

Chapter 1.

Introduction and Country Profile

1.1 Background

There is a growing awareness of the economy-wide significance of natural disasters and the problems they pose for long-term development. However, recognition of these issues has been largely amongst those working within the field of disaster management and there is still limited wider appreciation of their potentially serious implications. This in part reflects the fact that most assessments of the economic impacts of disasters have concentrated on the most easily measured direct losses - that is, the financial cost of visible physical damage. This emphasis, in turn, reflects particular concerns to meet the short-term humanitarian needs of affected communities in the aftermath of a disaster and pressures to determine replacement investment requirements and insured losses. It also reflects difficulties in analyzing indirect and secondary impacts. The latter two types of impact could include, for example, effects on the flow of goods and services and changes in income distribution and the incidence of poverty as well as balance-of-payments and budgetary consequences. A further bias in the existing body of evidence relates to the fact that the relatively few studies that have examined indirect and secondary impacts have focused on the impact of a particular, often recent disaster event. The more difficult to determine longer-term cumulative consequences of a series of disasters on a particular country's development are typically overlooked. Yet, in reality, most disasters are recurrent rather than one-off events, striking a country at infrequent intervals over the course of time and potentially affecting cumulatively both the rate and pattern of development (Benson and Clay, 2000).

These biases have effectively limited the extent of information available to policy-makers on the nature and scale of a country's economic vulnerability to natural hazards. More fundamentally, they have contributed to a widespread failure to address natural hazards as a potentially serious threat to sustainable development or to appreciate the potentially high economic and social returns to mitigation despite the fact that high hazard vulnerability is by no means inevitable. Instead, to date, national, and to some extent international, efforts to promote disaster prevention and mitigation have often been confined to statements of intent.

1.2 Objectives and Methodologies

This study seeks to increase understanding of the wider economic and financial impacts of natural disasters, factors determining the vulnerability of hazard-prone economies, opportunities for mitigation and factors inhibiting their adoption. It involves the detailed analysis of the impact of natural disasters in three case-study countries. The study findings are intended to contribute towards the development of guidelines on the assessment of natural hazard vulnerability from an economic perspective. This document presents the findings of the first case study undertaken in Dominica.

The case study countries were selected to provide a range of hazard experiences in economies of varying size and complexity from different regions of the world. The first, which is the subject of this report, is Dominica, the highly disaster-prone, small-island Caribbean state. A second case study is being undertaken in Bangladesh, a large, disaster-prone Asian economy; and the third case will be conducted in a drought-affected southern African economy (provisionally Malawi).

There are considerable methodological difficulties in isolating the economic impacts of natural disasters from other internal and external factors. The study adopts and seeks to refine further an eclectic approach used in previous studies, involving a mixture of quantitative and qualitative analysis to examine the economic impacts of natural hazards (Benson and Clay, 1998; Benson, 1997a). The quantitative aspect is partial, involving a combination of regression analysis, examination of movement around trends, "before-and-after" impacts of disasters and comparisons of forecasts versus actual performance. A qualitative political economic analysis is also undertaken to place findings within the economic and social policy context of each case-study country.

Each case study focuses on the disaggregated impacts of natural disasters on various sectors of the relevant economy including the public sector. It includes an assessment of the factors determining the extent of hazard vulnerability of the economy and of whether and why that vulnerability has changed over time. It also considers the degree of attention paid to economic issues in disaster mitigation, preparedness, relief and rehabilitation programs; how the economic consequences of disasters can be further mitigated, and the degree of attention currently attached to natural disasters and hazard risk in economic policy-making and planning, by the national government, the World Bank and other key international, regional and bilateral agencies, as relevant in each case study country.

1.3 Country Profile

The Commonwealth of Dominica is situated in the Eastern Caribbean at 15°N and 61°W. It is the largest and most northerly of the Windward Islands, with a landmass of 751 km² and measuring 47 km in length and 25 km in width. The island is of volcanic origin with rugged terrain and is the most mountainous of the eastern Caribbean islands. Its highest point, Morne Diablotin, rises to 1,447m, while Morne Trois Pitons rises to 1,424m, and two other mountains rise to over 1,200m. The topography is marked by a large number of deeply incised narrow, river valleys and steep ridges. Slopes of 30° or more are found in at least 60% of Dominica (Map 1).

The island's vegetation is dense, a consequence of its elevation and very high rainfall, which varies from about 1800 mm per year on the western coast to over 7,500 mm in the mountainous interior. The vegetation is diverse, with more than 1,000 species of tropical flowering plants. The diversity is related to the fact that more than 80% of the island receives at least 2500 mm of rain per year and much of the vegetation has been left undisturbed by humans. However, high rainfall in the mountainous non-coastal areas of the island also results in frequent localized flooding and landslides, which are recurrent annual problems.

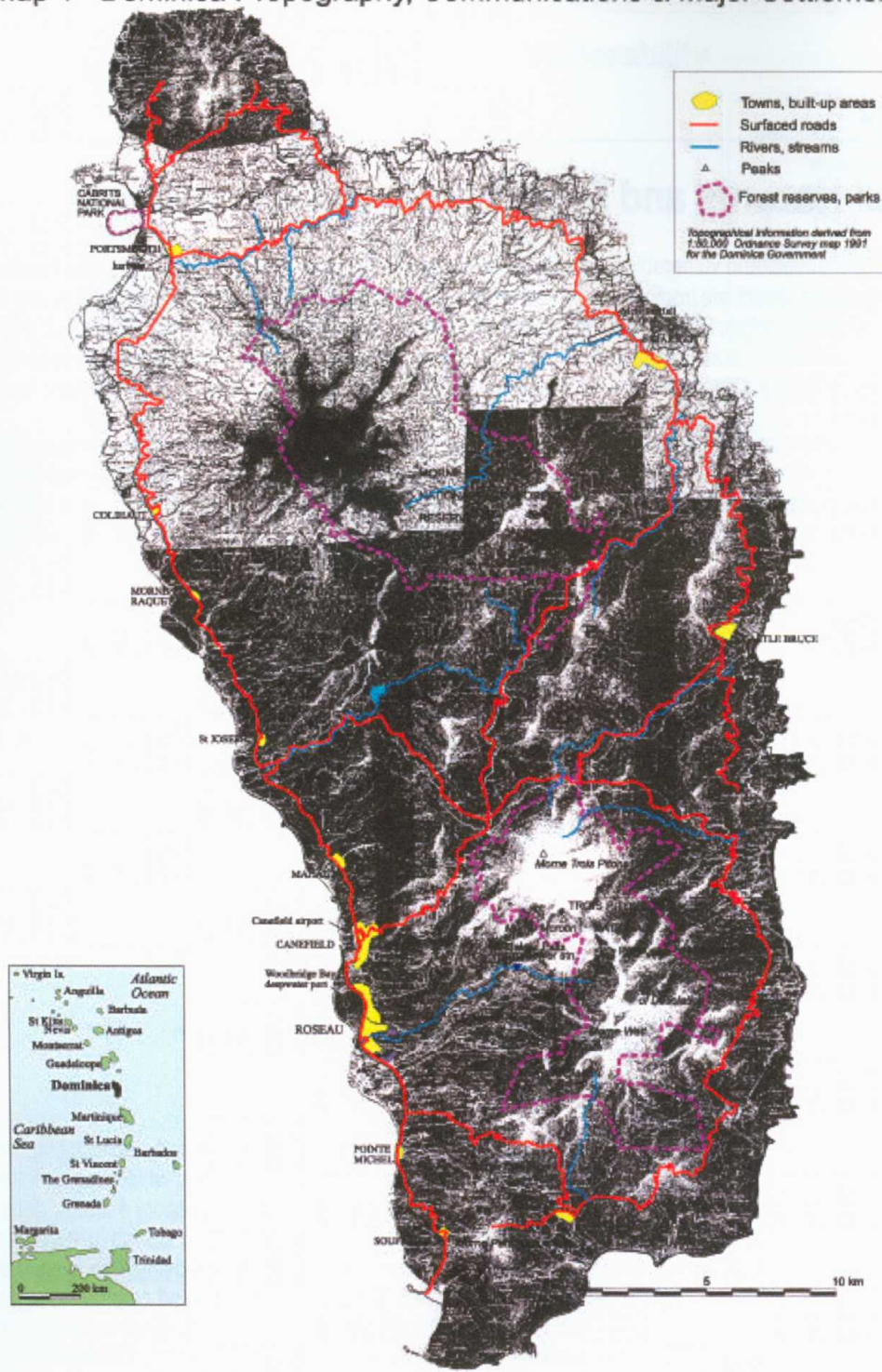
Dominica is a lower middle-income country, with an estimated population of 76,000 and per capita GDP of EC\$7,900 (US\$2,900) in 1998. Some 30% of the population was estimated as living at or below the poverty line in 1996. There is a long established pattern of net out-migration to work and settle in wealthier islands, the UK and North America. Reflecting the physical topography, most of the island's population and infrastructure are located on the coast, making Dominica particularly vulnerable to strong winds and high seas (Map 2). Some 24% of the total population resided in the Roseau city area at the 1991 census (GoCD, 1999a).¹

It is a member of various regional organizations, several of which play an important role in determining policy and economic performance. It is one of seven full members of the Organization of Eastern Caribbean States (OECS), which was formed in 1981. The OECS treaty provides for co-operation in several areas including trade, external relations, transport and communications, the judiciary and mutual defense and security (EIU, 1999). The seven full members of the OECS together with Anguilla are also members of the Eastern Caribbean Central Bank (ECCB), a monetary authority that issues a common currency, the Eastern Caribbean dollar, and conducts monetary policy on behalf of its member countries. Dominica is also a member of the wider CARICOM, which has established preferential external trade arrangements that favor members of the community.

Dominica achieved independence from the United Kingdom in November 1978. The UK's long-standing preferential arrangements on bananas, incorporated after access by the UK into the EU trading arrangements in 1973, had considerable implications for the development of Dominica. On independence Dominica also became one of the signatories to the ACP-EU Lomé Accords.

¹ All of the Caribbean island capital cities are located on the coast, with much of the commercial, industrial and residential infrastructure also in the coastal belt (Suite, 1996)

Map 1 Dominica : Topography, Communications & Major Settlements



Chapter 2

Natural Hazards and Disasters since Independence

Dominica is susceptible and vulnerable to a wide range of natural hazards.² The most common, most probable and historically most significant are tropical storms and hurricanes. The island is geologically extremely young and almost completely volcanic in origin. Following a recent volcanic alert, its susceptibility and vulnerability to volcanic activity in the future is now a major cause for concern. There is a related risk of earthquake. Landslides are a common feature of life and the landscape. Other potential hazards include drought, storm surges, floods, bush fires and tsunamis.

This study focuses on hazard events since 1978. The key events over this period have been Hurricanes David and Frederick in 1979, Allen in 1980, Hugo in 1989, the three tropical storms in 1995 and Hurricane Lenny in 1999. The Layou River landslide in 1997 and the volcano alert since September 1998 are also considered. This brief review of major events serves as a backdrop to an assessment of the environmental, economy-wide and sectoral impact of disasters.

2.1 Tropical Storms and Hurricanes

Dominica's location as the most northerly of the Windward Islands places it well within the Atlantic hurricane belt. Officially, the hurricane season extends from June to November but meteorologists advise that such storms could occur outside the season. Tropical storms and hurricanes occupy a prominent place in Dominica's history. Since 1978 the more physically damaging or economically and socially significant have been:

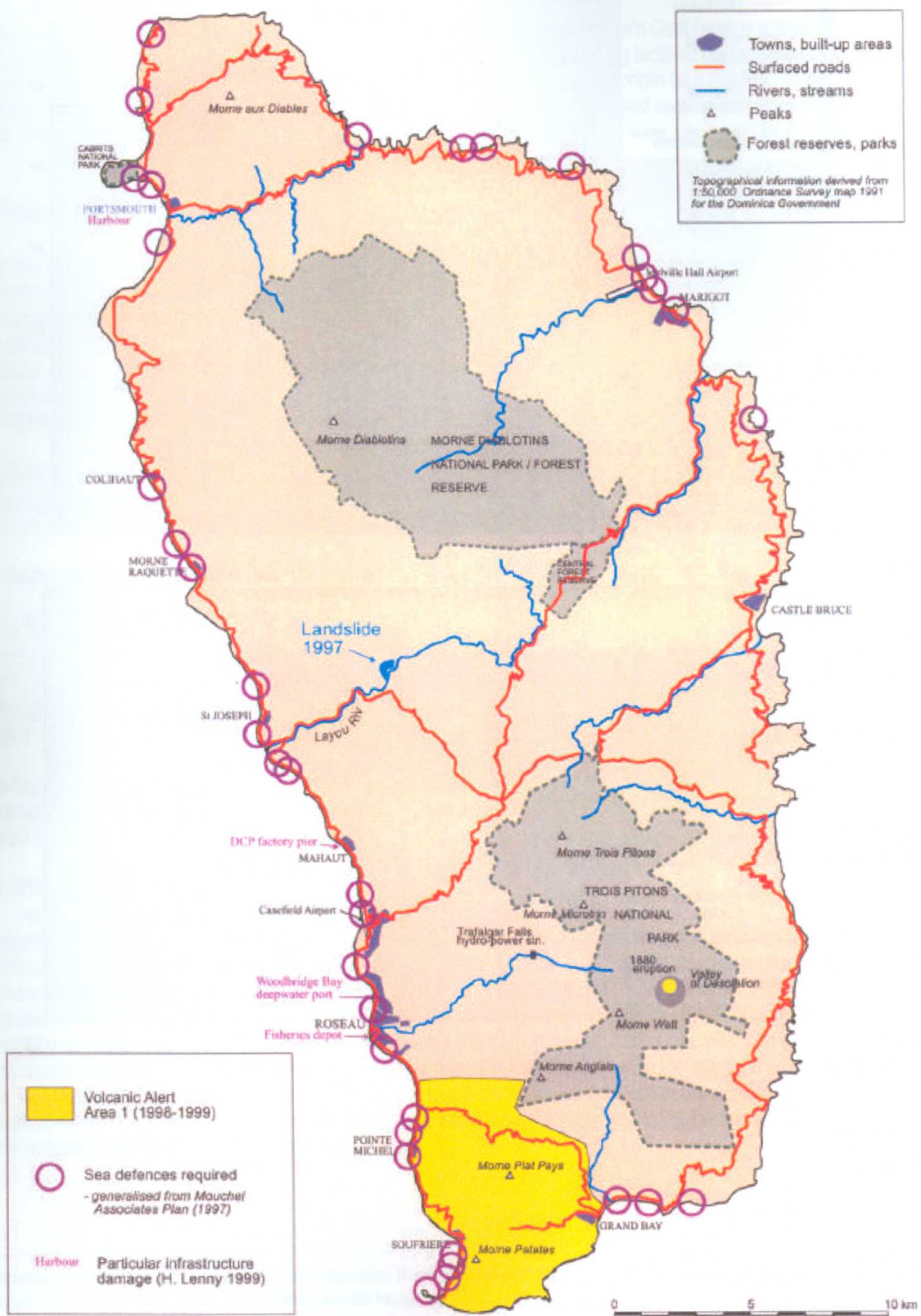
<u>Year</u>	<u>Name of hurricane³</u>
1979	David, Frederick
1980	Allen
1984	Klaus
1989	Hugo
1994	Debbie
1995	'Three storms' viz Iris, Luis, Marilyn
1999	Lenny

Hurricane David, a Category 4 hurricane, directly impacted the country and was particularly devastating, resulting in considerable world media attention and international disaster relief. Hurricane Frederick, which closely followed, and Hurricane Allen in 1980 exacerbated the effects of David. Hurricane Hugo, another Category 4 storm, dealt a glancing blow to Dominica whilst devastating St Kitts and Montserrat to the north. Three storms in 1995 had a severe cumulative impact. Hurricane Lenny, also a Category 4 storm, was unprecedented in moving from west to east across the northern Caribbean (Map 3). It caused largely coastal damage to Dominica and neighboring Guadeloupe and Martinique. The effects and impacts of these and the other serious storms are considered in later sections of the study. As there have been many potentially confusing statements about the 'unprecedented' nature of the major storms from Hurricane David onwards, a review of historical storm records is presented in Annex A.

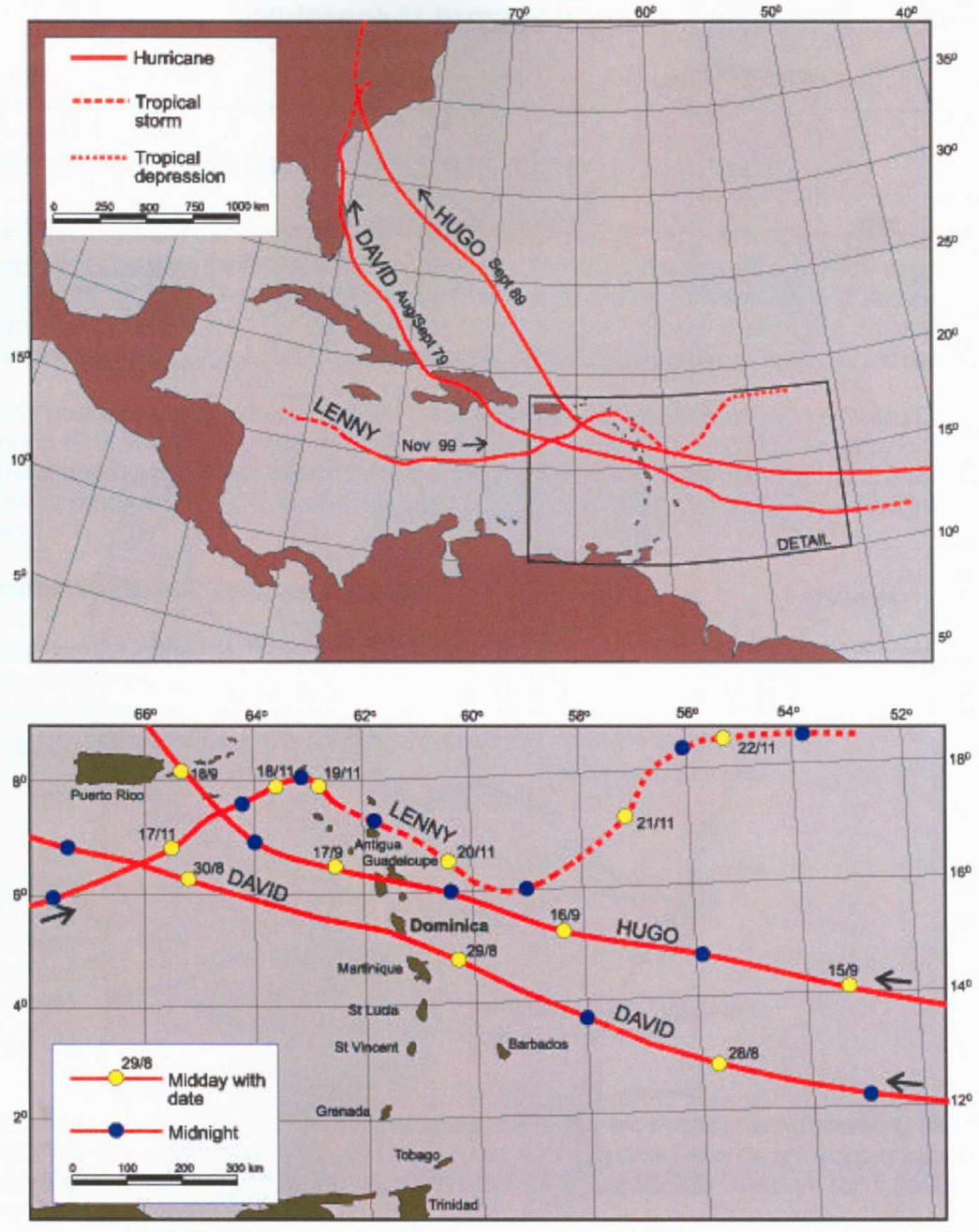
² A fuller discussion of natural hazards including the related definitions of disasters, risks and vulnerability employed in this study is provided in Annex A.

³ Debbie and Iris were named tropical storms, that is, intense depressions with sustained wind speeds in excess of 61km/hour, but less than the 119-120 km/hour to be classed as hurricane Category 1. A Category 4 hurricane such as David has sustained wind speeds in excess of 210km/hour (see Annex A Table A2.1).

Map 2 Dominica : Natural Hazard Vulnerability



Map 3 Hurricanes of Category 4 Affecting Dominica 1979 - 1999



2.2 Earthquakes

Earthquakes in Dominica derive from two separable but related forces. The Eastern Caribbean is a zone of subduction in which the Atlantic Plate pushes under the Caribbean Plate, causing tectonic earthquakes. The second source of earthquakes originates from the seismic events relating to Dominica's origin as a volcanic island, a consequence of plate-tectonic forces (Rowley, 1992). Earthquakes have not caused serious disruption in recent times. There is little publicly available information about potential hazard risks.

2.3 Volcanic Activity

Only one volcanic event in Dominica's recorded history has produced surface manifestations, an ash event in 1880 in the Valley of Desolation. However, visible signs of continuing volcanic activity are apparent, with soufrières, hot springs and lakes. Several volcanic alerts associated with periods of increased seismic activity have also occurred. The most recent one is ongoing after a series of shallow earthquake swarms that were widely felt from October 1998 to March 1999 (see below Section 5.3 and Section 13.2). The potential risk of, and vulnerability to, volcanic activity remains at a relatively high level with the focus of risk on the south of the island, where 20% of the population live (GoCD, 1999a) (Map 2). There has been no loss of life recorded due to volcanic activity ⁴

The Seismic Research Unit (SRU), University of the West Indies (UWI), St Augustine, Trinidad, has direct responsibility on behalf of the GoCD for monitoring seismic activity. After earthquake swarms began in 1998, the SRU, as discussed in Section 14.2, enhanced its level of monitoring (SRU, 1998).

2.4 Landslides and Mudslides

Many forces and features combine to make Dominica extremely vulnerable to landslides and mudslides. The most common landslides are debris flows. At least 2% of the total land area has been disturbed by landslides (De Graff, 1987; De Graff and others, 1989). Twenty-five deaths due to landslides have been recorded, including eight fatalities in the village of Bagatelle during heavy rain in 1977. Landslides have affected the Dominica Hydroelectric Expansion project: construction delays and project redesign costs are discussed further in Section 6.4

The largest and environmentally most significant recent landslide, in the Layou River Valley, started in March 1997, culminating in a series of major events in November 1997 (Map 2). No lives were lost, although the socio-economic impact has been substantial in other ways (See Annex A 3.6)

2.5 Other Hazards

Droughts, storm surges, floods, bush fires and tsunamis have been regarded as lesser hazards in that the overall combination of their manifestations, effects and frequencies have been comparatively smaller than those of hurricanes, landslides and earthquakes. However, it must be stressed that any of these hazards could assume major proportions if there were a change in physical conditions or social activity that altered levels of vulnerability. The need to constantly reappraise risks is underlined by the growing attention accorded to drought, affecting banana production in particular (see Section 5.1). The potential for a major bush fire was also drawn to the team's attention during its visit. As the unusual eastward tracking Hurricane Lenny, apparently unprecedented in historical records, demonstrated in 1999, events that follow an exceptional pattern may be very damaging because they are not catered for in mitigation and preparedness measures.

⁴ However, excavations have revealed a pre-Columbian Arawak settlement near Soufrière in the south of the island overlain by volcanic deposits (Personal communication, Lennox Honychurch)