considerable economic hardship to many families. This example clearly raises serious questions about the appropriateness of certain water resource management decisions as well as underlining the need for greater dissemination of hazard risk information. In designing the golf course, enquiries had been made about the maximum level of the reservoir but the authorities had been unwilling to disclose such information. The constructers had therefore assumed a maximum level of 16 metres and set the course's ground level at 19 metres.

After Traisawasdichai, 1995.

gains in terms of reducing the scale of damage (VNCIDNDR, 1994).[77] For example, Lustig (1992) estimated that an improved severe storm and typhoon warning system for the Red River Delta would carry a cost-benefit ratio of 10, although it is not clear how this figure was derived. Poor proven forecasting capabilities have also undermined people's confidence in the system, implying that warnings which are issued are not always fully heeded. For example, Viet Nam SCS et al. (1991) reported that warnings had sometimes being ignored whilst it had taken some time for confidence to be regained in more recently improved systems (Viet Nam MWR et al., 1995). However, various efforts are being undertaken to improve warning capabilities, with international support from various donors including UNDP, the World Meteorological Office and the Norwegian Government. An international meeting on water disasters in Viet Nam in 1994 also called for the incorporation of various traditional methods for predicting water disasters, such as observation of the behaviour of animals and changes to plants, into wider forecasting and warning systems (Viet Nam MWR et al., 1994).

[77] The Red River Delta Master Plan (Viet Nam MOSTE, 1995a) reached a similar conclusion, reporting that although much effort has been devoted to flood warnings in the Basin, 'the overall impression is that the current warning system leaves considerable room for improvement. Constraints are mainly financial but to a certain extent also institutional' (p.75). The report recommended that the development of an early warning system should focus on both better modelling and dissemination.

There may also be some scope for longer-term forecasting. Weather patterns in Viet Nam are causally linked to El Niño Southern Oscillation (ENSO) events although there has been little research to date on the precise nature of this relationship. ENSO events are typically associated with a higher incidence of typhoons and lower rainfall, although the link is slightly weaker in the Mekong River Delta than further north. This relationship provides some scope for longer-term forecasts permitting, for example, adjustments in cropping decisions or levels of agricultural exports. However, this would also require both that forecast information is widely disseminated in an easily understood form and that local communities have both the knowledge and the resources to take appropriate action.

7.6 Post-disaster relief

Post-disaster relief efforts constitute another major component of disaster management. Appropriate and carefully targeted packages can play an important role both in meeting immediate humanitarian needs and also in ensuring a rapid economic recovery and helping to curtail the spiralling vulnerability of communities facing a succession of disasters. Moreover, as overall standards of living increase and the economy becomes increasingly integrated, any disruptions to normal economic activities will have ever greater multiplier impacts through the economy, increasing the economic returns to rehabilitation expenditure.

Immediate relief efforts are well-organised and effective in Viet Nam. Prior to the start of each flood and typhoon season, a flood and storm plan is prepared at both the central government and provincial level. Post-disaster relief efforts are then mobilised very rapidly, drawing on central, provincial and district level government resources to meet immediate relief needs. National rice reserves may also be drawn upon whilst additional private charitable contributions, a relatively new phenomenon, and international assistance is often forthcoming (see Chapter 10). Finally, and often most importantly, local communities also contribute labour in support of the immediate relief efforts, including for the emergency repair of flood control structures. Indeed, the local population may carry out up to 90% of its own relief work, often before relief workers have arrived on the scene.

However, there appears to be some scope for improvement with regard to rehabilitation. Recent rehabilitation efforts have often included the provision of seeds, fishing boats and nets as appropriate, particularly from the Red Cross and the international community (for example, the UN Food and Agriculture Organisation (FAO)), helping affected communities to regain self-sufficiency. The government is also apparently well-organised in helping to replace any newly planted crops which have been lost. However, rehabilitation efforts more generally are reported to be less than adequate and poorer households can continue to experience the adverse impacts

of a disaster for an extended period of time, effectively caught in a poverty trap. This problem appears to be partly related to inadequacies in current disaster assessment practices as well as to public resource constraints in responding to disasters (see section 7.7). Nevertheless, the scale and nature of rehabilitation measures therefore needs to be carefully reconsidered, taking account of the wider economic benefits of increased rehabilitation expenditure.

7.7 Broader economic policy and natural disasters

The environmental factors contributing to the scale and frequency of incidence of natural hazards are well-recognised and environmental policies have included various measures to help redress such influences, as already noted.[78] Meanwhile, flood control measures, as well as irrigation, are commonly identified as priority areas for investment. However, broader government and donor policy and strategy documents examined for the purposes of this study have failed to identify natural disasters as a major threat to sustainable, equitable economic development. For example:

- In discussing directions for the development of key sectors, the government paper presented at the 1995 Consultative Group Meeting (Viet Nam Government, 1995d) only mentioned natural disasters indirectly, in the context of the need for the implementation of the Law on Environmental Protection in part to protect water resources. The document included no discussion of the appropriateness of the proposed development strategy relative to the hazard risks faced by the country.

- In outlining its broad macroeconomic goals up to the year 2000, the government document prepared for the 1993 Donor Conference (Viet Nam Government, 1993) also failed to mention the need to take account of natural hazards in broader economic development and diversification strategies although the importance of maintaining a healthy environment as well as the need for improved structural flood mitigation measures and reforestation were recognised.

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[78] For example, the Viet Nam National Plan for Environment and Sustainable Development (Vietnam SCS et al., 1991) includes a number of activities which have some bearing on hazard mitigation amongst its recommended actions, including:

- integrated watershed management, including an emphasis on the multi-purpose use of water, land-use and human settlement planning and focussing in part on flood control measures;
- sustainable coastal management, including the establishment of wind-breaker forests;
- the promotion of coastal aquaculture without mangrove destruction;
- the protection, conservation and rehabilitation of mangroves, estuaries, lagoons and reefs, primarily because they are critical spawning grounds for many commercial fish species but also effectively preventing the destruction of vital flood protection barriers.

- A 1995 document, *Country Strategy Note for Cooperation with the United Nations System* (Viet Nam Government, 1995c) did not identity natural hazards as a risk to either economic or social development but only as one to the environment, the protection of which was viewed almost as an end in itself.

Yet the underlying factors determining the degree of severity and incidence of natural disasters in Viet Nam are complex, involving various socio-economic as well as climatological, hydrological, geological and environmental factors. They therefore demand both an integrated approach to disaster prevention and mitigation and the inclusion of hazard risk assessments in the formulation of overall policies and planning.[79] The adoption of such practices will be particularly important if, as suggested above, the hazard vulnerability of the economy increases in the short to medium term.

On a more positive note, integrated sectoral management has already been called for in areas where there are clear potential conflicts of commercial interest. For example, the need for integrated coastal management, incorporating all types of development such as tourism, industry, oil installations, agriculture and aquaculture has been recognised, hopefully taking into account both hazard risks and the implications of various developments for the nature and scale of vulnerability to those risks. Similarly, in recognition of the fact that uncoordinated development of roads and other infrastructure has compounded the extent of flooding in the past, Viet Nam MWR et al. (1995) has called for a coordinated planning effort which steps 'beyond reducing negative aspects . . . (to) examine opportunities for coordinating sectoral development plans and promoting multipurpose use of infrastructure' (p.18). These developments are very encouraging and efforts should be made both to ensure that they are implemented and to encourage coordinated inter-sectoral policies which take account of hazard risks in both these and other spheres of economic life.

Viet Nam has also made some progress in improving the extent to which environmental issues are considered in broader decision-making, reflecting the fact that the importance to the social and economic development process of good natural resource management is well recognised. For example, environmental impact assessments (EIAs) were introduced in the early 1980s, although the technique is currently viewed more as a project appraisal design tool, has mainly been used in the context of foreign assistance projects and is not offered at the regional or sectoral

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[79] Similarly, participants at the International Conference on Climate Change and Sea Level Rise Impact, held in Hanoi in 1991, recommended that 'consideration of long-term climate change should be an integral part of the formulation of a national strategy for sustainable development' (Ninh et al., 1991). The National Action Plan for Climate and Climate Change issues has subsequently included the planning of economic development strategies for coastal regions which may be affected by sea level rise as one of its main activities (Granich et al., 1993).

level.[80] A similar form of disaster impact assessment should perhaps be developed, considering both the hazard risks faced by the project and the impact of the project on the scale and nature of hazard risks and vulnerability.

A comprehensive assessment of the economy, taking account of hazard vulnerability in different sectors and subsectors, including via various inter-sectoral linkages, would provide a useful basis for improving the extent to which natural hazard risks are considered in broader economic planning. It could also highlight any potential widening of regional disparities as a consequence of natural disasters. Problems relating to the availability of hydrometeorological and other relevant information also need to be overcome as part of this process (for example, see Box 7.5) so that the level and nature of natural hazard risks can be better appreciated by both planners and individual investors. Methods of post-disaster damage assessment also need to be improved to help enhance the understanding of the economic impact of natural disasters and thus facilitate the adoption of appropriate policies and strategies in all spheres of the economy, as discussed below.

7.8 Disaster damage assessment

Current efforts to assess the economic impacts of natural disasters in Viet Nam are essentially confined to post-disaster damage assessments. Such assessments should aim to serve two purposes. First, they should provide essential information upon which appropriate and timely responses can be based, addressing both short-term humanitarian needs and measures required to ensure a rapid economic recovery. Second, they should form a fundamental part of efforts to ascertain the broader economic impacts of disasters at both the macro and household levels, as an important component in furthering understanding of changing economic vulnerability to natural hazards and how development strategies can be directed to reduce the impact of disasters.

Damage assessments have focussed on the first of these objectives to date. In accordance with state regulations dating back to the pre-*doi moi* period, data on damage caused by disasters (for example, the number of persons killed, injured or missing; the number of hospitals damaged; the number of dykes broken/spilt over/collapsed; the number of state farms inundated) are collected at the commune/village level in volume terms and submitted, via district and provincial levels, to central government. Various government departments also submit reports. Central government then converts these data into monetary terms. The reports must be submitted within 5–30 days after the disaster (ESCAP, 1984).

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[80] The EIAs which have been conducted have included several of water reservoirs as well as at least one hydropower station and an irrigation system.

In practice, even these assessments have varied considerably in terms of both their timeliness and accuracy. Data have often been collated by untrained people whilst there have been inconsistencies in reporting. For example, rice losses are sometimes stated in terms of acreage and sometimes in volume. Assessment reports are also commonly delivered late, perhaps 2–3 months after the disaster; and there is some suggestion that estimates of damage may also have been exaggerated on occasion. Due to the poor quality of damage assessments, provincial authorities have often requested standardised lists of relief goods, implying that certain critical needs may not be met (DMU, 1996). The extent of the problem is underlined by the fact that international NGOs have recently begun to undertake their own joint assessments as, for example, during the 1995 floods. These assessments have placed particular emphasis on the identification of efforts to assist the poorest groups.

The various problems associated with current damage assessment procedures are well recognised. To help resolve them, an attempt was made to introduce a standardised reporting format in 1995, drawing on international attempts of the UN Economic and Social Commission for Asia and the Pacific (ESCAP) and others to do likewise, although this task had yet to be completed by early 1996. It is also, for example, planned to extend existing training programmes prepared by the CCSC&DP for disaster managers to include damage assessment techniques. The DMU is also involved in efforts to improve the quality and timeliness of post-disaster assessments. Such efforts could potentially represent a major advancement in facilitating the delivery of more appropriate and cost-effective relief and rehabilitation programmes, a particularly pertinent goal in view of the severe financial constraints faced by the government.

Efforts are also required to improve assessments of the broader macroeconomic impacts of disasters. Current efforts appear to be confined to an annual reckoning of a few basic indicators such as confirmed deaths; numbers of houses, schools, hospitals and bridges damaged or destroyed; losses in rice production; the area of rice fields damaged; and numbers of bridges sunk. Whilst it is acknowledged that the total cost of damage is much higher than indicated by these figures alone (for example, DMU, 1996), no attempt has apparently been made to quantify the total physical damage, let alone the indirect and secondary effects.

8. Future funding of disaster mitigation and prevention projects

One of the key issues with regard to disaster prevention and mitigation in Viet Nam concerns the future funding of such activities, a problem which could be exacerbated in the future by the hazard-related implications of global warming. In the past, the state was heavily involved in the day-to-day running of the economy and controlled the allocation of most economic, financial and labour resources. However, the programme of economic reforms has substantially reduced the level of resources at the command of the government and, instead, there is increasing pressure for the self-financing of many public projects as the government strives to ensure minimal budgetary deficits, as part of its broader efforts to achieve sustainable economic growth.

In the past, all able-bodied persons between the ages of 18 and 45 years[81] had to provide 20 days labour per annum to the construction, operation and maintenance of disaster-mitigation infrastructure. Individual farmers now maintain embankments and dredge on-farm canal systems which cut across their own land. However, such efforts do not extend to the maintenance of larger structures or the repair of major dyke breaches, which remain the responsibility of provincial authorities and central government. Contributions to such efforts have been reduced to 10 days, effectively almost halving resources available to meet the single most expensive component of dyke construction and maintenance – namely, labour – required under current labour-intensive designs and techniques.[82] Alternatively, people can opt to pay a fee, with the funds collected used to hire work teams to undertake the work instead. Most state employees prefer the latter option.

As part of the efforts to overcome funding problems, various ways of constructing less expensive, longer-lasting sea dykes are now being explored. The government is also trying to reduce maintenance costs through improved monitoring, better use of equipment and the application of new materials in the repair of dykes. For example, a 4-year US$48m rehabilitation programme was begun to strengthen the Hanoi dyke system in 1994 and, upon completion, is expected to substantially reduce annual maintenance and repair costs (Viet Nam MWR et al., 1995). At least in policy documents, increased emphasis has also been placed on more cost-effective non-structural measures. Nevertheless, considerable funding will still be required to meet

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[81] According to some sources, women between the ages of 18–25 rather than 18–45 years had to participate.

[82] Contributions are higher in a few provinces. For example, in Ha'i Hau District of Hanam Minh Province, where the coastline is retreating, able-bodied workers have to devote 40 days per year to such activities.

operational, maintenance, rehabilitation and new investment costs of structural measures given the poor quality and, in places, limited coverage of the existing dyke system. Indeed, as already noted, the Red River bed is now higher than that of the adjoining flood plain. The consequences of abandoning protection now would therefore be catastrophic, physically, socially and economically, and Viet Nam has little choice but to ensure maintenance of the embankment.

Considerable external donor funding has been provided in this area (see Chapter 10) but is insufficient given the sheer scale of resources required. Furthermore, donor funding is typically directed towards new investments, upgrading and rehabilitation rather than towards the substantial day-to-day operational and maintenance costs. There is an apparently similar tendency for local governments to prioritise new construction over operational and maintenance activities (Viet Nam Ministry of Construction et al., 1995). Yet if dykes receive no maintenance, their life is reduced from perhaps 50 to 20 years. Ensuring continued adequate maintenance of existing infrastructure is therefore particularly crucial. Indeed, some Red Cross chapters, for example, are currently developing plans to become involved in dyke maintenance, because of increasing concerns about the funding of future maintenance, representing an important new departure in Red Cross activities.

Some data are available providing an indication of the effective shortfall in resources for total disaster-related activities.[83] According to these, in 1993 the DDMDC had a 40bn VND (US$3.6m) budget, with a further 20bn VND earmarked for use by the provincial authorities in meeting the cost of emergency repairs. The provinces budgeted an additional 25bn VND for emergency labour and 28bn for dyke maintenance from their own resources.[84] Resources were also budgeted by other government departments, including 80bn VND under the Ministry of Forestry, 38bn VND under the Ministry of Transport and smaller allocations under the hydrometeorology, telecommunications and irrigation and buildings budgets. Budgeted funds from all sources totalled some 240bn VND (US$21.9m), considerably higher than budgeted resources of slightly over 150bn VND (US$14.4m) in 1992 (UNDHA et al., 1994). Yet the 1993 figures nevertheless imply that it would take 33 years to reach the estimated US$715m required (as of early 1996) to provide adequate protection against seawater intrusion alone, assuming no global warming. Meanwhile, to cope with the impacts of climate change as well, the ADB (1994) estimates that annual investments of US$172m are required over the

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[83] As of early 1996, the DMU was undertaking a study on operational and maintenance costs in two coastal areas which should provide further evidence on the level of funding required for adequate maintenance and performance of existing dyke structures. This should help inform the debate on the most appropriate form of financing.

[84] According to the World Bank (1995a), from 1994 every province budgeted 2–10bn VND for emergency relief, implying a considerable increase on the 1993 level.

next two decades totalling US$3.4bn by 2015. This implies annual expenditure equivalent to some eight-fold the 1993 budgetary allocations and 4.1% of total preliminary government expenditure in 1993.[85] The ADB (1994) further estimates that to provide adequate protection against an assumed 70 cm sea-level rise by 2070, investments to the tune of some US$2–4bn are required in coastal protection structures.[86] Additional investments are needed to prevent flooding and waterlogging, including US$900m in drainage and US$1m in reservoirs. Separate calculations made as part of the Viet Nam Vulnerability Assessment (see Box 2.1) estimate that a US$7bn programme would be required to provide protection against a 1 metre increase in the sea level by 2025.[87] These various figures underline the importance of identifying new sources of funding, even before taking account of the additional burden placed on government resources by post-disaster relief and rehabilitation requirements, sometimes including substantial dyke repair costs.

To partly compensate for the loss in financial and labour resources at the government's disposal, a new Flood and Storm Preparedness and Prevention Fund has already been introduced, in around 1991 or 1992. This fund was established at the provincial level and is levied on all men of 16–60 years of age and women of 18–55. Rates charged appear to differ between provinces, and perhaps even districts, but are universally low.[88] In 1992, 4bn VND (US$0.36m) was collected through the Fund whilst over 5bn VND (US$0.47m) was raised in 1993. Some 30% of the Fund can be used at the commune level and 30% at the district level whilst the remaining 40% has to be passed up to the provincial authorities. The Fund is expected to meet the cost of the repair of dykes in the aftermath of floods or typhoons as well as operational, maintenance and new investment costs. However, the level of funds generated is not

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[85] ADB (1994) suggests that the coastal sea-dyke system alone will need to be extended from its current length of 2,700 km to around 4,700 km, including an expansion of the dyke system in the Central provinces and Mekong Delta. Other protective measures including the planting of mangroves and perhaps the construction of a second line of dykes and the relocation further inland of existing dyke structures may also be necessary.

[86] ADB forecasts on sea level rises are rather high, as discussed in further detail in Chapter 2.

[87] See footnote 88.

[88] For example, one person interviewed for this study indicated that in some areas labourers are each required to pay 1kg of rice annually, merchants 2kg and government employees one day's salary, whilst in other areas labourers are required to pay 3.5kg annually with, presumably, higher charges for other categories of workers as well. Payments can also be made in salt in some areas. Another source reported that annual contributions are set at 1,000 VND (equivalent to US$0.09 at 1994 official rates of exchange) or the contribution of one day's labour (worth perhaps 4,000 VND) for which workers are provided 1kg of rice (Viet Nam MWR et al., 1994). In Gia Vien District, a much higher rate of 9,000 VND is charged (van der Oever, 1994)). Higher rates may also be levied in urban than in rural areas.

substantial and, when compared with the above figures, is clearly insufficient to meet the full costs of such activities. Some provinces or districts have therefore been empowered to impose additional fees to top up earnings.[89] Meanwhile in others, the Fund has apparently not been collected at all as total revenue would be so low (Viet Nam MWR et al., 1995).

To provide additional sources of funding, various other revenue-raising schemes have also been proposed, typically involving contributions from the local community which directly benefits from any expenditure. Discussions have focussed particularly on the introduction of a user fee or tariff, possibly introduced alongside a consultative process whereby local communities are involved in decisions on the most appropriate height and effective level of protection offered by dyke and other structures. For example, in 1993 it was proposed that a local water tax should be introduced to meet the costs of operation and maintenance of the irrigation and drainage works installed under a WFP project. User fees have already been set for other services previously provided free of charge, including health care, education and irrigation.[90] Therefore, the concept of user fees is not new. Moreover, some communes are already charging disaster levies, the proceeds of which can be retained at the commune level.[91] However, there are concerns about the ability of poorer households to meet the cost of these various user fees. Although some waivers have been introduced for existing fees whilst overall levels of real social service expenditure have increased since 1986 (particularly for social relief and education), in practice user fees have already placed additional pressures on poorer households.[92] For example, Oxfam-UK/Ireland (no date) reports that many of the people in Ky Anh District of Ha Tinh Province, North Central Coast, are facing difficulties meeting various cost recovery charges. Meanwhile, in the WFP irrigation and drainage project mentioned above, a

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[89] For example, in two districts benefiting from a WFP project, local authorities have approved annual contributions of 7,000 VND per capita in one district and 9,000 VND per capita in the other.

[90] For example, it appears that an irrigation fee has been charged since at least 1984, on the premise that some farmers directly benefit from irrigation schemes and so should bear the costs of provision. The rates charged vary, depending on types of crops grown and the distance of particular users from irrigation and drainage structures. Since 1993, the central government has set a minimum fee which local authorities have been allowed to increase to a level which meets operational, maintenance and new investment costs of local structures. The fee is collected in-kind, in the form of rice.

[91] For example, Oxfam-UK/Ireland (no date) reports a 2% levy on rice production in Ky Anh District of Ha Tinh Province, North Central Coast, one of the most disaster-prone areas of Viet Nam, to cover the costs of employing guards to provide daily inspections of the dyke system.

[92] For example, VLSS data indicated that the most important reason for non-attendance of school is the cost (UNDP et al., 1995).

subsequent study determined that considerable government subsidies would be required for some years as the gains to farmers were not sufficient to justify a tax which totally recouped operation and maintenance costs (van der Oever, 1994).

On a more practical level, there are also certain difficulties in identifying users of dykes. Communities located further from a dyke typically experience floods less frequently and may not regard themselves as beneficiaries in the same way as communities located closer to such structures. Furthermore, it can be more difficult to measure the direct benefits of flood control measures than of, say, irrigation installations. The benefits of the former accrue over time, in the form of reductions in flood-related losses. Thus, households may not necessarily experience a tangible increase in earnings in every year as a consequence of expenditure in this area but, rather, lesser downward fluctuations in disaster years. This implies that they may not have regular additional resources as a direct consequence of the flood prevention or mitigation measures to cover their contribution to the cost of that investment or its upkeep.

As an alternative source of funding, a Build, Own, Operate and Transfer (BOOT) scheme has also been proposed under which private capital would be invested in disaster mitigation infrastructure which, in turn, would ultimately be transferred to a relevant public authority. Again, this concept is not new and the National Assembly approved amendments to the Foreign Investment Law in December 1992 to allow direct foreign investment in such schemes. One of their main advantages is that infrastructure could be built quickly (Viet Nam MWR et al., 1994). However, the scheme would also require the imposition of some form of local levy, raising difficulties similar to those entailed in the notion of user fees. Moreover, the strictly financial returns to such schemes, excluding the potentially considerable social benefits, may be relatively low and therefore unattractive to potential investors, particularly in some of the poorest regions of the country. For example, the benefit-cost ratio of disaster mitigation structures is much lower in Central Viet Nam than in other regions of the country precisely because the area is one of low productivity and inadequate infrastructure. Similar potential problems of attracting investment resources to the poorer regions of the country are entailed in government schemes to maximise the cost-effectiveness, narrowly defined, of public investment. To date, socio-economic rather than purely financial factors do seem to be playing a role in the allocation of government disaster mitigation and prevention funds but there is no guarantee that this practice will continue.[93]

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[93] For example, the National Environmental Action Plan (Viet Nam Government, 1995b) identifies eight priority areas for sea dyke protection scattered along the coastline of the country (Quang Ninh, Nam Ha, Quang Binh, Thai Binh, Ha Tinh, Da Nang, Phu Yen and Ninh Binh), based on both typhoon intensity and socio-economic factors.

A state-run disaster insurance scheme has also been proposed, with premiums collected in the form of a disaster mitigation tax. There are certain advantages to such schemes (see Box 8.1). However, this assumes that households have the resources to undertake such investments in the first place as well as to pay the insurance premiums (see section 7.4). Meanwhile the scale of coverage of private disaster insurance schemes is very limited to date and is likely to remain so for the foreseeable future.

Finally, the equity of some form of user-based charge, be it user fees, insurance premiums or local taxes, also needs to be considered. Land is allocated free of charge in Viet Nam, with land rental effectively collected through various taxes including the agricultural land tax, the main rural tax. Rates charged reflect various factors including the quality of the land and prevailing weather conditions. The imposition of additional taxes in more disaster-prone areas could therefore negate the concern for equity embedded in the existing system. Before any scheme is adopted, it should thus be analysed within the context of total taxes and fees to see if communities in more disaster-prone areas – and, by implication, some of the poorest segments of the population – are being expected to pay substantial additional fees which they cannot afford (after taking account of the benefits of improved protection) and which are therefore not equitable.[94]

In conclusion, for the foreseeable future it appears that central and provincial governments as well as donors will continue to have to meet a large part of major investment or repair costs pertaining to structural flood measures from general revenues whilst local communities can be expected to finance little more than the operational and maintenance costs if even that. Such expenditure can be justified because ultimately the whole economy benefits from improved disaster mitigation schemes via various factors such as multiplier effects, greater economic stability and reduced regional inequalities. However, this conclusions does not solve the problem of how to fund disaster-related expenditures, implicitly entailing some re-allocation of resources from elsewhere or demanding considerably increased donor grant assistance in this area.

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[94] The agricultural land tax was introduced in 1994, replacing the agricultural tax, and is collected from some 10 million households. There are six bands, based on the quality of the land, the region, its location, prevailing weather and water supply. These bands reflect an effort to ensure a more equitable system of taxation. The tax can apparently be paid either in kind or in cash although it is set in quantity terms of paddy per hectare. Certain exemptions are allowed including for crop damage, a practice which also appears to have been applied in the past. Other significant sources of rural revenue include an irrigation tax and taxes on the sale of farm produce and other agricultural activities, such as pig rearing, which have to be registered for turnover tax. According to available information, the agricultural land tax varies between 7 and 15% of annual production. Irrigation tax ranges between perhaps 2–3% and 7–10% of production, the latter in mountainous areas.

Box 8.1 Insurance

Insurance is not an economic solution to potential disaster losses but simply a mechanism for the transfer of risk (possibly via reinsurance overseas), effectively altering the economic impacts of a disaster but not necessarily eliminating them. However, insurance helps facilitate the recovery of individual producers and may encourage investment in enterprises where the risks would otherwise have been too great. Extensive insurance coverage also offers an important source of post-disaster relief and reconstruction funding, reducing the burden on public resources. Furthermore, part of the revenue collected through insurance premiums may be used for disaster mitigation, rather than relief, purposes to the extent that such investments directly reduce subsequent insurance claims. They can therefore provide an additional source of disaster mitigation and preparedness funding. The insurance industry also offers a mechanism for promoting the adoption of improved building standards and other disaster prevention and mitigation measures; encouraging more appropriate land-use decisions; and, implicitly, stimulating levels of domestic savings.

A state-owned insurance company, was created in Viet Nam in 1965 and became the sole provider of insurance after companies in the south of the country were merged into it, following unification in 1975 (Oanh, 1994). Since the early 1990s, foreign insurance companies have also been allowed to operate in part to help stimulate foreign investment. However, insurance coverage remains very limited to date, with most policies taken out by hotels and some state-owned factories. Total premiums formed only 0.0032% of GDP in 1992, compared to 5–10% in developed countries. The main categories of insurance in terms of total premiums paid were as follows in 1992: marine (22.6%) personal accident (15.2%), cargo (14%), automobiles (12.2%), aviation (9%), off-shore oil and gas (6.7%), fire and special peril (3.2%), fishing vessels (2.2%) and agriculture (0.2%) and reinsurance and others (14.5%) (ibid.).

There is also little apparent differentiation of levels of premiums between different categories of risk. Oanh (1994) reports that this has created difficulties in encouraging the uptake of marine insurance in the south where the uniform flat rate premium charged across the country is high relative to local risks. A similar lack of differentiation in disaster-related premiums could also potentially discourage the spread of this type of insurance in some parts of the country.

Agricultural insurance has been offered since 1986, covering livestock as well as crops, with the aim of stabilising agricultural incomes and presumably providing cover against natural disasters as well as disease. However, rates of uptake have been very low to date, partly reflecting the fact that farmers receive some state support when crops fail. Agricultural insurance has also been associated with very high claim ratios, averaging 89% of total premiums in 1987–92. If the costs of administering the policies are also taken into account, it is clear that the scheme must little more than break even.

Increased emphasis must also be placed on more cost-efficient efforts to reduce economic and social vulnerability to natural hazards, as well as to the effects of future

global warming, for example, by ensuring more appropriate agricultural and other income-generating strategies and by increasing levels of income so that vulnerable communities can invest in more disaster-proof housing. For example, it has been suggested that a housing credit scheme could perhaps be introduced for households incorporating typhoon-proofing structures (Norton and Chantry, 1993). As per capita incomes of more disaster-vulnerable groups increase, taxes on immediate beneficiaries of flood protection schemes could become more viable.

9. Household vulnerability

Natural disasters can have profound implications for individual households, resulting in the death or injury of family members and the loss of homes, possessions, food stores and standing crops as well as productive assets such as agricultural and fishing implements.[95] Even fuel supplies, for example, can be destroyed as rural households in the Red River Delta and coastal central provinces rely on rice straw and similar materials for domestic fuel. Natural disasters can also lead to temporary food shortages and disrupt employment opportunities. For example, salt production and agricultural activities may be contingent on an operational sea dyke system whilst employment in local agro-processing industries is dependent upon the continued supply of local inputs and working transport infrastructure. As discussed below, disasters can reduce investment in production inputs, such as fertilisers, thus reducing potential levels of production. Disasters can also result in an increased incidence of disease in both people and livestock; and may have significant psychological impacts relating to the stress and trauma associated with natural disasters, even amongst communities where flooding is an annual event.

However, household vulnerability in Viet Nam is a complex issue. The nature of vulnerability varies between various income and occupational groups and between different parts of the country, partly reflecting the frequency of hazards but also the scope for and degree of uptake of coping mechanisms and adaptive behaviour. The relatively poorer North Central and Central Coastal regions are probably perceived as the most vulnerable regions (see Box 9.1). In these areas, efforts to minimise the impacts of natural hazards have often dominated economic behaviour even if contributing to high rates of underemployment. For example, Anh et al. (1993) report that the population of one commune in Quang Binh province is only occupied for about a third of the year as agricultural opportunities are limited by the threat of natural hazards and by salination whilst there are few income-generating opportunities. More generally, they face frequent losses as a consequence of natural disasters.

In contrast, communities facing annual floods in the relatively wealthier Red and Mekong River Deltas are often well prepared. For example, floodway farmers in the Red River Delta, who cultivate the highly fertile land lying between rivers and dykes have adapted well to regular floods whilst benefiting from the highly fertile soils which permit two crops per year. During the annual flood season they move their

[95] The DMU (1996) reports that one of the most critical impacts of disasters on low income rural families is the loss of official papers and family records, including identity cards, land ownership records and pension documents.

Box 9.1 Living with natural disasters

In 1993, the World Food Programme (WFP) commissioned a baseline rapid assessment for a sea-dyke project in central Viet Nam (Anh et al., 1993). The study was based on household interviews with 40–60 households in each of 6 villages, providing a useful insight into the effects of continual exposure to natural hazards.

The study revealed that most farming households spent only 90–100 days per annum on agricultural activities due to the constraints imposed by frequent flooding in the remainder of the year. Only a third of the land was used to produce two rice crops whilst cultivation of three crops was very rare, although a subsidiary crop, such as sweet potato, maize or peanut, could be inter-cropped with rice on drained lands during the summer and autumn. The weak sea-dyke network also meant that there had been little investment in irrigation, with most cultivation under rainfed production. In consequence, rice yields were typically very low, around a third to half the national average, and most households were not food self-sufficient.

Agricultural earnings were complemented by fishing, an activity which formed the primary source of income for some households. However, risk of natural hazards had limited investment in fishing equipment. Gradual deterioration of the dykes had also reduced salt-production activities due to the frequent flooding of former salt-fields. Meanwhile, although half of the households surveyed had family wells, these wells were typically salted for 4–5 months in the year, forcing households to travel considerable distances to obtain drinking water. A combination of poverty and natural hazards had generated some migration in search of higher wages and lower risk of hazard-related losses.

The construction and retro-fitting of houses was identified as the first priority in household expenditure (presumably after food). In the two years prior to the survey, some 28% of houses were reported to have had a major reconditioning, partly entailing necessary repairs as a consequence of natural disasters as well as some improvement in the standard of living.

Anh et al., 1993

possessions to higher ground and live in tents for the duration, although they remain vulnerable to early rains occurring before crops have been harvested. (UNDHA et al., 1994). However, even in the two main river deltas there are some vulnerable communities. For example, Christoplos (1996: 3) points to 'a large and growing

portion of the (Mekong) Delta's population (which) is landless and destitute, with little or no margin to survive sudden emergencies'. These groups have commonly been over-looked in the belief that all will benefit from the high economic growth in the region. Yet, in fact, inequalities in the distribution of food and income are reported to be particularly severe in the Mekong, in part because of especially weak mechanisms for the redistribution of wealth, effectively making poorer households particularly vulnerable to natural hazards (ibid.).

Communities are also typically more vulnerable to natural hazards with longer return periods. For example, housing structures in the Mekong Delta, where typhoons occur relatively less frequently, are reported to be particularly vulnerable to typhoons (ibid.). Meanwhile, housing structures across Viet Nam are apparently poorly equipped to withstand the impact of a major earthquake.

There is also an important dynamic element to vulnerability: the scale and nature of a household's vulnerability will alter over time reflecting various factors such as changes in socio-economic behaviour or in the scale and frequency of the hazard risks themselves. It may take some time before the nature of this new vulnerability is fully understood and thus before appropriate adaptive measures can be adopted.

In fact, there are a number of factors which may currently be increasing household vulnerability to natural hazards in Viet Nam:

- **Changing crop mix** As already discussed, there are certain reasons to suggest that on-going changes in the agricultural sector may be increasing the level of hazard vulnerability in the shorter term although there are various measures which can be taken to avoid this (see Chapter 4).

- **Changing levels of protection from structural flood control measures** The condition of parts of the country's extensive dyke system has deteriorated due to insufficient operational and maintenance funding, effectively increasing vulnerability to floods. Even improvements to structural flood control measures can increase vulnerability as households become over-confident, perhaps believing that they are now fully-protected against floods and thus, for example, investing in new crops or equipment which are subsequently destroyed by a flood. In fact, total losses over an extended period of time can be higher where better protection exists.

- **Environmental degradation** Environmental degradation as well as changes in water resource availability and utilisation can similarly alter the level and nature of hazard risks, again requiring commensurate adjustments in behaviour (see Chapter 9 and Box 7.2) as well as changes in the scale and nature of hazard protection measures. Environmental depletion can also restrict the scope for traditional coping mechanisms. For example, declining fishing stocks have implied

there are fewer opportunities to resort to fishing, an important traditional coping mechanism, during times of economic hardship (Christoplos, 1996).

- **Demographic and land pressures** Parts of the country have an extremely high population density, particularly in the Red River Delta where there is only 0.06ha of land per capita (UNDP, 1995a). Severe demographic pressure has led to environmental degradation and the cultivation of more marginal lands, including floodways, hazardous coastal areas and hillsides, as well as to increased urban migration. This pressure is expected to continue, with the population forecast to reach 85m by 2005 and 120–130m by 2025 (UNDHA et al., 1994).

- **Population movements** The rapid economic changes have been accompanied by population movements, in part under the government's resettlement programme which relocates households from areas of high to lower population density. Refugees have also been returning to the country. Thus people may be moving into areas where they have little understanding of the nature or severity of hazard risks, effectively increasing their vulnerability, whilst perhaps also placing increasing pressure on traditional coping mechanisms of the indigenous population. For example, during the particularly severe 1994 floods in the Mekong valley, those most severely affected were reported to be the recently settled inhabitants of the so-called New Economic Zone and the new arrivals from Cambodia, mainly ethnic Vietnamese, who had arrived in 1993 (IFRC, 1994).

- **Changes in the quality, design and location of housing** (see section 7.4).

- **Changes in land-use rights** The 1993 Law on Land grants households the right to buy and sell land-use rights. To date, the law has been implemented relatively slowly, with only 31% of households in 28% of total communes granted land-use certificates by 1995 (Cuc, 1995). However, the World Bank (1995a) has voiced concern that as land-use rights are increasingly exchanged and until labour markets are much better developed, certain segments of the population could become increasingly disadvantaged if they are forced to sell their land as a consequence of, for example, natural disasters or illness, rather than in order to undertake off-farm investments. Forced sales would reduce their access to resources, leaving them increasingly vulnerable to future disasters.[96]

Most fundamentally, poverty alleviation is central to solutions to reduce household vulnerability to natural hazards, in turn requiring rural diversification and greater non-agricultural job opportunities. Yet the country's age structure implies that perhaps a

[96] In practice, the extent to which this occurs may be partly restricted by the fact that long-term transfer of land still requires the permission of local authorities.

million people are entering the labour market every year, placing continual pressure on labour markets.

Efforts to streamline disaster mitigation and prevention measures in line with the preferences of local people could also play an important role in helping reduce household vulnerability to natural hazards. For example, along some parts of the coastline there are two lines of dykes, with farming and aquaculture taking place between them. Maintenance activities tend to be focussed on the innermost dyke yet this may not be entirely in accordance with the preferences of local people.

Poverty and disaster vulnerability The most poverty-stricken regions of Viet Nam are broadly the most hazard-prone with the greatest incidence of poverty in the Central Highlands, Northern Uplands and North Central Coast (see section 3.3). The link between natural hazards and poverty is clearly recognised both by the government and donors, as, for example, indicated by the government's poverty alleviation programme for 1996–2000. Similarly, the World Bank Poverty Report (World Bank, 1995a) recognises the role of climatic conditions in determining prospects for rural development and poverty reduction. The UNDP et al. 1995 poverty study identifies excessive risk, including that posed by natural hazards, as one of the main underlying causes of poverty. Oxfam-UK/Ireland (1996) also identifies natural disasters as one of the causes of poverty and identifies those located in coastal high-risk areas affected by natural hazards and/or increasing soil salinity and acidity as lying amongst some of the poorest groups in the country. However, recognition of the relationship between poverty and hazard vulnerability is still far from universal.[97]

Households have devised various strategies to reduce risks, as reflected, for example, in their choice of crops (see Chapter 4). However, these entail the adoption of hazard risk-minimisation rather than income-maximisation strategies, potentially creating a poverty trap as households choose not to exploit potential income-enhancing opportunities. In the aftermath of a disaster, poorer households also often have to borrow funds to meet their basic needs until they are able to resume income-generating activities. Indeed, this is an annual pattern in, for example, the Mekong River Delta (Christoplos, 1996). Yet the poorest households have also traditionally had the weakest access to formal credit, in part due to lack of collateral, and instead have had to rely on informal credit markets which charge considerably higher rates

[97] For example, the questionnaire used in the Viet Nam Living Standards Survey only referred to natural hazards in identifying possible factors for migration (Viet Nam National Steering Committee, 1992). Households were also questioned if they had received any benefits from the government's Social Fund (which includes disaster relief) over the previous 12 months but were not asked about the basis of their eligibility. There were no questions pertaining to, for example, the impact of natural hazards on employment opportunities or agro-pastoral activities although the survey includes a question on land quality as defined in terms of crop yields over the past 12 months.

of interest, of perhaps 20–30% per month. This has sometimes resulted in considerable indebtedness, trapping households in poverty.

The UNDP et al. report identifies the need to help poorer families manage risk, an action which would reduce household vulnerability to natural disasters (UNDP et al., 1995). Other causes of poverty identified in the same report include isolation and inadequate productive resources, both of which are indirectly linked to natural hazards to the extent that hazards exacerbate the difficulty and cost of movement of goods and people between areas whilst inhibiting investment. Physical and social isolation also intensifies the localised impact of shocks such as natural hazards and prolongs the recovery period.

Since unification, poverty reduction has consistently been a central government objective and one of the key driving forces behind the economic reforms. The government aims to eradicate hunger by the year 2000 and poverty by 2010. Indeed, there are clear signs that absolute levels of poverty are already falling.[98] However, there are also concerns that the incidence of relative poverty may be increasing and that income disparities could widen further in the short- to medium-term.

Moreover, the specific measures outlined under the government's poverty strategy up to the year 2000 do not include any directly aimed at reducing vulnerability to natural hazards or thus at tackling the disaster-related poverty trap. The strategy is based upon providing job opportunities rather than welfare transfers for poorer households. Yet more hazard-vulnerable households may not be able to take advantage of better job and income-generating opportunities, such as improved marketing facilities, because they will continue to select risk-minimising options. Thus, it is far too early to assume that poverty-reduction programmes will necessarily reduce the socio-economic impacts of natural hazards. Instead, government and donor anti-poverty programmes will have to be carefully monitored at both the planning and implementation stage to ensure that they contribute to a reduction in hazard vulnerability. Indeed, if hazard vulnerability is not specifically addressed then the achievement of any anti-poverty programmes could suffer major setbacks as a consequence of severe natural hazards.

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[98] The Viet Nam General Statistical Office (GSO) estimates that the level of poverty fell by 6% between 1992 and 1994 to around 20% of the population (UNDP, 1995b). The World Bank estimates, using an expenditure- rather than income-based poverty line, that poverty fell from 70% in the mid-1980s to about 50% in 1992 (World Bank, 1995a). Both studies agree that 90% of poverty was rural. Meanwhile, in response to a 1993 GSO poverty study, 52% of households said that their living standards had much improved since 1990 whilst 31% said that they had improved at least in some respects (Viet Nam Government, 1995a).

10. External assistance and disasters

Disaster-related mitigation, prevention and response requirements place a considerable strain on government resources, as already noted. Moreover, there is little likelihood of private investment in this area. External assistance offers an important alternative form of finance and it is therefore important to consider both the role of the international community in this area and the factors determining its involvement. Donor behaviour is also worthy of examination to the extent that it provides some measure of the international community's perceptions of the physical, economic and social risks imposed by natural hazards in turn partly reflecting more general attitudes espoused by the Viet Nam Government.

During the late 1970s, Viet Nam received considerable western external assistance. However, with the notable exception of a few UN organisations, bilateral agencies and several non-governmental organisations (NGOs), most western aid programmes were suspended during the 1980s whilst the former Council for Mutual Economic Assistance (CMEA) countries, particularly the former Soviet Union, emerged as the main providers of external assistance instead.[99] Following its own domestic upheavals, assistance from the former Soviet Union was halved to US$160m in 1991 and ceased entirely in 1992. Instead, an increasing number of western bilateral donors began to resume aid to the country, particularly following the lifting of the US-led trade embargo and the resumption of international financial institution (IFI) lending in 1993.[100] Some US$1.8bn external assistance was pledged at the 1993 Donors' Conference and an additional US$2bn at each of the 1994 and 1995 conferences. The number of NGOs also burgeoned, with over 140 external NGOs actively providing support to Viet Nam by 1993, including some 30 with staff and offices in the country. Over 60 NGOs had offices in Hanoi alone by early 1996. Further substantial increases in official development assistance are expected in future years (UNDP, 1995b).

In terms of the principal sectors supported by external aid, CMEA assistance was provided in support of a range of activities including power, communications, agriculture, mining, oil and gas production, chemicals, engineering and metallurgy

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[99] Viet Nam has maintained relations with the international financial institutions (IFIs) throughout the period since 1975, both through a regular policy dialogue and the periodic financial and technical assistance. However, approval of new loans from the IMF, World Bank and Asian Development Bank were suspended in 1979 and were not reinstated until a US trade embargo was lifted and overdue obligations cleared.

[100] A US$369m Japanese balance-of-payments support commodity loan accounted for much of the substantial increase in western assistance in 1992, US$200m of which was used as debt relief for previous arrears.

(UNDP, 1993a). However, disaster-related assistance appeared to have been relatively modest, with the notable exception of the funding of the multi-purpose Hoa Binh reservoir which was constructed for hydroelectrical as well as flood control purposes.[101] Instead, most structural flood control measures were undertaken directly by the Viet Nam Government during the 1980s.

Increased western external assistance flows from the late 1980s coincided with major economic reforms and increasing budgetary pressures (see Chapter 6). Disaster-related activities perhaps offered an obvious role for the newer donors as labour resources at the command of the government diminished and, instead, the government increasingly had to draw on financial resources to undertake disaster-related activities. However, the use of western aid for development purposes was largely prohibited until the lifting of the trade embargo in 1993, effectively limiting its use in disaster prevention and mitigation activities. Instead, the bulk of western aid provided before around 1991 was in the form of humanitarian assistance, in part for use support of disaster victims.

NGOs, who could operate outside the embargo using private funding, and the World Food Programme (WFP), which has a wider mandate than most other UN organisations, were better placed to become involved in investment activities. Indeed, in the absence of much bilateral or multilateral funding, several NGOs assumed a somewhat atypical role, engaging in relatively large-scale projects by their normal standards and in projects which also entailed very little direct involvement with the beneficiary communities. The scope of activities was influenced both by the availability of resources to the NGOs and the government's wishes. The latter had a particular preference for infrastructural projects, in part because the government could ill-afford such projects and also because they entailed relatively little direct external involvement in their day-to-day implementation, typically requiring only intermittent technical assistance. Indeed, in some cases funds were directly transferred to construction companies hired to undertake the project (Egan et al., 1994). From an NGO's perspective, infrastructural projects were attractive given the constraints imposed on the numbers of expatriate personnel permitted into the country as such projects could be both reviewed at the proposal stage and subsequently monitored relatively easily.[102] Meanwhile, in terms of NGO resources, although NGOs could not secure financial support for their development activities from multilateral or bilateral

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[101] Data on the levels of assistance provided specifically to disaster-related activities are not available up to 1990. However, data for 1991 indicate that none was disbursed in support of such activities this year, at least. Given the involvement of some of the first western donors and NGOs to arrive in Viet Nam in areas of flood control, it seems reasonable to conclude that Soviet involvement in this area had been limited.

[102] NGOs were not allowed to have either offices or resident expatriate personnel in Viet Nam until 1990 (Egan et al., 1994).

donors, some bilateral food aid was available for projects which could be deemed to have a food security element. In the circumstances, relatively large-scale dyke projects (as well as related canal and irrigation projects), which would protect land from flooding and so permit an improvement in agricultural production, with clear food security implications, thus enabling NGOs to draw on food aid resources, therefore seemed an ideal choice for NGO involvement (see Boxes 10.1 and 10.2).

Thus, several of the earlier NGOs, together with WFP (see Box 10.3), began dyke rehabilitation and upgrading projects and disaster-related activities probably formed a relatively large share in total western assistance during this period, although full data are not available before 1991. Data which do exist indicate that between 1988 and 1990, NGOs alone implemented 44 irrigation and flood control projects costing under US$50,000 (in nominal values) and 47 larger projects costing between US$50,000 and US$500,000 (excluding unpaid labour which was sometimes provided free by local communities). By 1990 there were five NGOs working in the sector, with nine NGOs by 1993 (Egan et al., 1994).

In the more recent period 1991–4, for which relatively complete records are available, disaster-related assistance, broadly defined, accounted for US$40.0m or 2.2% of total aid at real 1994 prices, including US$14.2m in post-disaster relief and rehabilitation.[103] A more disaggregated discussion of this assistance is provided below. The total figure does not seem particularly high, especially when compared with, for example, the US$38.0m (at real 1994 prices) disbursed for primary and secondary education over the same period, in a country which already has a very high literacy rate. This suggests some scope for increasing disaster-related assistance, particularly given its pivotal role in poverty alleviation. Increased expenditure in this area could also help redress current imbalances in the regional allocation of assistance to the extent that more hazard-prone areas have tended to receive relatively less per capita international assistance to date – imbalances which themselves may partly reflect more limited investment opportunities in more hazard-prone areas as a direct consequence of higher risk of hazards.[104]

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[103] Projects are classified by their principal activity, as indicated by the project title and brief description. A number of donors have also been involved in various other water management projects which contain some disaster-related implications – for example, supporting irrigation and drainage works, watershed management, reforestation of uphill and coastal areas and improvement of the eco-system. In particular, donors have provided significant assistance in the area of irrigation, totalling US$13.9m (at real 1994 prices) over the period 1991–4 (including some projects which also entailed a hydroelectric power generation element). This assistance has been excluded from the above analysis but has various positive and sometimes negative implications for the impacts of natural hazards (see section 7.7).

[104] Based on information reported by donors, two-thirds of assistance in 1993 and slightly over a third in 1994 could be attributed to particular provinces or urban authorities. The North Central

Box 10.1 Oxfam-Belgium

Oxfam-Belgium has a long history of involvement in Viet Nam as one of the few NGOs supporting the north of the country during the war, although it did not have an active presence in Viet Nam until 1989. Its Viet Nam programme is also one of its largest worldwide.

Oxfam-Belgium's first projects were implemented in the water and health sectors and included some 10–15 dyke construction and rehabilitation food-for-work projects. The scale of these projects were relatively large by Oxfam-Belgium's normal standards, although much smaller than WFP's dyke projects (see Box 10.3). Each project cost some US$20–70,000 and involved the construction and upgrading of around 5–10 km of dyke. Ideally, Oxfam-Belgium would have preferred to undertake community development and small-scale dyke projects but was partly forced into a larger role by the very scale of food aid resources made available to it by the European Commission. Moreover, restrictions on access to the provinces effectively curtailed any involvement in more community-based structures.

Over time, however, political changes and increasing openness, most markedly the abolition of travel permits, have gradually permitted a shift in management style towards one based on greater direct involvement with local communities. They have also facilitated a shift towards much smaller projects, often entailing the construction or upgrading of only 2–3 km of dykes together with some irrigation and drainage components. More recently still, disaster mitigation activities have formed part of wider integrated rural development projects, whilst Oxfam-Belgium has had much less involvement in structural flood control measures. The NGO has faced some problems in achieving this transition, in part relating to the fact that it initially continued to have considerable resources, especially of food aid, at its disposal which it was under some pressure to utilise. Nevertheless, by about 1994 projects were being undertaken on a much smaller scale and entailing much reduced food-for-work components. Furthermore, they were being managed by local management committees at the village or commune level rather than implemented through district or provincial governments.

Meanwhile, the increase in western assistance has been accompanied by a gradual change in the operating environment, particularly since around 1993. This has influenced the nature of externally-funded projects, particularly those supported by NGOs, enabling greater community involvement in projects as access to beneficiaries has increased.[105] At the same time, there has been an overall reduction in the scale of

Coast – that is, the most hazard-vulnerable province in Viet Nam – fared particularly badly in the allocation of this assistance, receiving US$1.7 and US$1.9 per capita in the two years respectively compared to comparative figures of US$14.5 and US$25 per capita in Hanoi.

[105] For example, in its newest project area, Oxfam-UK/Ireland has adopted a 'one-programme approach', involving a number of activities ranging from agriculture/sustainable livelihoods and other incoming generating activities to credit, primary education and small-scale infrastructure.

Box 10.2 Oxfam-UK/Ireland

Oxfam-UK/Ireland has supported development activities in Viet Nam since 1981 and has had an office and programme staff in the country since 1990. It has been involved in the construction of sea dykes and irrigation projects in three provinces since 1986, a role selected from a government-identified list of projects. However, in contrast to the WFP and Oxfam-Belgium dyke projects, workers have been paid in cash rather than kind, reflecting Oxfam-UK/Ireland's continued opposition to food-for-work projects worldwide.

As of early 1996, Oxfam-UK/Ireland's overall programme was largely concentrated in four of the poorest districts in the North Central Coast, Mekong Delta and North Mountain and Midlands regions, with the overall objective of improving well-being by sustainable means. In the first of these project areas, Ky Anh district of the North Central Coast, frequent natural hazards are experienced. Oxfam-UK/Ireland's activities have therefore included construction of sea dykes, support to communities in the planting of 300–500 ha mangrove forests and the introduction of typhoon-resistant schools and housing. Oxfam-UK/Ireland had previously implemented a US$0.1m sea dyke rehabilitation project in the same area but the dyke was subsequently destroyed by a severe typhoon. The current project was therefore designed to heighten, as well as repair, the dyke.

Oxfam-UK/Ireland intends to continue to maintain its involvement in emergency activities at least up to the year 2000, actively participating in disaster prevention, preparedness and response in the provinces it works in as part of its more general strategy to reduce poverty. As of early 1996, it was envisaged that this programme would include the construction of structural measures such as dykes as well as, for example, of typhoon-resistant buildings where necessary. However, Oxfam-UK/Ireland is now questioning the extent to which it should be involved in the maintenance and construction of infrastructure more generally.

After Oxfam-UK/Ireland (1996)

individual NGO projects. For example, in 1994 NGOs implemented 17 irrigation and flood control projects costing under US$50,000 but only 2 costing over that amount (Egan et al., 1994). Nevertheless, NGOs have continued to play a much larger role in disaster-related activities than overall assistance, even excluding disaster relief efforts (Figure 10.1). Meanwhile, newer donors, particularly bilateral ones, have typically focused on other areas of assistance.

Utilisation of disaster-related aid resources, 1991–4 Flood protection measures formed the single largest share of disaster-related aid disbursements over this period, accounting for 45% of the total with some additional marginal support for various non-structural measures such as mangrove planting (see Boxes 10.2, 10.3 and 10.4 and Figure 10.2). A number of donors and NGOs have been involved in this area working on a range of scales, as already indicated. For example, Oxfam-UK/Ireland (see Box 10.2) and ICCO (a Dutch NGO) have been involved in small-scale projects,

Figure 10.1: External assistance to Viet Nam by source, 1991-4 (at real 1994 US$)

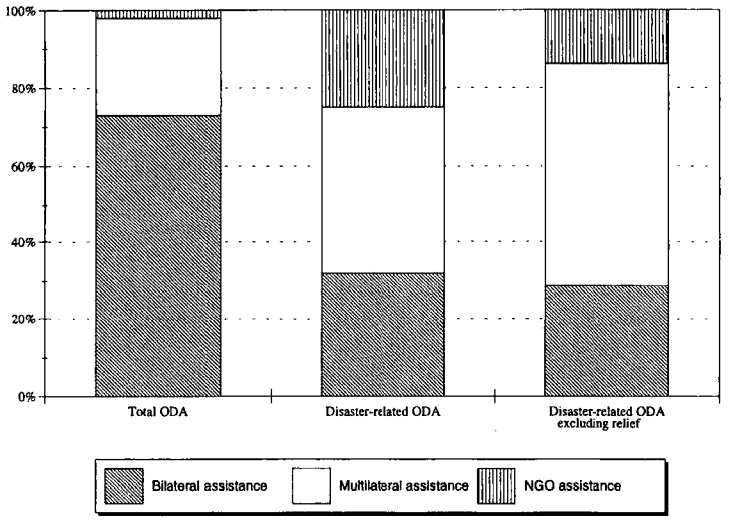
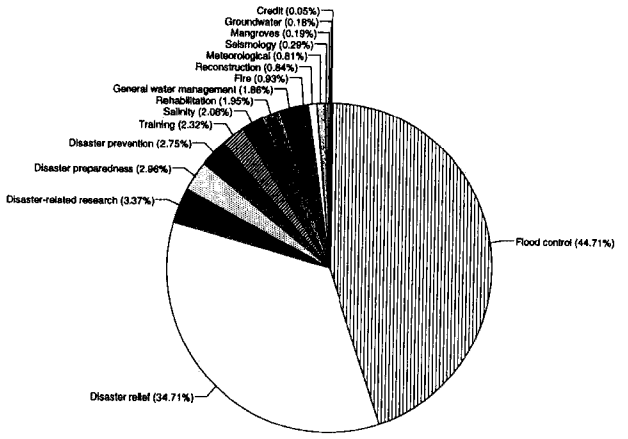


Figure 10.2: Disbursements of disaster related assistance by use, 1991-4 (excluding assistance to irrigation projects and at real 1994 US$)



Source: UNDP, various

Box 10.3 The World Food Programme

The World Food Programme (WFP) has been operational in Viet Nam since 1975, initially providing relief and post-war rehabilitation assistance but gradually branching out into three main areas of cooperation: forestry, sea dyke rehabilitation and vulnerable groups feeding in the context of primary health care. Since 1977, WFP has completed one quick action and six development projects in the water resources/irrigation sector, to a total value of US$48.8m. Meanwhile, total WFP development projects amounted to US$240m by 1995 (WFP, 1996).

WFP initially became involved in the water resources sector in the mid-1980s, providing US$12m in food aid under an irrigation and river-dyke project in Ninh Binh province following heavy flooding in the region in 1985 (Project 3351). The project entailed the rehabilitation and upgrading of 84 km of dyke systems, which provided protection to some 15,000 ha of land and 28,000 households, as well as the improvement of 285 km of irrigation and drainage canals. More recently, it has provided US$0.9m of food assistance in support of a 1-year dyke and canal rehabilitation and upgrading project in Quang Nam-Da Nang province (Project 4125-Q). Between 1993 and 1998 it is also providing food assistance to a total value of US$13.1m for a project to rehabilitate 454 km of the total 1,100 km of sea dykes in 7 central provinces and 28 districts, including the establishment and maintenance of 1,010 ha of mangrove and filao trees (Project 4617). WFP has also begun a second US$25m sea-dyke project (Project 5325) to upgrade, rehabilitate and protect 361 km of sea dykes in the Red River Delta. This project is more expensive than the previous one because of stronger tidal surges in the project area, necessitating higher dykes.

The broader objective of the dyke projects has typically been to increase agricultural production, by supporting higher cropping intensity and land reclamation, and to reduce losses incurred as a consequence of natural hazards, including salination. The projects have been focussed particularly on poorer provinces. Some evidence of their success is indicated by an evaluation of Project 3351 which found that between 1989 and 1993 the project had contributed to a 156% increase in paddy production, to a reduction in the proportion of food deficit households from 15–17% to 8–10%, and to a reduction in the level of poor households from 30% to 15–20%. Furthermore, whereas the two project districts had received government subsidies and paid reduced land tax because of low rice yields in the past, by 1993 they were able to make considerably higher contributions to the state (Viet Nam Water Resources Service, 1993).

Certain WFP forestry projects have also entailed disaster prevention or mitigation elements. As of early 1996, for example, WFP was implementing a forestry project in Central Viet Nam to rehabilitate 125,000 ha of degraded forest in 13 coastal provinces, in part with the objective of providing protection against erosion, typhoons and encroaching sand dunes and again involving a food-for-work element.

WFP's food-for-work schemes also appear to have performed an important role in both providing employment and purchasing power and in funding construction of essential rural infrastructure. However, a recent multi-donor evaluation of WFP concluded that there was a strong case for arguing that in the future WFP food-for-work projects in the Forestry and Water Resources sector should be supported by multilateral-lending agencies instead because, as general standards of living and household food security improve, beneficiaries are likely to prefer cash wages (WFP, 1996). With this in mind, WFP is planning to phase out its development assistance to Viet Nam by the end of the year 2000.

Box 10.4 Mangrove Plantations and Save the Children Fund (United Kingdom)

In 1989, Save the Children Fund (United Kingdom) (SCF-UK) implemented the first donor-funded mangrove planting project in the central and northern provinces of Viet Nam, as one of its first projects in the country. By early 1996, it had supported mangrove projects in Ha Tinh, Nghe An and Thanh Hoa provinces, all in the Northern Central Coast region. The projects have involved the planting and subsequent monitoring of mangroves as well as support for their protection and for the proper functioning of mangrove management committees. The projects have aimed to contribute to an improvement in the marine environment, to provide an additional source of income from mangrove by-products and to increase agricultural production (Macintosh and Hong, no date). SCF-UK has also provided training for project implementors; and, together with other NGOs, has run multi-media educational activities for both children and adults addressing mangrove-related issues. SCF-UK subsequently hopes to assist local communities in using the mangrove plantations for income-generating purposes in a sustainable manner – for example, for crab-farming.

The extent of local community involvement has varied although the mangrove projects have generally been well-respected. However, in some villages financial penalties had had to be imposed on those inflicting damage to trees (ibid.), suggesting that the wider, longer-term community benefits did not always hold sway over personal gain. Some difficulties have also been encountered relating to technical expertise and maintenance (SCF-UK, 1995). For example, in Ha Tinh Province, one report indicated that only 30–60% of dead seedlings had been replaced because local people did not always appreciate the importance of replanting (Macintosh and Hong, no date).

In the future, SCF-UK envisages that it will probably cease its support to mangrove plantations, leaving this role for larger donors such as UNDP and WFP instead. However, such organisations by definition, have a less community-oriented approach and this could diminish their level of success, particularly in terms of protecting the mangroves before they are fully established and in promoting a sense of community responsibility.

the latter undertaking a project entailing the construction of two stretches of dykes 7 and 11 km in length. In contrast, WFP has been involved in several much larger projects, for example rehabilitating 454 km of sea dykes under one project (see Box 10.3).

Post disaster-relief formed the second largest share (34%) of total disaster-related assistance in 1991–4. Despite the government's reluctance to launch international disaster appeals since the country began exporting rice. Individual donors and NGOs have nevertheless been approached by lower echelons of government, right down to the commune level, to provide relief assistance on a number of occasions and these appeals have often elicited a generous response. Following three major typhoons in late 1995, UNDP took it upon itself to launch a more coordinated appeal, generating some US$600,000 from bilateral donors and NGOs although some multilateral organisations were unable to respond because the appeal was not official. Meanwhile, the Viet Nam Red Cross regularly raises funds in-country from the government, international NGOs and local fundraising events for use in flood-relief efforts (Christoplos, 1996). In the event of a disaster, some donors – for example, UNICEF – may also speed up the disbursement of assistance under development projects already being implemented in the affected area to help assist communities.

Post-disaster rehabilitation and reconstruction appear to have received far less support, accounting for only 2% of total disaster-related assistance over the period 1991–4 despite its critical importance in helping to ensure a rapid economic recovery and to avoid longer-term adverse impacts on the incidence and depth of poverty. Admittedly, the apparently low level of assistance in this area is exaggerated to the extent that some rehabilitation items are reported under relief supplies and cannot be separated out due to data limitations. For example, the Viet Nam Red Cross has provided fishing boats in response to floods in the Mekong Delta as well as more general support for the rehabilitation of houses and other infrastructure yet these activities are reported under relief efforts. Nevertheless, donors should pay particular attention to efforts to ensure a rapid rehabilitation of affected communities. Indeed, in terms of the broader macroeconomic impacts of natural disasters, increased provision of such assistance could become increasingly critical in the future as greater economic integration implies that economic conditions in one region affect those in others.

Some donors have been involved in initiatives to enhance the country's disaster forecasting, preparedness and management capacity, accounting for 3% of total disaster-related assistance over the period 1991–4. For example, the Viet Nam Red Cross runs a Disaster Preparedness Programme focussing on the construction, equipping and staffing of disaster preparedness centres and including training of disaster preparedness and relief workers in techniques such as temporary dyke strengthening as well as first aid. The Red Cross also plays a role in mobilising volunteers to undertake immediate pre-disaster preparedness measures. Meanwhile, both the Red Cross and UNDP (through the Disaster Management Unit) are supporting the development of disaster management capacity (see Box 10.5). In terms of technical forecasting capability, the Norwegian government has financed a project to improve Viet Nam's typhoon-forecasting capacity whilst the World Meteorological

Box 10.5 The United Nations Development Programme

The United Nations Development Programme (UNDP) has been particularly active in supporting disaster-related activities in Viet Nam. Natural disasters are contained under UNDP's environment and natural resources programme, which has three basic objectives: (i) the reduction of urban and industrial pollution; (ii) the reduction of the impact of natural disasters; and (iii) the sustainable exploitation of natural resources (UNDP, 1995a). The programme recognises that natural disasters 'are not predestined but often a consequence of unsustainable natural resource management practices' (UNDP, 1995a, p.14) and therefore aims to address the causes of disasters as well as to support more direct mitigation and disaster management activities.

During the 1980s and early 1990s, UNDP supported eight projects aimed at strengthening national flood mitigation and emergency preparedness. It has also facilitated a number of meetings and workshops to increase awareness of disaster-related issues and funding requirements. In addition, it has funded the drawing up of master plans for the development of the Mekong and Red River Deltas, both of which include some reference to the impact of natural hazards (Viet Nam MWR and UNDP, 1992). More recently, UNDP has begun providing financial support to the Disaster Management Unit, a unit located within the ex-Ministry of Water Resources (see section 7.1). It has also provided technical assistance to a WFP Sea Dyke project, to improve the quality of dams built.

UNDP is currently re-orientating the emphasis of its programme in Viet Nam towards one which is more poverty-focused, reflecting a wider global shift in UNDP's work as well as one of the Viet Nam Government's own major priorities. The inter-relationship between natural disasters and poverty has already been recognised and this will hopefully lead to the creation of programmes which include efforts to reduce vulnerability to natural disasters. Indeed, anti-poverty initiatives which fail to address disaster-vulnerability may achieve little.

Office, UNDP and the French government have provided support to the country's hydrometeorology capacity. Both ADB and the Netherlands have also been involved in projects which consider the consequences of global warming.

Terms of disaster-related assistance Virtually all western disaster-related assistance to date has been in the form of grant assistance despite the fact that 46% of total assistance disbursed over the period 1991–4 was in the form of loans. This would appear entirely appropriate on the basis of the fact that disaster-related assistance does

not generate any direct income. Furthermore, it hopefully avoids any expectation that some part of the expenditure should be reimbursed by beneficiaries to the central government.[106] Food aid has formed a large share of total disaster-related assistance whilst flows of free-standing technical cooperation have also been significant, particularly as compared to total assistance to the country (Figures 10.3 and 10.4).

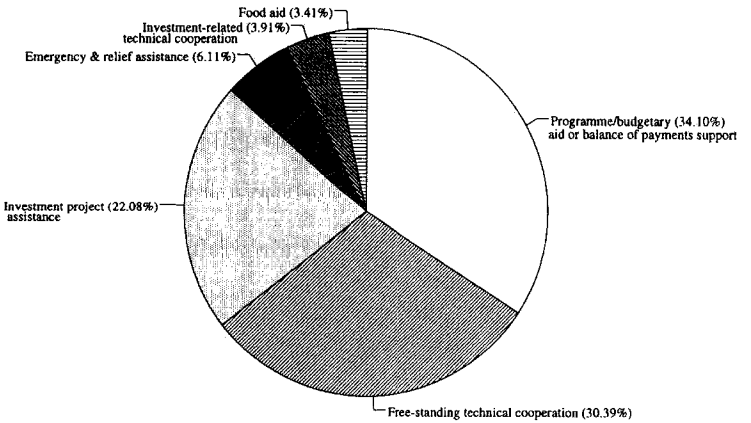
Aid absorptive capacity Certain aid absorption problems have been encountered, with annual aid disbursements averaging around US$400m less than commitments in recent years. Absorptive difficulties have partly reflected the fact that the government has had little experience to date with the procedures and regulations of various donors, effectively slowing down the establishment of projects. However, the Viet Nam Government has been undertaking efforts to improve institutional, negotiation and implementation aspects of aid to increase levels of absorption and several donors are working alongside the government to overcome problems (UNDP, 1995b). Absorption problems have also reflected certain difficulties on the part of the government in meeting project counterpart costs, underlining the high opportunity cost of counterpart funding and thus the importance of both streamlining aid projects in keeping with the government's own investment priorities and of the need for particular efforts on the part of donors to help minimise counterpart costs. For example, under one WFP sea-dyke project certain difficulties were encountered in obtaining adequate counterpart funding for the purchase of rock and concrete revetment. However, this was partly due to a WFP consultant's recommendation to use larger rock sizes, in turn increasing transport costs (WFP, 1996).[107]

Disasters themselves do not appear to have resulted in any delay in the disbursement of overall external assistance, although it is not entirely implausible that a series of severe natural disasters in quick succession in various parts of the country could

[106] The government is anxious that the country should not accumulate high levels of external debt and thus wants to ensure that external assistance loans are used effectively. The draft Public Investment Programme therefore suggests that state enterprises, provinces and agencies should repay any loans to central government at uniform rates of interest and repayment, although possible concessions for poorer provinces and particular types of projects, such as social infrastructural and human capital projects, are being considered.

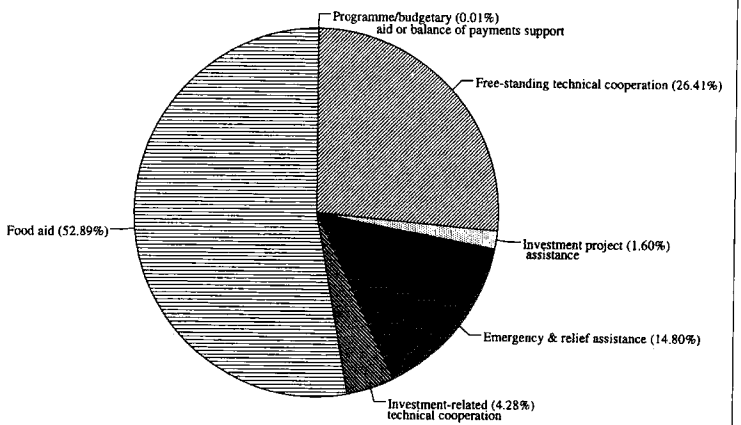
[107] One NGO overcame problems associated with government counterpart funding under a dyke rehabilitation project by monetising some of the food aid resources which another donor had provided to finance the purchase of materials. WFP also provides some non-food items, such as geo-textiles for dyke filters, trucks, wooden boats and tools.

Figure 10.3: Total assistance to Viet Nam by type of assistance, 1991-4 (at real 1994 US$)



Source: UNDP, various

Figure 10.4: Disaster-related assistance to Viet Nam by type of assistance, 1991-4 (at real 1994 US$)



Source: UNDP, various

reduce rates of disbursements, with implications for fiscal and monetary policy.[108]

Concluding comments There is clearly a role for increased multilateral and bilateral involvement in disaster-related activities, given both the scale of current assistance and the clear problems faced by the government in financing such expenditure, as indicated in Chapter 8. Part of the key to securing such assistance could lie in the improved coordination of international assistance, effectively rationalising its allocation and highlighting gaps or shortfalls. The need to coordinate assistance as a joint effort between the government and donors has already been recognised whilst the government has also been particularly keen to ensure that aid resources are used efficiently.

Donors have taken some initiatives of their own in improving aid coordination. UNDP has been appointed the role of fostering in-country coordination. In addition, a Country Strategy Note has been prepared, establishing a strategic framework for the programming of future assistance from the UN system (Government of Viet Nam, 1995c). Meanwhile, NGO activities are formally coordinated by the People's Aid Coordinating Committee (PACCOM) whilst the NGO Resource Centre plays an important informal networking role. NGOs also established a Water Resources Sectoral Group in 1993, meeting monthly with the aim of eliminating duplication of efforts and sharing information (Egan et al., 1994).[109]

The government could also play a role in encouraging more investment in disaster prevention and mitigation strategies. As already noted, the government has consistently played an important role in directing external assistance to particular sectors. During the late 1980s and early 1990s, it drew up lists of projects which donors and NGOs were expected to choose from. More recently, a looser sectoral approach has been taken, with different donors encouraged to support particular

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[108] In 1993, the government pursued an expansionary monetary policy in expectation of considerable inflows of foreign assistance which, in the event, were much diminished due to various non-disaster-related factors. Levels of bank credit had also grown strongly over the same period as a consequence of extensive private sector lending. These two factors combined to result in a worsening of the fiscal deficit from 3% in 1991 and 1992 to 5.5% in 1993 (ADB, 1995). The subsequent rise in inflation, in part a consequence of the wider fiscal deficit, led to a tightening of fiscal and monetary policy in 1994 as well as the containment of public capital expenditures below budgetary projections, resulting in an overall fiscal deficit for the year of 2.2% of GDP (ADB, 1995). The government borrowed US$100m commercially because of the slow disbursement of ODA. The increase in the fiscal deficit in 1993 also placed temporary pressure on the external current account.

[109] There was also a call for the establishment of a working group specifically to coordinate overall water-disaster assistance in 1994 (Viet Nam MWR et al., 1994), although this has not been followed up.

sectors, normally reflecting their previous activities.[110] As part of a broader process of coherent and rational allocation of all public investment resources, and particularly in view of the country's considerable investment needs, the government has also drawn up a draft Public Investment Programme (PIP) with the assistance of several donors (see Chapter 6). The PIP provides both the basis for formulating annual state investment budgets and also for negotiating external assistance. All projects receiving official development assistance support are included and this will hopefully ensure a more rational allocation of resources as well as encourage further investment in disaster prevention and mitigation. In the area of water disaster prevention, mitigation and preparedness more specifically, Viet Nam's Strategy and Action Plan for Mitigating Water Disasters has provided a coherent framework for both government action and donor assistance. As already noted, progress had already been made under many of the 18 tasks of the Plan in part with donor funding (see Box 7.1).

However, perhaps somewhat surprisingly an examination of the areas for external support, identified by the government in its presentation to the 1995 Donor Consultative Group meeting did not specifically include disaster mitigation and prevention activities although water supply systems, forestry and power projects were listed with indirect implications for disaster mitigation and prevention.[111] This could partly reflect increasing pressure to encourage investment in projects generating high direct returns which can be used to repay any loans, as well as the difficulties in estimating the true returns to disaster-related investments.

Yet there is an implicit danger that by failing to identify disaster mitigation and prevention measures specifically, be they structural or non-structural, in key government documents, donors could fail to appreciate their fundamental importance to many aspects of Viet Nam's economy. For example, one donor representative interviewed for this study who had had little involvement in disaster mitigation stated that he thought the government attached a low priority to investments in this area. It is important that all donors are made fully aware of hazard risks, including earthquakes as well as water-related hazards. Furthermore, they should incorporate hazard risks into the design of their projects and programmes, both in terms of disaster-proofing the construction of any infrastructure, as some donors and NGOs

[110] For example, in mid-1995, the government identified two priority sectors for WFP – forestry and water resources. WFP was already working in both these areas as well as in health.

[111] As of the end of 1995, the government's more general priority areas for official development assistance were (i) rehabilitation and expansion of infrastructure; (ii) support for the social sectors, particularly education and health; and (iii) assistance to the reform process and institutional strengthening. Environmental protection and management had also emerged as a particular focus of the government in directing external assistance flows (UNDP, 1995a).

already do,[112] and also by undertaking hazard risk assessments. The latter could encourage donors to adjust projects to minimise risks – for example, by altering the choice of crops and varieties supported under an agricultural project. Donors also need to recognise the broader adverse economic impacts that natural disasters could have, potentially frustrating government efforts to meet certain targets upon which continued provision of some external assistance, including IMF and World Bank structural adjustment facilities, may be conditional.[113]

[112] For example, the Japanese government has supported a large school-building project which has incorporated typhoon-proofing features. Similarly, Oxfam UK/Ireland has included typhoon-proofing features in projects located in typhoon-prone areas. It has also been trying to promote the design of bamboo and grass typhoon-proof structures – that is, utilising materials which are more readily available to poorer families.

[113] For example, the IMF approved 3-year US$540m Enhanced Structural Adjustment Facility (ESAF) (a concessional IMF lending facility) in November 1994, conditional upon the progress of macroeconomic management, institutional reforms and sectoral policies. A US$150m World Bank Structural Adjustment Credit was approved in October 1994, again conditional upon certain factors.

11. Conclusions

The main findings of the paper are as follows:-

- Reflecting the country's steep high mountains, narrow low plains and extensive coastline, Viet Nam is particularly prone to annual riverine and coastal flooding and to typhoons. It also experiences droughts and earthquakes.

- The incidence and severity of natural hazards is increasing as a consequence of **environmental degradation**. Rapid deforestation is disrupting watershed management systems and increasing monsoonal rainfall run-off whilst destruction of mangroves and coral reefs has increased the exposure of coastal areas to typhoons, sea surges and seawater intrusion. The link between environmental degradation and the increased incidence of natural hazards has been formally recognised. However, further progress is required both in implementing various environmental protection and regeneration policies and laws and in promoting environmental awareness.

- **Global warming** is expected to have serious implications for Viet Nam, particularly in terms of the rise in sea level as a considerable part of the country is low lying. There is also some concern that climate change could result in an increase in the frequency and intensity of typhoons and flooding, although the climatological implications of global warming are still being investigated.

- Natural disasters have important **economic impacts** in Viet Nam, particularly in terms of development opportunities foregone and, more recently, in exacerbating regional and occupational income inequalities and reinforcing poverty. It is more difficult to measure the impacts of natural hazards on annual rates of growth and other broad economic indicators due to the high incidence of natural hazards, implying that the benefits of a hazard-free year cannot be measured. Measurement problems are further compounded by the fact that water resources have been used to considerable economic advantage and are viewed as a 'national treasure' where the extent of annual flooding remains within certain, expected parameters and thus where water resources can be adequately controlled. The on-going programme of major economic and political reforms since 1986, which has resulted in very high rates of growth, with commensurate increases in levels of investment, external trade and so on, have also complicated problems in isolating the impacts of disasters. Indeed, even years of more severe flooding have not reversed these trends. However, at a more localised level, natural disasters nevertheless have potentially severe economic impacts.

- **Economic hazard vulnerability** could increase further in the future for various reasons. First and foremost, economic growth prospects are considered good but performance will partly depend on exploitation of the country's comparative advantages and sectoral strengths, including it's hazard-vulnerable agricultural sector and the promotion of related industries. Increasing capital investments could also imply higher levels of direct disaster-related damage if appropriate prevention and mitigation measures are not taken. Future changes in the management of the Mekong River could have further implications for both the nature of hazard risks and economic vulnerability whilst improved market integration and financial deepening could also increase hazard vulnerability. Moreover, natural disasters could disrupt efforts to consolidate macroeconomic stability, another essential pre-requisite for sustainable growth. For example, a severe natural disaster could force up the rate of inflation, with potential knock-on implications for fiscal and monetary policies.

- Natural disasters appear to have been an important factor contributing to gradually **widening regional disparities** as some areas of the country have been better placed to take advantage of the opportunities presented by the economic reforms. For example, some of the more hazard-prone regions have received disproportionately small shares in private and public investment and external assistance. The threat of hazards has also restricted possibilities for crop diversification and cultivation of higher-yielding varieties in some areas. The government intends to enact a series of policies to narrow the gap between the rich and poor and it is critically important that any such programmes include efforts to reduce hazard vulnerability.

- Natural disasters have clear adverse implications for the **agricultural sector**, both damaging crops and agricultural infrastructure and also influencing cropping decisions. Available data indicate that, between 1971 and 1995, Viet Nam lost over 6 million tonnes of rice as a direct consequence of water-related disasters alone, equivalent to almost 2% of actual rice production over the same period. True losses were probably considerably higher.

- There is strong evidence of household mechanisms to minimise the agricultural impacts of disasters, as most obviously reflected in choice of rice varieties and cropping intensities. For example, in more hazard-prone regions of the country, lower yielding but more hazard-tolerant traditional varieties of rice are typically preferred. Furthermore, in some areas of the country only one crop is grown each year, compared with up to three crops in certain other regions, as the risk of disaster-related losses is considered too great during much of the year to chance cultivation. Thus, more hazard vulnerable areas achieve lower levels of production even in disaster-free years. As already noted, regional disparities in agricultural production have been further accentuated as gradual liberalisation has

improved production incentives, with farmers in less hazard-prone areas better placed to increase cropping intensities and cultivate higher-yielding varieties.

- Some farmers could be become increasingly vulnerable to natural hazards during the initial stages of diversification. Although recent reforms may provide farmers the opportunity to produce crops better suited to local growing conditions, this assumes knowledge about the suitability of new crops, varieties and cropping patterns. In practice, farmers typically have little experience beyond rice cultivation whilst agricultural extension services have been disrupted by the reform process, limiting the scope for appropriate support and advice until various problems have been overcome. In the shorter-term farmers could also be most concerned with maximising income, perhaps only starting to take natural hazard risks into account after they have experienced heavy disaster-related losses. For example, many farmers in the Mekong Delta have planted fruit trees, presumably in response to perceived market opportunities, yet the trees would be destroyed in the event of widespread floods.

- **Government agricultural policy** appears to have done little to reduce the sector's hazard vulnerability. Although flood and typhoon protection works implicitly offer some protection, there is no evidence to suggest that the government is promoting detailed regional cropping strategies which incorporate relative hazard risk analysis. Indeed, the Ministry of Agriculture is planning crop diversification in areas which already produce surplus food crops rather than aiming to exploit comparative advantages of production, such as by encouraging diversification out of rice production in food deficit areas where other crops would perform better. The government urgently needs to undertake a careful assessment of the agro-ecology of the country, including vulnerability to natural hazards, as a basis for the design of an appropriate agricultural strategy.

- Severe disasters can have potentially profound **budgetary impacts**. It is difficult to isolate the impact of natural disasters on either government expenditure or revenue aggregates. However, a more detailed examination of disaster-related expenditure indicates that natural disasters do impose a considerable strain on public resources as well as reduce revenue. Moreover, the fiscal system exacerbates regional differences to the extent that provinces partly depend on their own revenues and are not compensated by central government for intermittent disaster-related shortfalls.

- **Disaster prevention and mitigation measures** can play an important role in reducing the economic impacts of disasters. Historically, particular emphasis has been placed on structural flood mitigation measures and, as a result of centuries of efforts, Viet Nam now has some 5,000 km of river dykes and 3,000 km of sea dykes. However, it is widely held that the existing system does not provide

adequate protection and that further measures would be both economically and socially beneficial. There are two basic problems: (i) the dyke system does not cover all parts of the country; and (ii) much of the dyke system which does exist is of a low quality, potentially implying high maintenance costs. Moreover, the flood control system itself has played some role in exacerbating, rather than alleviating, the extent of the problem as its gradual expansion and strengthening has gradually confined flows of water, in turn implying that sediment is being increasingly deposited in the river channels rather than on the deltas. This has raised the height of the river channels, placing greater strain on the dykes and implying that when floods do occur they tend to be higher - and therefore cause more damage - than in the past. At the same time, greater protection has to some extent restricted the run-off of riverine and coastal flood waters.

- The significant scale of the country's structural flood protection investments requirements raises serious **concerns about the future funding of disaster-related activities**. The ADB (1994), for example, estimates that annual investments of US$172m are required over the next two decades to provide adequate protection against seawater intrusion alone (taking account of an assumed rise in sea level), implying annual expenditure some eight-fold the 1993 level and equivalent to 4.1% of total preliminary government expenditure in 1993, with substantial additional operational and maintenance expenses. Furthermore, the consequences of abandoning protection would be catastrophic physically, socially and economically as, as already indicated, the Red River bed is now higher than that of the adjoining floodplain. Viet Nam therefore has little choice but to ensure embankment maintenance. In the past, the costs of the country's extensive labour-intensive structural flood control measures appear to have been met relatively easily, even if protection needs were not fully satisfied, reflecting the government's control over considerable financial, capital and labour resources. More recent reforms have resulted in a decline in the government's access to resources, particularly labour.

- To partly overcome the decline in public resources at the government's disposal, a universally charged Flood and Storm Preparedness and Prevention Fund was introduced in the early 1990s. However, charges are low and funding generated not substantial. Careful decisions therefore need to be taken about **future sources of funding for disaster prevention and mitigation activities**. Various new forms of finance are being discussed, most typically involving some form of levy on direct beneficiaries. However, such fees could potentially negate the concern for equity embedded in the existing system of taxes. Before any scheme is adopted, it should therefore be analysed within the context of total taxes and fees to see if communities in more hazard-prone areas - and, by implication, some of the poorest segments of the population - are being expected to pay substantial additional fees which, after taking account of the benefits of improved protection,

serve exacerbate existing inequalities. Indeed, for the foreseeable future it would seem that central and provincial governments as well as donors will have to meet a large part of investment and repair costs from general revenues whilst local communities can be expected to finance little more than operational and maintenance costs at most. However, as per capita incomes of more disaster-vulnerable groups increase, flood protection-related levies on immediate beneficiaries of flood protection schemes could become more viable.

- There has been a recent surge in interest in **non-structural prevention and mitigation measures**, which can also play an important role in reducing economic hazard vulnerability, in part driven by overall funding constraints and thus the need to achieve greater cost-efficiency. However, the rate of uptake has remained relatively limited to date, reflecting limited general knowledge. This indicates a need for public education as well as, for example, the enforcement of appropriate legislation regulating land-use and improved building standards. Further hazard risk mapping is also required, with the resulting maps placed in the public domain in a form comprehensible to the lay-person. In addition, greater attention needs to be paid to efforts to combat the impacts of drought and earthquakes, as well as floods and typhoons.

- Adequate **disaster warnings** are important, providing vulnerable communities an opportunity to minimise the economic impacts of impending hazards and, more fundamentally, to prevent loss of life. Indeed, the Viet Nam Government attaches considerable importance to improved forecasting and warning systems. However, simple preparedness measures, such as moving livestock to safer areas, are apparently often not practised because of limited public disaster awareness (DMU, 1996). This suggests considerable scope for reducing the direct damage created by disasters relatively simply and inexpensively. Various efforts are also being undertaken to improve warning capabilities, supported by external assistance.

- **Post-disaster relief and rehabilitation measures** are also important in minimising the economic impacts of disasters. Immediate relief efforts are well-organised and effective in Viet Nam. However, rehabilitation efforts are reported to be less adequate and poorer households can continue to experience the adverse impacts of a disaster for a considerable length of time. This problem appears to be partly related to inadequacies in current disaster assessment practices as well as to public resource constraints in responding to disasters. Nevertheless, the scale and nature of rehabilitation measures needs to be carefully reconsidered, taking account of the wider economic benefits of increased rehabilitation expenditure.

- Natural disasters can have profound impacts on individual households. **Household hazard vulnerability** is a complex issue. The nature of the vulnerability varies between income and occupational groups, as already noted, between different regions of the country, reflecting both hazard risks and the scope for and degree of uptake of coping mechanisms. Communities which face annual flooding are typically well prepared but particularly severe flooding as well as less predictable typhoons, droughts and earthquakes, can have far-reaching effects. In addition, there are a number of factors at work which currently appear to be increasing household hazard vulnerability, including changing crop mixes combined with relatively poor knowledge of hazard risks; environmental degradation and changing water resource use; demographic and land pressures; population movements; changes in the quality, design and location of housing and reductions in government resources for meeting housing costs; and changes in land use rights.

- The most **poverty**-stricken regions of Viet Nam are broadly the most hazard-prone and poverty alleviation lies at the heart of efforts to reduce household vulnerability to natural hazards. Poorer households are unable to invest in simple disaster-proofing measures, such as alterations in their housing, leaving them more exposed to natural hazards. Hazards, in turn, result in further impoverishment by destroying assets and income-generating opportunities as well as potentially resulting in higher debt. The mutually reinforcing links between hazard vulnerability and poverty are clearly recognised both by the government and donors. Moreover, poverty reduction has consistently been a central government objective since unification and one of the key driving forces behind the economic reforms. However, the specific measures outlined by the government to eliminate poverty and hunger over the next five years exclude any initiatives directly aimed at reducing hazard vulnerability.

- Disaster mitigation, prevention and response requirements place a considerable strain on government resources. **External assistance** therefore offers an important alternative source of finance. During the late 1980s and early 1990s, most external assistance in support of disaster mitigation and prevention activities was provided by NGOs and WFP. Meanwhile, in the absence of much bilateral or multilateral development assistance, disaster relief activities appear to have formed a relatively large share in total non-CMEA assistance. In the more recent period 1991-4, disaster-related assistance, broadly defined, has accounted for only 2.2% of total assistance (at real 1994 prices). This suggests that donors ought to channel more assistance into this area, particularly given the pivotal role of such activities in poverty alleviation. Strikingly, NGOs have continued to play a much larger role in disaster prevention and mitigation, as well as in relief activities, than in overall external assistance. Flood protection measures formed the single largest share (45%) of total disaster-related aid disbursements between

1991 and 1994, followed by post-disaster relief (34%). Post-disaster rehabilitation and reconstruction efforts have received far less support and donors should allocate more resources to such activities. Donors could also pay greater attention to non-structural, as well as structural, disaster mitigation and prevention activities. On a more positive note, virtually all disaster-related assistance to date from the non-Soviet bloc has been in the form of grant assistance. Furthermore, there has apparently been relatively little diversion of allocated funds from development to emergency activities in the aftermath of disasters.

The underlying factors determining hazard vulnerability in Viet Nam are complex and dynamic, necessitating an integrated approach to disaster prevention and mitigation as well as the inclusion of hazard risk assessments in the formulation of overall policies and planning and individual development projects. The environmental causes of natural hazards are well-recognised and environmental policies have included various measures to reduce the incidence of natural hazards. Moreover, flood control measures, as well as irrigation, are commonly included amongst priority areas for investment. However, broader government and donor policy and strategy documents examined for the purposes of this study have failed to identify natural hazards as a major threat to sustainable economic growth or as an obstacle to development. Similarly, although Viet Nam has achieved notable progress as one of only a handful of countries worldwide to have adopted a water-disaster mitigation strategy and action plan, this plan fails to call for the incorporation of hazard risks into broader economic strategies.

Viet Nam's recent economic performance has been extremely impressive but has been largely the consequence of structural change rather than established and sustainable growth paths. Although prospects appear favourable, further growth is by no means guaranteed and sustainable, equitable growth will partly depend on efforts to address the broader macroeconomic impacts of natural disasters. A comprehensive hazard assessment of all aspects of the economy would provide a useful tool in helping to improve consideration of hazard risks in broader economic planning and highlight any possible emerging hazard-related regional disparities. Post-disaster damage assessments also need to be improved, an initiative which has already been started. Furthermore, problems relating to the availability of hydrometeorlogical and other relevant hazard risk information need to be overcome so that the level and nature of hazard risks can be better appreciated by both planners and individual investors.

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