

UNITED NATIONS OFFICE OF THE DISASTER RELIEF CO-ORDINATOR

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UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

The Economic and Social Effects of Natural Disasters on  
the Least Developed and Developing Island Countries:

With special reference to

Antigua and Barbuda

Republic of Cape Verde

Comoros Federal Islamic Republic (and Mayotte)

Republic of the Maldives

Western Samoa

A REPORT FOR UNCTAD VI; BELGRADE 1983

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October 1982

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The Economic and Social Effects of Natural Disasters on the Least Developed and Developing Island Countries:  
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United Nations Office of the Disaster Relief Co-ordinator (UNDRO) &  
United Nations Conference on Trade and Development (UNCTAD)  
A Report for UNCTAD VI, Belgrade 1983

**James Lewis** Consultant to UNDRO/UNCTAD October **1982**

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Notwithstanding the many changes of name, designation, terminology and technology that have occurred during the twenty-eight years since the production of this report, its contents continue to be of interest and relevance to numerous disciplines that have themselves changed and expanded: geographers, historians, and devotees of island studies, for example. Overall, the report's contents continue to be particularly relevant to researchers and teachers of the widely inclusive study of natural hazards and disasters.

Titles by the author referenced in the report, and some relevant to it and published subsequently, are:

**1981** *Some perspectives on natural disaster vulnerability in Tonga*  
Pacific Viewpoint 22/2 pp145-162 September  
Victoria University of Wellington

**1981** *The Sri Lanka Cyclone 1978: Socio-economic analysis of housing destruction*  
Marga 6/2 pp1-33

**1981** Marga Institute, Colombo  
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**1980** *Hurricane Damage (with reference to Hurricane Allen)*  
Correspondence: Nature 287 October  
Macmillan Journals London

**1979** *The Vulnerable State: An Alternative View*  
Chapter 5 Disaster Assistance: Appraisal, Reform and New Approaches  
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**1979** *Volcano in Tonga*  
Journal of Administration Overseas XVIII/2 pp83-121 April  
ODA/HMSO London

**1977** *Disaster Preparedness in the South Pacific*  
South Pacific Bulletin pp14-20 First Quarter

Titles by the author relevant to the report and published subsequently, are:

**1984** *A Multi-hazard history of Antigua*  
Disasters 8/3 pp190-197 Pergamon

**1987** *Cook Islands Cyclone*  
AODRO Newsletter 5/1 April  
Australian Overseas Disaster Response Organisation

**1988** *Sea Level Rise: Tonga, Tuvalu (& Kiribati)* Field Mission for the  
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1990 Environmentalist 10/2 pp141-142

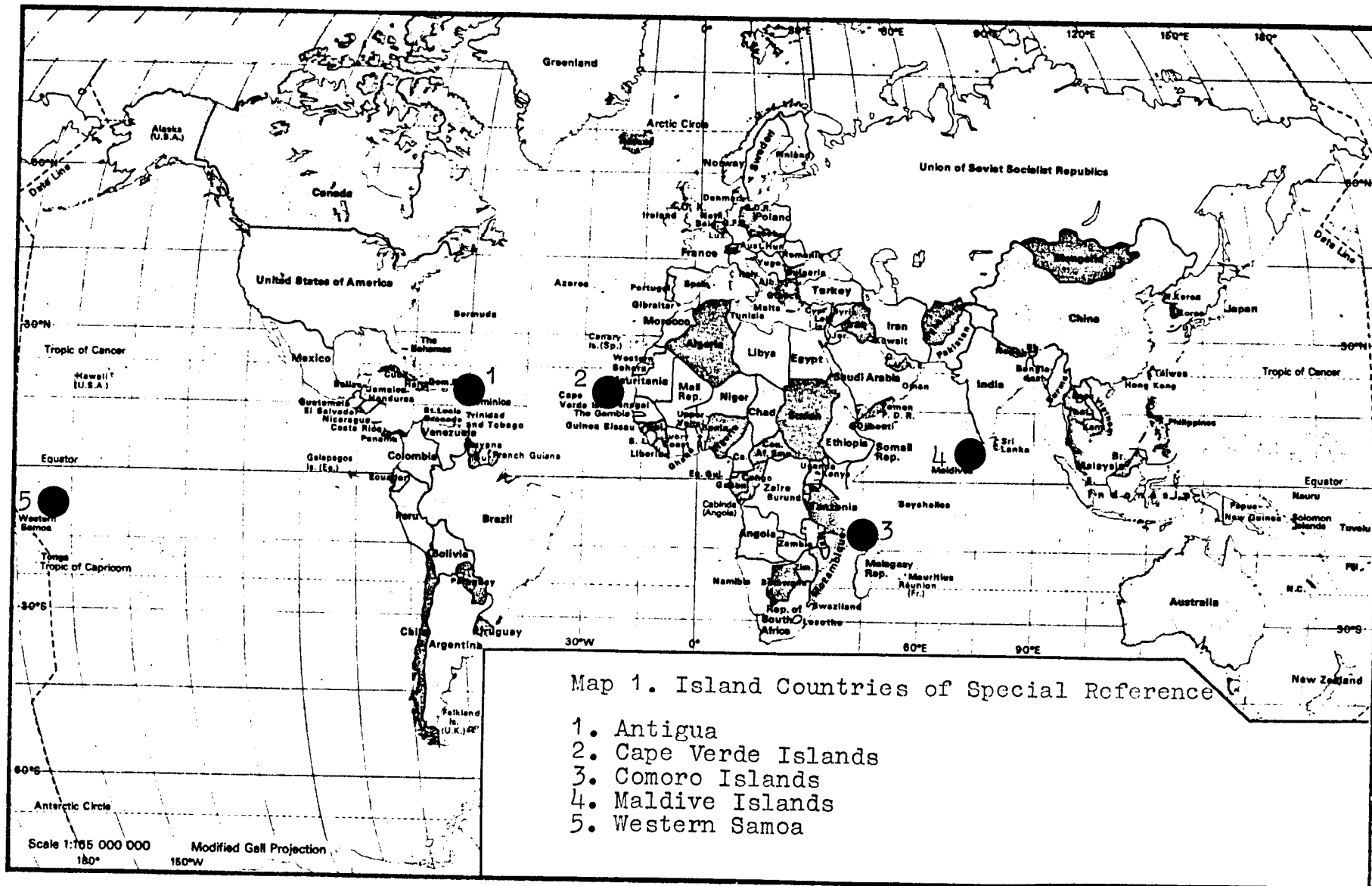
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Disasters 14/3 pp241-248

**1991** *Tropical Cyclones and Island States (pp39-44)*  
Shelter, Settlements, Policy and the Poor ITDG London  
<http://www.islandvulnerability.org/docs/lewis1991sspp.pdf>  
Development in Disaster-prone Places: Studies in Vulnerability

**1999** IT Publications (Practical Action), London  
*Includes five case studies of vulnerability description and analysis*

- *Volcano in Tonga*
- *Some perspectives on natural disaster vulnerability in Tonga*
- *A multi-hazard history of Antigua*
- *Vulnerability to a cyclone: Damage distribution in Sri Lanka*
- *Change, and vulnerability to a natural hazard: Chiswell, Dorset*

**2009** *An Island Characteristic: Derivative vulnerabilities to indigenous and exogenous hazards*  
Shima 3/1  
<http://www.shimajournal.org/issues/v3n1/d.%20Lewis%20Shima%20v3n1%203-15.pdf>





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## Explanatory notes for text and annexes; tables, figures and maps

### 1. Text and Annexes

In general the text does not repeat the more detailed information of the Annexes, but occasionally summarises them and frequently refers to them by Annex number.

The Tables of Contents includes a listing of Annex titles.

### 2. Tables

With the exception of Tables 8 and 9, Tables are included in their relevant place in the text of the Main Report, and in the text of the Annexes. Tables 8 and 9 are located between the end of the Report and Annex 1.

The Tables of Contents includes a listing of Tables.

The following is relevant in particular to Tables 8 and 9, as well as to the Report as whole:

- All events referred to are assumed to have been damaging events, though information on damage and loss may not be available. It is unlikely that the Colonial and Missionary Reports would have included events that were not damaging; on the other hand events of only local significance have not been included.
- Storms, gales, cyclones, hurricanes etc are all listed by the name appearing in the records. They may not all have qualified as hurricanes (winds above 75 mph). On the other hand damage is sometimes recorded for gales and storms, and sometimes not recorded for hurricanes.
- "Famine" has been used to describe food shortages incurring deaths. Food shortages may have incurred unrecorded deaths, and may or may not have been due to shortage of rain. "Drought" has been used for meteorological phenomena of rain shortage where no deaths have been recorded.
- "Epidemic" has been used to describe any disease having abnormal effects on mortality.

### 3. Figures

- Figures 1-5 follow Tables 8 and 9 between the end of the Report and Annex 1.
- Figures 6-10 are included with the Annexes which refer to them.

The Tables of Contents include a listing of Figures.

With regard to Figures 1-4 the graphs are included to show comparative rises and falls; not to give quantities. In order to separate and clarify graphic comparisons, some values have been multiplied by factors of 10 or 100. Those are indicated on the graphs.

#### 4. Maps

- Map 1 is placed before the beginning of the Report.
- Maps 2-7 are placed with Annex 17.
- Maps 8-13 are placed with Annexes which refer to them.

The Tables of Contents include a listing of Maps.

## Preface

The UNCTAD Trade and Development Board examined in 1973 the need for special measures in favour of the least developed among developing countries. A Panel of Experts from island countries identified a range of problems concerning their development, recognising the severe impact of natural disasters and certain measures which could be taken on account of them; recurring themes of UNCTAD V in Manilla 1979 and the UNCTAD plan of action for the 1980's directed towards least developed and developing countries. In 1982, the UNCTAD Trade and Development Board called for studies to be prepared on problems of island developing countries so that they may effectively be addressed by UNCTAD VI Belgrade in 1983.

Acknowledgements

This three-month study undertaken during 1982 has included research into colonial records, other archives and publications held in Geneva, Lisbon, London, and Paris (in accordance with Terms of Reference, Annex 18 ).

Special thanks are due to the Librarian and staff of the following libraries:

Archives Nationales, Departement Outre-mer, Paris.

Arquivo Historico Ultramarino, Lisbon.

Foreign and Commonwealth Office, London.

New Zealand High Commission, London.

Office of the United Nations Disaster Relief Co-ordinator (UNDRO), Geneva  
(and Registry).

Overseas Development Administration, London.

Palais des Nations, Geneva.

School of Oriental and African Studies, University of London.

Sociedad de Geografia, Lisbon.

United Nations Educational, Scientific and Cultural Organisation (UNESCO),  
Paris.

University of Bath.



## 1. ISLAND DEVELOPING COUNTRIES AND NATURAL DISASTERS

### 1.1 Highest Proportional Impact

The economic and social cost of natural disasters is heaviest on the developing countries, especially when damage and loss are measured as a proportion of the national economy. The smallest countries also suffer the greatest proportional housing destruction and homelessness. The smaller developing countries are the most vulnerable of all to economic and social effects of disasters (Tables 1 and 2).

Tropical cyclones have been the disaster type most responsible for high proportional losses amongst island countries. Hurricane "Bebe" in 1972 seriously affected Tuvalu, Fiji, Tonga and Niue and over one-fifth of Fiji's population were made homeless. Hurricane "David" in 1979 seriously affected the Dominican Republic and Haiti, and 80 per cent of Dominica's housing stock was destroyed. Hurricane "Allen" in 1980 caused very severe damage to Barbados, St Vincent, St Lucia, the Dominican Republic, Cuba, Jamaica and the Cayman Islands. Over 50 per cent of housing in Tonga was destroyed by Hurricane "Isaac" in March 1982; together with 90 per cent of coconuts, breadfruit and bananas, and half of the crops of yams and cassava.

Sixteen thousand people in St Vincent, 15 per cent of the population, were temporarily evacuated in 1979 during the eruption of Mt Soufriere; and in 1946 2,500 people, seven per cent of Tonga's population (the total population of one volcanic island of the archipelago) were evacuated from Niua'fo'u. Only one quarter of them have since returned.

Table 3 shows island developing countries and their proneness to natural disaster by type. Tropical cyclone is the most predominant and earthquake a close second. The few island countries prone to tsunami are included, though small islands in mid-ocean are not noticeably affected by this phenomenon. Some larger island earthquake prone countries with heavily configurated coastlines may be prone to local tsunamis as well as to trans-oceanic tsunamis.

Percentage of National Populations Made HomelessTABLE 1

Location	Disaster Type	Year	Approx Number of Homeless	Approx National Population for same year	% population made homeless
Niue	Cyclone	1960	4,850	5,500	88.0
Tonga	Cyclone	1961	8,000	66,000	12.12
Skopje, Yugoslavia	Earthquake	1963	100,000	20 million	0.5
Gediz, Turkey	Earthquake	1970	90,000	36 million	0.25
Chimbute, Peru	Earthquake and Landslide	1970	500,000	14 million	3.5
Bangladesh	Cyclone	1970	11 million	72.5 million	15.42
Managua, Nicaragua	Earthquake	1972	250,000	2,152,000	11.5
Tuvalu (Ellice Islands)	Cyclone	1972	800	5,700	14.3
Fiji	Cyclone	1972	120,000	541,000	22.18
Honduras	Cyclone	1974	80,000	2,784,000	3.0
Guatemala	Earthquake	1976	1 million	6,478,000	15.4
Andhra Pradesh, India	Cyclone	1977	2 million	550 million 45 million	0.365% National 4.5% State
Dominica	Cyclone	1979	60,000	82,000	73.17

Source: Lewis, J (1978)

1  
9

COMPARISONS OF DISASTER SIZE; GNP, AND COUNTRY AREA

TABLE 2

Country	Year	No. homeless	% homeless	cost of damage (US \$ millions)	% cost/GNP	GNP/capita (disaster year) US \$	Area (sq km)
<b>TROPICAL CYCLONE</b>							
Niue	* 1960	4,850	88.00				259
Tonga	* 1961	8,000	12.12			410 (1975)	700
Bangladesh	1970	11 million	15.42			90 (1974)	55,126
Fiji	* 1972	120,000	22.18			1,010 (1974)	7,055
Tuvalu	* 1972	800	14.03				25
Tonga	* 1973			2.4	6.00	o 410 (1975)	700
Sri Lanka	* 1978	1 million	6.97			200	65,610
Dominica	* 1979	60,000	73.00			470	751
Dominican Rep	* 1979	350,000	6.82	830	18.00	o 900	48,734
Mauritius	1979	30,000	3.26	50	5.88	o 920	1,843
Haiti	1980	200,000	4.13	250	21.73	o 240	27,750
St Lucia	* 1980	6,000	5.00	80	88.88	o 730	616
St Vincent	1980			20	40.00	o 450	389
Martinique	1980			68	5.00	4180	1,100
Grenada	1980			3	5.00	o 570	344
<b>EARTHQUAKE</b>							
Nicaragua	1972	250,000	11.5			640 (1974)	148,000
Guatemala	1976	1 million	15.4			700	42,042
<b>FLOOD</b>							
Bangladesh	1974			580	8.93	90	55,126

\* = ildcs over 5% homeless

o = ildcs over 5% of GNP

Notes TABLE 2:

Taken from a study of 112 reported disasters (earthquakes, tropical cyclones, and floods) between 1977 and 1981, with random information from some disasters in earlier years. Percentages of populations made homeless can be estimated for 54.

Percentages of cost of damage and loss against GNP can be estimated for 38. Of the percentages of homeless, 31 are below 1% but 11 are over 5%, and of these 2 are over 15%. Of the 11, 8 are island developing countries (\*).

Of the GNP percentages, 20 are below 1%, but 9 are over 5%, of which 4 are over 15%. Of the 9, 7 are island developing countries (o).

The extremely high vulnerability of some smallest and poorest countries is evidenced by Niue (1960); Dominica (1979), and St Lucia (1980).

Information on disaster cost and homelessness has been taken from "Courier" and "UNDRO News". Both sources are extracts from nationally prepared estimates and often not for the same disaster ("Courier" being restricted to member countries of the Lome Convention). Lewis (1981)

TABLE 3

ISLAND DEVELOPING COUNTRIES AND TERRITORIES; PRONENESS TO NATURAL DISASTER BY TYPE	Earthquake	Flood	Drought	Tropical Cyclone	Tsunami	Volcanic Eruption
American Samoa	o			o	o	o
Antigua	o		o			
Ascension						o
Bahamas				o		
Bahrain						
Barbados	o	o				
Bermuda				o		
Br Virgin Is	o			o		
Brunei						
Cape Verde Is	o		o			o
Cayman Is				o		o
Christmas Is (Indian Oc)						
Comoro Is				o		o
Cook Is				o		
Cuba	o	o		o	o	
Cyprus	o				o	
Dominica	o			o		
Dominican Rep	o	o	o	o		
Falkland Is (Malvinas)	o					
Fiji	o	o	o	o		
French Polynesia				o		
Grenada				o		
Guam						
Haiti	o	o	o	o		
Indonesia	o	o		o	o	o
Jamaica	o	o		o		
Kiribati			o			
Madagascar		o		o		
Maldives	o					
Malta						
Mauritius				o		o
Montserrat						
Nauru			o			

TABLE 3 (continued)

	Earthquake	Flood	Drought	Tropical Cyclone	Tsunami	Volcanic Eruption
Netherlands Antilles						
New Caledonia	o			o		
Niue				o		
Papua New Guinea	o		o		o	o
Philippines	o	o	o	o	o	o
Pitcairn				o		
Puerto Rico	o			o		
St Helena						
St Kitts-Nevis-Anguilla						
St Lucia	o			o		o
St Vincent	o			o		o
Sao Tome and Principe						
Seychelles						
Singapore		o				
Solomon Is	o			o	o	o
Sri Lanka		o		o	o	
Tokelau						
Tonga	o		o	o		o
Trinidad and Tobago	o	o		o		
Tristan da Cunha	o					o
Trust Territory of the Pacific Islands				o		
Turks and Caicos Is				o		
Tuvalu				o		
US Virgin Is	o			o		
Vanuatu	o			o		o
Western Samoa	o			o		o
Wallis and Futuna						

Notes TABLE 3:

- Earthquake is a variable event, with its own scale of magnitude. Earthquake proneness in this table includes all degrees of magnitude, depth, and damage.
- Drought, or extreme dry periods, probably occur to some degree in all countries shown.
- Landslide probably occurs in some mountainous islands, especially those which are earthquake-prone.
- Food shortages, of national or local impact, may occur in most countries shown, associated with other disasters or not.

Sources

"World Map of Natural Hazards" Munich Re. 1978.

"Atlas on Seismicity and Vulcanism" Swiss Re. 1978.

"When Disaster Strikes" Country Fact Sheets. CRS/LRCS/LWF/OXFAM/WCC.

"UNCTAD 1979; TD/242.

## 1.2 Island variety

The necessary identification of island developing countries, their inclusion as one group for special study, and their apparent cartographic insignificance conceals their infinite variety.

Island countries may be essentially single (eg Niue; Dominica; St Lucia) or archipelagic (eg Cape Verde; Cook Islands; Maldives; Tonga). Total land area may be large (eg Madagascar) or minute (eg Tuvalu; Pitcairn Islands); but the total land area of some archipelagoes may be less than some single small islands (eg Maldives/Antigua; Cook Islands/Niue). Island countries may be very close to continents (eg Comoro Islands; Sri Lanka) or extremely remote and isolate (eg Mauritius; Western Samoa). Their populations range from eight and a half million (Madagascar) to 19,000 (Cook Islands) and 4,000 (Niue). Archipelagic countries themselves offer extreme variables; simply in the numbers of islands contained which may be several (eg Comoros), "hundreds" (eg Tonga) or "thousands" (eg Maldives). Of the five countries of special reference, only Antigua and the Maldives belong to the "very small" category in Table 5; with Barbados, St Vincent, Dominica and Tonga, amongst others. The other three countries, Cape Verde Islands, Comoro Islands, and Western Samoa are larger and archipelagic, which advantageously contains disasters (epidemic and volcanic eruption) or divides disasters (tropical cyclone; earthquake), protecting the national entity from overall severity. (Grand Comoro itself is three times larger than St Vincent, larger than Martinique, and more than  $2\frac{1}{2}$  times larger than Antigua; the single island of Fogo (Cape Verde Islands) is almost twice as big as Antigua.

Parts of some islands are mountainous, and parts of some may be river plain (eg Fiji; Jamaica). Some very small islands are surprisingly mountainous (eg Dominica), others are essentially a single peak or ridge with foothills (eg St Vincent), others are flat and many are narrow attenuated or broken atolls. Archipelagic island countries may wholly comprise mountainous islands (eg New Hebrides) or atolls (eg Maldives; Tuvalu) or a mixture of each (eg Cook Islands; Tonga). Some islands may be largely active volcanic peaks (eg St Vincent) and some archipelagic countries may contain one or more islands which are active volcanoes (eg Cape Verde Islands/Fogo; Comoro Islands/Grand Comoro; Solomon Islands/Savo; Tonga/Niua Fo'ou and Kao).



Though the distances from island country capital to the nearest continental capital (Tables 4 and 5) may be as much as 3,000 kilometres (Western Samoa), distances to be travelled within some island countries (especially the archipelagoes) may represent an even greater remoteness in terms of travel time.

The very remoteness of many island countries (Tables 4 and 5) has often been of strategic significance to maritime politics, warfare or trade; bringing either welcome investment or unwelcome metropolitan pressure and presence. Portugal's trade and political links with Brazil and the influence of trans-Atlantic trade-winds created extraordinary significance for the Cape Verde Islands in the days of sail, and later as a coaling station. Strategic significance may be continuing in present-day traffic and communications needs; the Comoro Islands "control" sea traffic in the Mozambique Channel, important before the Suez Canal, and for shipping now too large to use it. During world wars the strategic significance of islands increased; the Comoros and many others became naval bases, and intensive battles have been fought for the strategic value of many other tiny islands in large oceans temporarily and devastatingly in the centre of world conflict.

Continuing strategic significance of some small islands has brought political, as well as social and economic hazards of disaster relief proffered for political advantage - a new vulnerability.

(Social and economic aspects of island variety are shown in Tables, 4, 5, and 6).

### 1.3 Island Vulnerability

Small islands can easily be missed by hurricanes which proceed to pound continental shorelines. The incidence of hurricanes and earthquakes may be no higher in island countries, though for some, some periods of recurrence are impressive. It is only in recent years that satellite imagery has made it possible for the world to watch whilst a vast tropical cyclone wholly subsumes one small island country after another; but in a world predisposed towards magnitude, small countries and small populations have no chance of creating disasters to compete in magnitude with those in continental countries. The often overwhelming proportional impact of disasters in small countries is the reason for special concern.

TABLE 4

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Population ('000) (1979)	No. of inhabited islands	Land area (sq km)	Population density (1979) (inhab/sq/km)	Maximum overall distance (km)	Dispersion (m/person) 2	Annual rate of population growth (1970-79)	GNP (1979) (millions)	GNP per capita (1979)	Formation	Natural Hazards	Date of recent and significant disasters	Distance from nearest Continent (km) 1	Year of Independence
THE LEAST DEVELOPED ISLAND COUNTRIES, AND ANTIGUA. COMPARATIVE BASIC DATA (SOCIO-ECONOMIC)														
Antigua	74	2	442	167	115	1.61	1.3	90	1150	Mounts	E'quake Drought	1974	900	1967
Cape Verde Is	319	10	4033	79	323	1.07	2.0	80	260	Mounts	E'quake Drought Volcano	1977	700	1975
Comoro Is	345	4	2170	159	275	0.89	4.0	90	260	Mounts	Volcano T. Cyc.	1977 1980	350	1975
Maldive Is	150	220	298	503	1000	8.20	2.9	30	220	Atolls	E'quake Storm		800	1968
Western Samoa	155	4	2842	55	165	1.09	1.1	na	na	Mounts	T.Cyc. E'quake Volcano	1966 1968	3000	1962

1 distance from island country capital to nearest continental capital or important town

2 greatest distance between the extreme points divided by the population of a country

650

Sources TABLE 4:

1. "Basic Data on the Least Developed Countries: Report by the UNCTAD Secretariat". UNCTAD: TD/240/Supp 1. 1979.
2. "Specific action related to the particular needs and problems of the island developing countries: issues for consideration" (Annexes) UNCTAD: TD/242. 1979.
3. World Bank Atlas 1981.
4. The Times Atlas of the World 1977.
5. Encyclopaedia of Places. Penguin. 1978.

CLASSIFICATION OF DEVELOPING ISLAND COUNTRIES AND TERRITORIES BY POPULATION, INCOME LEVEL, LAND AREA AND DISTANCE FROM THE NEAREST CONTINENT

Population	GDP per capita 1976 US\$	Distance from nearest continent (1)		
		Less than 500 km	500 to 1500 km	More than 1,500 km
Over 1 million	Under 250	Sri Lanka L	Madagascar L	
	250-500		Haiti M Indonesia L Philippines L	
	500-1000	Cuba L	Dominican Rep L Papua New Guinea L	
	Over 1000	Singapore VS Trinidad and Tobago M	Jamaica M Puerto Rico M	
100,000 to 1 million	Under 250	Comoros S		
	250-500		Cape Verde M	Western Samoa S Solomon Is M
	500-1000			Mauritius S
	Over 1000	Bahamas M Bahrain VS Cyprus M Malta VS Neth Antilles S	Barbados VS	Fiji M
Under 150,000	Under 250		Maldives VS	
	250-500	Sao Tome and Principe S	St Vincent VS Dominica VS	Cook Is VS New Hebrides M Tonga VS
	500-1000		Antigua VS Grenada VS St Kitts-Nevis- Anguilla VS St Lucia VS Turks and Caicos VS	Gilbert Is VS Seychelles VS Trust Territory of the Pacific Is S
	Over 1000		Bermuda VS Br Virgin Is VS Montserrat VS New Caledonia M US Virgin Is VS	American Samoa VS Brunei M Fr Polynesia M Guam VS

**Source:** UNCTAD 1979 TD/242 (based on data from the United Nations Statistical Office and the World Bank)

**Note:** Land area: VS = very small = below 1,000 sq km; S = small = 1,000 to 3,999 sq km; M = medium = 4,000 to 39,999 sq km; L = large = 40,000 sq km and above.

(1) Distance from the island's capital to the nearest continental country capital or important town.

TABLE 6  
THE LEAST DEVELOPED ISLAND COUNTRIES, AND ANTIGUA.  
COMPARATIVE BASIC DATA (CULTURAL; HISTORICAL, SOCIAL) Source: Caldwell, J C, et al (1980)

	Political Status: Independent (Ind) Independent Associated (Ind Ass)	Languages a) Official b) Major A = Arabic C = Creole E = English F = French I = Local P = Portuguese	European Influence			Ethnic Composition A = African E = European P = Pacific Islander S = Asian	Religion C = Christianity I = Islam	Urban Population (20)	Agricultural population (% workforce)	Demographic Indicators 1978			
			When discovered	When European presence really felt	When European rule began					Crude death rate	Expectation of life at birth	Infant mortality rate	Crude birth rate
Comoros	Ind	F A	16C	16C	1886	A:S	I	5	-	22	46	-	47
Maldives	Ind	L L	1518	1518	1887	S:A	I	11	-	23	< 50	-	50
Western Samoa	Ind	E LE	1722	1820	1899	P	C	21	67	7	63	40	37
Cape Verde	Ind	P PC	1460	1462	1462	C.A.	C	8	40	9	50	105	28
Antigua	Ind Ass	E	1493	-	1632	-	C	34	12	7	62	25	20

The manifestation of tectonic, volcanic, and other geomorphic processes which have created islands, continue to change island structure and formation which may bring disaster for island inhabitants. Earthquakes have raised islands, lowered islands, caused lagoons to drain and dry, and whole islands to recurrently disappear and reappear. Volcanoes have re-shaped and remoulded islands, and tropical cyclones have shifted massive sections of island reef. In such contexts, islanders as well as islands have been moulded by natural forces, and the relationships between the two has produced a complexity of experience and successful adjustment and adaptation.

So successful are adjustments to hazard that average life-expectancy at birth in island countries (Table 6) is, at 65, 13 years higher than in some continental South-East Asian and African countries. Exceptions are the Maldivian Islands (50) and the Comoro Islands (46) where conditions of environmental health account for more than tropical cyclones, earthquakes, or volcanoes; and the Cape Verde Islands (50: infant mortality rate 105) with famine and disease.

Availability of, and access to, food and water is frequently interrupted in the fragile production systems of island countries. Hurricanes have often brought food shortages in their wake, and prolonged dry periods have had similar effect. Attempts to generalise between disasters and between islands are misleading as variations in magnitude and force, locality, season and population introduce the anomalies so frequent in island analysis. Vulnerability to famine is, however, increasing in some small islands where there is less capacity and flexibility to adapt to changing social and economic expectations and activities. The fragile ecological balance required for food production in hazardous environments of small islands is more quickly and drastically exposed by relatively slow change in socio-economic systems, or by sudden change in natural systems.

Variable nutrition levels, affected by intermittent or frequent food shortages and conditions of environmental health, may have permitted disease and epidemic of high proportional impact and frequency. Islands were severely vulnerable to new diseases introduced by traders, colonists and travellers, and proportional impact on small countries was extremely high. Western Samoa suffered the highest proportion of deaths due to

influenza in 1918 than any other country in the world during the first half of the twentieth century / <sup>(Annex 14)</sup> The conveyance and re-emergence of some diseases is continuing as one negative bi-product of tourism in attractive island countries.

Island countries are vulnerable to external pressures and changes in ways in which large countries are not. Their small productions have often been victim of international markets, and continue to be so. Often heavily dependant on trade, they are individually quite unable to influence trade patterns and values for their narrow range of trading resources. They are often wholly economically dependent which has made island countries so prone to "protection" and colonialism in the past, and which makes economic independence so much more difficult to achieve and maintain (even) than political independence, the cause for many of political instability.

The Comoro Islands are not yet a political entity; variations within archipelagic island groups being political as well as environmental. Archipelagic countries may be affected by natural disaster in islands which may or may not include the capital; the political significance in unstable situations being the more difficult to contain.

Though there are certain national similarities and national experiences and conditions which make possible some comparisons between island countries, there are anomalous local variations. The larger and higher islands provide a variety of climate, rainfall, and "ecological niches" for a variety of food production and other activities. The type, quantity and season of food production may vary considerably within as well as between islands. High islands catch rainfall, but they also catch the damaging erosion that heavy rains may bring. Atolls depend for fresh water on storage "lenses" in porous coral rock, which are easily disturbed by inappropriate well pumping or are rendered unusable by salt water blown during storms. Storms can quickly devastate food supplies on atolls by high winds, salt "burnt" foliage, and high waves and sea surge. In some not-so-small single islands, one part may be affected where another is not. Hurricane "Allen" caused serious damage and destruction in nine island countries while affecting all their capitals the least.

Prevailing social and economic conditions and processes are as significant in disaster as are prevailing hazards. Vulnerability to disaster at local, provincial and national levels is a function of socio-economic conditions and of hazard in a total environment. The condition of vulnerability is no more static therefore than the social and economic processes of change which may subscribe to it - and to which disaster in its turn subscribes.

Exposure to disaster, in its aftermath, brings exposure to disaster relief. Sudden bounty causes some to interpret disasters as a timely "catch all as catch can" to augment inadequacies of development assistance; others to see the long-term cost of disaster relief, if only to obscure the causative social economic causes of disaster, and as a cause itself of exacerbated dependancy and increased vulnerability. Disasters themselves are part of overall processes of inevitable change; exposed by historical perspective and disaster recurrence.

Each country has its own unique combination of topography, history, resources, and experience of hazard. Although there are some sub-national variations, in islands most factors come together and inescapably and discernably bear upon one another in ways that are not so obvious in larger countries with wider regional variations and characteristics. Responses to hazard in large countries may vary from place to place; in islands this is very much less the case - and there are fewer options and few unaffected resources.

## 2. ECONOMIC AND SOCIAL EFFECTS

### 2.1 The Five Island Developing Countries for Special Study

The five island countries of special study in this Report are:

Antigua and Barbuda  
The Republic of Cape Verde  
The Comoro Islamic Republic (and Mayotte)  
The Republic of Maldives  
Western Samoa.

The last named four are the island countries of the Least Developed Countries.



Map 1 shows the location of the five countries and Tables 4, 5 and 6 give some basic socio-economic comparisons. Annex 17 provides a brief history of each country; and Annexes 1 to 14 a series of disaster analyses.

A primary observation from the Tables is the wide variation between almost all categories. Generalisations with regard to island countries start and end with their grouping as islands. Even disaster experience is not uniform (Annexes 1 to 14).

The impressive variety of disaster type represented by those experienced in these five small countries includes earthquake; volcanic eruption; tropical cyclone (hurricane); drought, food shortage and famine; epidemic; fire and brief flooding in association with tropical cyclone.

In addition to these most obviously "natural" disasters are those caused by warfare, political unrest, and influx of immigrants or refugees (returnees). More valuable than disaster semantics are those conditions created by one kind of event which affect the incumbent vulnerability for the next event. Environmental relationships of cause and effect have more practical significance than definitions surrounding each disaster type. The inclusion of fire and epidemic are particularly relevant in this respect (Annexes 3 and 14).

2.2 Temporal and Spatial Analyses

Two chronologies of disaster events are included as Tables 8 and 9. A graphic chronology gives damaging events in all the five countries for special study for years 1700-1982, and a notated chronology gives the series of known damaging events for each country in sequence with notes of damages and losses sustained.

Of the six disaster types shown in the graphic chronology (Table 8), the highest number of years for which any one type of disaster is recorded (between 1700 and 1982: 282 years) is 67 - for famine years in the Cape Verde Islands. It is significant that the second highest number of years is also for drought/food shortage - 45 years in Antigua. Volcanic eruption in the Comoro Islands comes fourth with 24 years; and hurricane in Western Samoa third with 25 years (There are a total of nine years with more than one event). Records for the Comoro Islands commence with 1828; and for Western Samoa 1750 (or for practical purposes 1830).

Though drought in Antigua caused suffering and some deaths, the real cause for drought concern was the effect on sugar production (Annex 1). Had it not been for the colonial administration's concern for exports, drought may not have been recorded at all. "Drought" in Antigua is not comparable with drought in the Cape Verde Islands. Rainfall figures for the two countries (Table 7) over the same period show why recurrent catastrophic famine occurred in the Cape Verde Islands and simply depressed sugar exports in Antigua; and why Antigua was to receive Cape Verdian migrants and not vice-versa. In the 75 years between 1875 and 1949 the lowest rainfall for Antigua was 647 mm for 1930 (731 mm for 1875; 732 mm for 1947). Only one annual maximum in the Cape Verde Islands exceeded that level, 1,000 mm in 1906 which was a rare peak - other recorded maxima are 500 mm in 1893, 560 mm in 1918 and 550 mm in 1949. The average annual rainfall for the Cape Verde Islands (Praia) for the 63 years of record (during the 75) was 248.41 mm; the average for Antigua for the same period was 1,098.80 mm.

Comparisons of disaster occurrence between countries have limited usefulness. A more telling use of the figures is the total number of disaster/years for each country. Cape Verde Islands have 89; Antigua has 86; Western Samoa 48; Comoro Islands 45; and the Maldive Islands 15.

Numbers of years covered by available data vary however:

Antigua	from 1461	: 522 years
Cape Verde Islands	from 1664	: 319 years
Comoro Islands	from 1828	: 156 years
Maldive Islands	from 1750	: 233 years
Western Samoa	from 1704	: 279 years

Disaster/year ratios and disaster year factors are thus:

Antigua	86/319	: 3.71
Cape Verde Islands	89/522	: 5.87
Comoro Islands	45/156	: 3.47
Maldive Islands	15/279	: 18.60
Western Samoa	48/233	: 4.85

The lowest factor reflects highest incidence of damaging events for the years for which data is available. Availability of data may not always represent reality however (Annex 10).

Cape Verde Islands (Praia) and Antigua:  
Comparative Annual Rainfall

TABLE 7

<u>Year</u>	<u>Cape Verde</u> <u>mm</u>	<u>Antigua</u> <u>mm</u>	<u>Year</u>	<u>Cape Verde</u> <u>mm</u>	<u>Antigua</u> <u>mm</u>	<u>Year</u>	<u>Cape Verde</u> <u>mm</u>	<u>Antigua</u> <u>mm</u>
1874	-	791	1909	180	1146	1944	250	943
1875	130	731	1910	190	883	1945	340	1038
1876	410	1066	1911	210	926	1946	90	942
1877	370	1245	1912	180	817	1947	25	732
1878	340	1196	1913	170	1086	1948	50	924
1879	330	1563	1914	230	936	1949	550	1245
1880	440	1261	1915	130	1425	1950	450	
1881	140	1365	1916	390	1479	1951	360	
1882	?	763	1917	180	930	1952	600	
1883	?	1410	1918	560	961	1953	320	
1884	?	1117	1919	160	1258	1954	260	
1885	40	1102	1920	25	764	1955	290	
1886	246	1213	1921	50	770	1956	180	
1887	410	1109	1922	150	892	1957	300	
1888	340	1123	1923	140	823	1958	130	
1889	150	1874	1924	140	1055	1959	70	
1890	510	838	1925	220	781	1960	80	
1891	240	1270	1926	90	1275			
1892	210	976	1927	520	1223			
1893	580	982	1928	?	818			
1894	440	986	1929	160	1035			
1895	170	1343	1930	160	647			
1896	130	1494	1931	?	1235			
1897	370	1007	1932	?	1485			
1898	310	1240	1933	?	1054			
1899	280	1191	1934	?	1063			
1900	240	938	1935	?	973			
1901	180	1463	1936	?	1523			
1902	?	1493	1937	?	1200			
1903	70	1109	1938	160	1136			
1904	240	940	1939	150	754			
1905	170	797	1940	210	949			
1906	1000	1369	1941	180	1254			
1907	190	1103	1942	180	1268			
1908	140	1112	1943	430	1246			

Sources: Antigua; Auchinleck 1956  
Cape Verde Is; Amaral 1964  
see Figure 8

With the exception of volcanic eruption and fire, all other disaster types have occurred in all five countries. No fires are recorded for Western Samoa or Cape Verde, and no volcanic eruption for Antigua or the Maldive Islands.

Inter-relationship between epidemic and other events is suggested in Antigua by epidemic of 1792 following four years of drought and food shortage, and in 1862-63 concurrent with food shortage years. Epidemic is recorded in Western Samoa for 1847-49 after hurricanes for 1846 and 1848.

With the exception of the severity of famine and drought in the Cape Verde Islands (and Antigua) there is nothing in simple numerical comparisons to indicate the severity of the single earthquake of 1843 amongst the total of four recorded for Antigua; though from their incidence, hurricanes could appropriately be inferred as a severe hazard for both Antigua (22), and Western Samoa (25).

Frequency and timing may be as significant as the strength of impact, damaging and disruptive effects of one disaster being as much a result of its position in a sequence of similar, or dissimilar disasters, its timing in relation to cropping cycles and its coincidence with other events. Though there are only nine hurricanes recorded for the Comoro Islands, their pairing and timing had a significance not borne by more frequent or single events elsewhere (Annex 8). Had the occurrence of earthquake in Antigua been more frequent, the effects of the 1843 and 1974 earthquakes might not have been so severe. Not only might tectonic movement have been more evenly spread over time, but building practices might have been more regularly reminded of earthquake risk.

2.3 Fluctuations in national production

In the absence of specific accounts for economic (and social) effects of disasters, one course is a retrospective examination of general and sectoral accounts for effects that disasters may have brought about. Accounts for years surrounding disaster events may however include fluctuations ascribable to other influences, known or unknown. Fluctuations cannot be wholly assumed to be caused by disaster; in fact there are often over-riding political events affecting them. Productivity in the Comoros went into severe decline in 1976 and 1977 and food shortages resulted in which the eruption of Kartala would have been economically insignificant - though twenty thousand people were evacuated and 5,000 made homeless".

In the Maldives overall economic growth continued in 1978 in spite of cholera epidemic of that year. Normally accepted fluctuations in previous years (eg fishing) were no less than those continuing through 1978. Whatever the economic impact of epidemic in 1978, it was wholly subsumed and disguised by other economic factors and is not separately discernable. And yet cholera epidemic in that year caused 219 deaths and unaccounted suffering for hundreds more which economic factors alone do not reveal.

Epidemic in 1978 was not an unusual event. It continued a long tradition of epidemic in the Maldives Islands, but was brought to international notice as part of a new international and national disaster awareness. It was only "new" because of new interest; it was not new as a Maldivian experience (Annex 10).

To change the tradition of epidemic a whole network of changes to indigenous systems in health, sanitation, education, housing etc are required, some of which may have commenced. As they become effective economics may reveal positive changes, or they may reveal negative costs, or they may continue to reveal nothing. Whatever the case they must not be taken alone without comparative analyses of social factors.

The 1974 earthquake in Antigua was a sudden, rare, and therefore precisely definable event. With reference to Figure 1, annual exports and annual imports both show a steep decline for 1974/75, a decline for imports slightly more than that for 1977/78. Imports in the following two years climbed to regain their 1970/74 (average) level; whereas exports continued a gradual decline for 1975/76 and 1976/77, to recover suddenly in 1977/78 to a level higher than their 1970/74 average.

Percentages of both imports and exports (Figures 2 and 3) show some erratic changes due to external economic influences and those which may have been attributable (in whole or in part) to the earthquake are not overly significant. Export commodities (Figure 4) behaved similarly, and some went up and others down. Some credence is lent to these analyses by the knowledge that Antiguan lobster fishing suffered by earthquake destruction of reefs and disturbance of fishing grounds (Annex 4) - expressed as a decline on the graph (Figure 4).

Percentage shares of imports (Figure 2) and exports (Figure 3) and commodity exports by volume (Figure 4) all show erratic rises and falls over the years 1970-1975 (but see explanatory notes to Figures 1 to 4). In 1974, the year of the earthquake, some sectors rose and others fell - but not always as much as they had done or were to do in years before and afterwards.

Where for other countries there are production figures spanning years of disaster occurrence, and where among those figures there is the suggestion of economic effects of disaster, all analyses show a) similar fluctuations in years where there was not disaster, and b) positive as well as negative effects between sectors in disaster years.

The effects of natural disasters on production include damage and disruption to transportation; roads, bridges and other infrastructure; and to marketing systems and labour, as well as to crops and manufacturing; and disaster relief accounts for less than one-third (average) of the total estimated disaster cost.

#### 2.4 Socio-economic assessment

That levels of social well-being are not adequately represented by wholly economic measurement is well known, and assessments of social values in addition to calculations of GNP are necessary. Assessments of the economic effects of disasters are similarly incomplete.

Social well-being comprises more than economic values, and moreover, includes factors which are severely disaster-prone such as housing, utilities infrastructure, education, health, transport and communications. Though damage and destruction to all of these can be assessed economically, their social value and their social cost when destroyed is more significant in the long term. Other important factors may have similarly elusive dual values, such as the effect of disasters on migration and emigration, on employment, under-employment and unemployment; demand for goods and services; fall in property values; reduced production capacity; and long term inflation and deflation.

Economic circumstances may conceal social reality. One effect of the Antigua earthquake of 1843 on the island's balance of payments was to markedly increase government revenue by receipts of customs taxes on imported reconstruction materials in 1844 and 1845 (Annex 3). Remittances

25

from Cape Verdians overseas, emigrants from catastrophic famines, bring about a largely positive national balance of payments for the Republic. Trade however, has become increasingly imbalanced as inexorable famine necessitated increases in imports of food in which the islands were once self-sufficient (in a slave economy). Here, prevailing social circumstances of emigration could conceal economic reality; but positive balances of payments could conceal countless disasters!

The high social cost of housing destruction and homelessness due to natural disasters in developing countries is shown in Tables 1 and 2. Where figures are available from within countries, similar effects to those evident between countries are apparent. Poor populations and small administrative units are most vulnerable to high proportional impact.

In many of the documentary sources available to this Report, the poor have been identified as having suffered most, either in their number or in the near totality of the proportion of lost effort or financial investment (Annex 4). The poor were a direct product of recently emancipated slavery; and a probable result of failure of sugar cane and food crops in years of failure due to drought and of associated epidemic, illness, and destitution. The poor were above all the bi-product of political and economic systems which perpetually excluded them; and where economic systems and evaluations predominate they will remain so.

Of the five countries for special reference there is experience of endemic and recurrent drought, and recurrent famine; rare but extremely serious earthquake; frequent but localised volcanic eruption; rare severe hurricanes and frequent damaging storms; and endemic environmental health hazards, all of different frequencies, and impacts. Their differences in respect of the cultural, historical and political contexts are even wider but the prevailing similarity is that of smallness; and in small countries spatial considerations are critical. Though temporally events may be separated, spatially in small countries they inevitably come together. Economic effects have social significance; social effects inevitably become economic effects and physical effects impinge upon one another.

Disasters are not isolative; they are part of a spectrum of continuing change in social, economic and natural environments, to which they

contribute. One disaster will affect the incumbent conditions for the next; the damaging effects of earthquake on crucial water conservation systems on Fogo (Annex 6); and the surprising seriousness of the eruption of 1977 on Grand Comoro (Annex 9) and the political and social context in which it occurred; the horrendous effects of famine on a Cape Verdian population largely comprised of slaves (Annex 5), and the effects of the 1843 earthquake in Antigua upon recently emancipated slaves (Annex 3). In more recent years, administrations of countries now independent have suffered recurrence of natural disaster for which there has yet to be modification of values and systems to cope with indigenous experience.

Natural disaster analysis exposes the inherent weaknesses and shortcomings of economic, technological and social systems, the complexity of the relationship between them and the socio-economic vulnerability which may result.

2.5 Adaptation and change

In the knowledge that there were certain necessary benefits to be gained by the habitation of hazardous locations, populations have invariably formed adaptive systems in responses to hazard. They included the utilisation of wild tubers, roots (Annex 13), insects, animals and fish; highly diversified food crop production; food preservation techniques; traditional medicines; local trade and community networks and a wide range of traditional knowledge which could be applied in emergencies towards survival. Traditional house forms and construction systems were one sector of this wide variety of adaptive systems. The many more adaptations concerned for food provision and bodily maintenance underline the importance of food. Shelter could be easily and quickly replaced from natural materials which were immediately accessible even, or especially, after disaster. It is adaptation to western styles and materials that has brought with it the emphasis that western cultures are obliged to place on dwelling provision and construction.



With accelerated processes of change now having taken effect, adaptation to a wide range of other influences and pressures have not always been compatible with one another.

Some of the more obvious changes have concerned building construction, whereas less visible changes similarly damaging to survival systems have taken place. Building construction has received a focus of attention where other less visible changes have not.

The selection, diversification, and location of crops have had to adapt to the needs of cash crop producers, and the ready availability of food aid has caused food producers to be less concerned about provision for emergencies. Adaptation in food crop production and management have disappeared as cash crops have replaced food crops altogether. These changes are not physical, are less obvious, and leave fewer observable traces. Their identification relies on painstaking field research and less on rapid observation or assumption.

Some changes, those self-motivated or those superimposed, may have removed options for adaptation once available. And some changes, especially in certain forms of building construction and material, may have served to increase vulnerability to hazards where traditional practices would have not.

Historical analysis provides perspective on the cause and reason of change. During the eighteenth century in St John's the capital of Antigua, fires were the more serious due to timber construction and shingle roofs. Their seriousness led to changes to masonry construction for stores, churches, government buildings, and houses for the rich. In 1843 these were to receive the most severe destruction and damage, from which it was observed, buildings of timber largely escaped (Annex 3). The masonry external walls of some large houses were demolished leaving the timber internal walls standing to support the roof.

Guidance is necessary as part of development planning strategy, to ensure maintenance of overall positive practices as well as continuation of hazard awareness. This is not only relevant to development options but to post-disaster intervention and disaster relief (Section 2.9).

It may be the governments who are the most readily seduced by post-disaster assistance, though it is at local levels where disaster causes greatest deprivation and hardship. Options for positive adjustment processes at local levels may be depleted or removed by the actions of central authorities; and it is in this context that insurance should be viewed (Section 3).

## 2.6 Natural disasters and Tourism

The fascination of risk is doubtless a source of attraction for tourism, especially in respect of visually apparent phenomena such as volcanoes or earthquake ruins. It is unlikely however that these regular positive inputs go very far to compensate damage sustained in their intermittent manifestation.

Visits to volcanic craters, or to ruins, are of incidental interest to tourists who would quickly choose alternative locations if their first choice were to become the sudden victim of eruption, earthquake or tropical cyclone. The destruction of airports and hotels would make it necessary that they should and damage to architectural (Annex 4) and archeological monuments and their inaccessibility would certainly encourage them to do so.

Permanent damage in a particular country may cause some long-term reduction to tourism, with consequent economic effects on balance of payments; but by and large, though tourism is a highly sensitive industry it quickly recovers from interruption on which it is quick to capitalise. Health risks (Annex 14) would have much more severe and lasting impact on tourism, but tourism may itself be the source of epidemic and disease.

Tourism is often of large scale in small islands and small communities, with comparatively large numbers of tourists at one time. In case of

natural disaster, tourists require special attention in preparedness plans, and careful integration into local contingency planning, if they are not to become an embarrassing burden to their host or parent countries.

Much more serious concerns can be directed towards some tourist developments on small islands. Often coastal, resort development implies change to natural protective features of dunes, reefs, mangroves, and trees; and in addition to placing itself in a position of high risk to sea-surge and storm, development may remove former natural protection that indigenous populations once enjoyed.

In allowing these developments to take place for probable economic benefits, governments must take measures to exercise controls on behalf of environmental needs, and be prepared to incur some expenditure and administrative resource on behalf of extended contingency planning for often remote and temporary populations.

## 2.7 Disaster relief

Doubts and concern about some side and long-term effects of disaster relief have been expressed since the concept was born out of the missionary and trade beginnings of colonial presence (Annex 13). The colonial administrations which followed were more concerned about damage to government property and to loss of export production than about damage sustained by "natives" or indigènes who were, in the early years of colonisation, better adapted to looking after themselves.

As colonial systems and indigenous populations and practices integrated, larger proportions of populations became dependant on the administration as a source of work and cash, as well as relief after disasters; and a wider population saw the perquisites of post-disaster benefits (Annex 13). Expatriate colons and planters regarded post-disaster assistance as their right. Their estimates of damage and loss may have anticipated the administration's zeal in reducing their claims.

In respect of disaster relief, colonial administrations appear to have been neither a malevolent nor a benevolent extension of their metropolitan power. Both French and British administrations were obliged to

petition and negotiate with Paris or London for the terms of post-disaster assistance. More often it was not grant aid that was given, but credit which had to be repaid to the metropolitan government (Annexes 2, 3 and 8). Evaluations of damage and loss, made in the first instance by local administrators, were usually re-assessed by visiting assessors from neighbouring territories. Visitors were invariably more sensitive to the needs of "natives" and indigènes, increasing their allocations or including them where they had been omitted (Annex 2 and 8). On the other hand, visiting assessors were more comfortable about reducing assessments of damage to government property, and severely cutting assessments of their losses by the colons and planters. Commercial interests were the most suspect and the most heavily curtailed, a back-handed compliment to indigènes:

"Les indigènes n'ont pas cherché a spéculer sur le secours qui pourrait leur être alloué par le métropole, ils se sont bornés a indiquer avec sincérité le montant de leurs pertes"  
(Annex 8)

Though falling often a long way below the indigenous assessments, grants and loans were made with stipulations on how and where they were to be spent, for example that government buildings should be repaired. Terms for repayment were an onerous burden in years to come and a severe hardship to continued development, often a point of concern for successive governors and their negotiations with central parliaments (Annex 3).

However guided by metropolitan interests, rigorous apportionment of post-disaster assistance embodied a discipline which has since disappeared from disaster relief management. Though the same discipline may now be difficult to achieve by post-independence exogenous or indigenous agencies (and though it may be undesirable in some respects), it did ensure a specific identification of need and a rigorous integration of assistance with those needs; an integration that is often lacking in present systems.

Thoroughly identified post-disaster needs may not always have been wholly met, but neither are they by current systems. Though there was some impatience by metropolitan powers concerned by the amounts of assistance that were being incurred (Annex 8), there was also the underlying view

that disasters were a normal part of life in the colonies which had to be borne out of their own current funds, and by indigenous systems.

Current criticisms concerning the negative effects of disaster-relief; induced dependancy and increased vulnerability, disrupted market values, induced fecklessness and debilitated self-reliance, can all be the more pertinent in small countries. Not only do the effects of disaster have a greater proportional scale; so do the effects of disaster relief - though disaster and relief may certainly not be proportionally related.

Disaster is largely experienced by rural communities at local levels, though it may be eventual cornucopia at the national level. Economics of this kind conceal a social reality, which some non-governmental field agencies are striving to modify.

Careless choice of food-aid for local distribution can introduce new tastes and new dependancies on apparent availability of imported foods making crop production appear unnecessary. Tinned fish removes the need to go fishing, and flour the need to plant. When the next disaster strikes, fishing skills and equipment will have been lost, and harvests will be non-existent. Dependancy on external assistance will have increased.

The apparent eagerness with which disaster relief and emergency assistance (especially financial assistance) is accepted may however be as much a result of shortcomings in the development aid system as it is of the relief system - and of the separation of the two. Small countries, and smaller units of small countries, with diffuse and disperse multi-ferous micro-fund development needs, lose out where economies of scale in aid and its administration are being sought by donors. Small wonder then that relief assistance is sought by governments for developmental purposes in these situations.

### 3. INSURANCE AND FUNDS

#### 3.1 Natural disaster insurance and developing countries

Insurance is a commercial and financial arrangement dependant on a participant's willingness and ability to pay certain premiums. Where there is not the willingness and ability to pay premiums, little of the discussion about insurance for natural disaster is directly relevant.

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Insurance may seek to introduce financial concepts for evaluation and compensation, where none existed previously. Alternatively, where insurance systems are obliged to be dependant on existing financial systems, and willingness and ability to pay, it may become a medium which reinforces the separation between those willing and able, and those too poor to be able - even though they might be willing. The separation that can ensue is obviously between the rich or those with money, and the poor - or those without money at a wholly subsistence level; it less obviously occurs between local (rural) levels, and central governmental levels - where government is the only relevant sector for such financial arrangements. Government is a sector vulnerable to high structural and infrastructural damage and therefore high cost which can be evaluated; community and domestic damage is less easily evaluated, evaluation is less relevant, compensation is less significant - and premiums therefore less relevant though representing a greater burden.

Sectors are not usually so clearly defined, which makes the social questions surrounding insurance to be more complex and more pertinent. Why should those with money be the ones to benefit, when the poor are repeatedly identified as the most vulnerable to natural disaster? Though the poorest and smallest units are known to suffer the highest proportional loss, at domestic, community, province or country level, is it wholly relevant that insurance can only be applied to the largest and richer units? Where commercial insurance becomes possible, for example through the intervention of government subsidies to keep premiums to an acceptable level, who is to receive benefits and to what proportion? How is compensation to be assessed where property evaluation remains elusive or impossible; and where property may represent only a small part of a victim's overall loss which may be crippling.

Most seriously, what effect is the intervention of financial arrangements for compensation to have on cultural and traditional adaptation to hazard? Will financial compensation introduce disregard for hazard in the knowledge of compensation after disaster? Will insurance become a medium by which damage and loss may increase? Will those who do not maintain property stand to gain more from damage compensation than those who do?

It becomes clear that in developing countries, where technological and social systems are necessarily not at the level of the metropolitan countries, insurance cannot be superimposed. If it is to have any usefulness at all, insurance must be by flexible integration with existing needs and systems of the developing countries. This may mean that the very commercial principles upon which the insurance industry has come to depend may have to be modified; and there is considerable scope in modification for participation in benefits by natural disaster victims.

### 3.2 Commercial insurance principles

Commercial insurance has long been recognised as a medium for natural disaster mitigation, but natural disaster has also been recognised as the potential cause of severe losses for the insurance industry.

There are great difficulties in bringing commercial mechanisms designed for frequent small losses, to effectively (and profitably) relate to rare catastrophic losses. Insurance for traditional risks in life and fire insurance was designed according to the following constraints:

- a) the insured event has to occur with a certain regularity, in a certain period of time;
- b) the sustained damage must be measurable; it must be possible to calculate the probability of occurrence and the degree;
- c) the risks must be spread geographically;
- d) the amount of damage must be limited.

Natural disasters, earthquakes and hurricanes especially, do not fit to these constraints, and thus cannot be dealt with by traditional insurance systems. In certain developed countries, it has been possible to provide for some degree of risk from natural disaster by adding special risks on the back of insurance for fire; and in some cases, governmental subsidisation has ensured that premiums have been kept to acceptable levels.

3.3 Government participation and reinsurance

The participation of governments in direct compensation for natural disaster has been on the increase, but the involvement of public funds for the insurance of private property has itself raised further problems. Many uninsured victims of damage have turned to government funds for assistance, and governments have been increasingly obliged to respond. This in turn has served as a disincentive for the purchase by the public of insurance. How much, it has been asked, should disaster be treated as a public responsibility, and should residents of hazard-prone areas bear the financial cost of living there?

This kind of question implies a knowledge of and an accessibility to choices and options concerning location and relocation not applicable to many populations of less developed countries, and even less applicable to populations of disaster prone and less developed island countries. In small countries, <sup>if</sup> there is often no permanent escape in relocation within them, even/relocation is possible. Temporary removal from one hazard may only introduce another for the near future.

Although the moral and political issues of governmental involvement in insurance for natural disaster may be more easily answered for less developed countries, the financial questions are more difficult. Without money, governments cannot be involved, however much they may want to be. Add to this paramount problem those concerning the need for a developed insurance industry, the imbalance of risk distribution for multi-hazard insurance, the need for insurance to be made compulsory; the need for insurance to be additional to humanitarian relief by governments, the evaluation of property to be insured, and the applicability of natural disaster insurance in less developed countries becomes even more remote and impractical.

Some form of international subsidy would be required to make it possible for governments of less developed countries to be involved in simplified insurance systems. Such international subsidy would operate in a way comparable to commercial re-insurance; it would be an international medium for the sharing of risk; and a medium also for the initiation and implementation of programmes for natural disaster mitigation. Insurance systems for operation by governments would need accompanying guidelines for compensation distribution by governments within their countries.



Insurance is traditionally risk specific; and vulnerability to risk is conceived as a retrospective evaluation. That is to say, risk is assessed after the construction or establishment of certain activities and practices in a hazardous location. On the basis of that risk, insurance premiums may be assessed taking into account the anticipated frequency of prevailing hazards and the location, nature and quality of construction and use.

Though there may be sufficient data at national levels to determine a chronology of damaging events, there is usually insufficient relevant information on material and financial cost of damage to permit projections of future disaster impact. Insurance schemes remain therefore at the governmental level only, where governments are willing to participate, because they represent the national level at which existing data is relevant.

### 3.4 Crop Insurance

Crop insurance in its negative and positive aspects, has been the subject of special study and some special insurance programmes have been initiated. A medium by which farmers might be encouraged to increase production once inherent risks could be placed aside, is seen by some to be provided by crop insurance; to spread risks among many farmers, through diverse regions, over time. Again, in order to keep premiums at an acceptable level, some form of subsidy is necessary in less developed countries. Governments of the poorer countries are unable to participate, and commercial re-insurance is either not feasible or too costly. Some form of international assistance is required for widespread applications.

#### The Mauritius example

A leading but almost unique example of crop insurance has been managed in Mauritius for thirty-five years (Annex 15). A significant conclusion of reports of the system is the predominant need for re-insurance cover.

### 3.5 Regional schemes

#### The Caribbean

In 1971, fourteen Caribbean governments requested the United Nations Development Programme (UNDP) to provide assistance for a regional

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insurance organisation to provide cover against damage caused by hurricanes and tropical storms. The project was deemed to be feasible, requiring additional information from the participating Governments. UNCTAD collaborated in setting up a project study group.

### The South Pacific

The economic arm of the South Pacific Forum, the South Pacific Bureau of Economic Co-operation, with the co-operation of the Commonwealth Secretariat, established in 1976 a regional Disaster Relief Fund (Annex 16).

Operating between Governments, at national level, the guidelines for the Fund were able to avoid many of the problems involved by the application of commercial insurance principles at domestic levels, such as feasible premiums, evaluation of property to be insured; and incentives to purchase. The guidelines were wholly based on assessments of disaster frequency at national levels throughout the South Pacific region represented by the nine initiating countries. The fund is a form of mutually provided and shared disaster relief. Contributions are given by Governments, administered on behalf of Governments, and benefits are similarly received and administered by Governments. Inherent advantages are that it is committed immediately upon request, and it is wholly spent within the subscribing region. It was additionally recognised as the "oil for the machinery" to make available indigenous resources between member countries, which might well be given free of charge, across often vast distances involving transportation which is very costly. Except for a small administration requirement absorbed by the SPEG Secretariat in Suva, the Fund has no field-inspectorate, no regional offices, no separate headquarters, and therefore few overhead costs.

A principal disadvantage of the Fund is that without financial backing from donors outside the region, or without re-insurance in some form, a disproportionate amount of contributions to the Fund/<sup>have</sup> had to be allocated to Reserves - and only one-third to the Working Fund. This placed a severely low limit on the amount available to each disaster, and on the direct practical usefulness therefore of contributions. International backing was required to release to the maximum the "self-help" potential of the Fund. This has not been forthcoming.

The Fund was recommended to make itself the catalyst for regional and national disaster preparedness because, it was observed, by not taking measures to mitigate disaster at national and sub-national levels, a member country could become a liability to the Fund. In 1978 Tonga, a member of the Fund, requested a project for disaster mitigation and preparedness.

4. CONCLUSIONS

4.1 The need for wholistic national strategies

It would be a comparatively simple process to identify measures appropriate to each of the five countries of special reference in this Report, in response to natural disasters to which they are prone. However, identification would not be based on field study and observation essential to practical recommendations; and to make a series of separate and unintegrated proposals would be a betrayal of the principles for disaster mitigation that have emerged from the execution of this Project.

Measures could include, for example, improved methods of building construction and management for earthquake resistance for all construction materials and systems (Antigua); improvements to drinking water collection, conservation, manufacture and distribution (Antigua, the Cape Verde Islands, Maldiv Islands). Improvements to wind-resistant construction (Antigua; Comoro Islands; Western Samoa); improved land-use planning in areas prone to lava flows (Comoro Islands; Western Samoa); improved systems for regular importation of food and the introduction of birth control programmes (Cape Verde Islands); improved inter-island and over-land transportation, landing and off-loading facilities; and improved communications in-island and between islands.

All measures would require specific design and management related to the unique matrix of economic, technical, social, and cultural circumstances of their proposed incumbent. There is no panacea common to all island countries simply because they are islands; but smallness can be made a significant advantage for planning methodology.

Though therefore, the problems of natural disasters in least-developed island countries cannot be solved by agglomeration by their outsiders, there do emerge some common factors from analysis of island experience.

Above all there is the inter-relationship of disaster events, effects and aftermath; one introducing vulnerability for another. For example, fire in wooden buildings causing changes to masonry which were to suffer greatest damage in earthquake (Antigua: Annex 3); earthquake damage to crucial water supply systems on Fogo (Cape Verde Islands: Annex 6); and the postponement of reservoir construction until the earthquake loan had been repaid (Antigua: Annex 2).

The more frequent events are the creators of incumbent conditions for the rare events; the more frequent they are the more normal they appear to be. A regular or even intermittent normality of low nutrition levels due to famine or food shortage might facilitate the occurrence of epidemic or disease. A population suffering from epidemic or even low standards of health, might be slower to rehabilitate after hurricane or earthquake. Out of variable "normals", in most cases influenced by frequent or endemic hazards, it is easy to see how normal conditions of all kinds significantly influence the economic and social effects of earthquake and hurricane.

The introduction of physical and material norms, construction methods for buildings, water, power and food supplies, gives the concept a tangibility; and the extension of the physical to institutional and administrative normality virtually completes the wide spectrum of factors which impinge upon disaster effects.

Realisation of the inter-connectedness of conditions brings the realisation of the need for inter-connectedness of strategy; because without a comprehensive and wholistic approach measures taken in one sector may well cause vulnerability to shift to another.

#### 4.2 Shortcomings of economic evaluations

Assessments therefore of the economic viability of each measure on its own, become academic without the context of overall strategy. In any case economic viability of many undertakings is rare for small island economies. In respect of measures in response to natural disasters of such overwhelming proportional impact in small economies (Tables 1 and 2), what measures could be economically viable? Almost nothing is economic; one of the most severe problems for island development. Moreover, attempts throughout colonial and recent history to manage

islands as economic entities have usually been successful only when commercial arrangements (eg between colonies and the metropol) have been positive, or when strategic purposes have introduced beneficial conditions in which to trade (eg shipping in the Cape Verde Islands). To form successful economic entities with only scant indigenous resources is rare and has usually been only temporary. If normal economic existence is near impossible, how can additional and separate measures to counter disaster be economic?

But there are more serious questions concerning economic assessment of disasters and disaster response. Against phenomena that respect neither territorial nor disciplinary boundaries, how can any mono-disciplinary strategy be effective? Classical economic development has been largely inadequate as a means of improving the quality of life or social well-being and security. Economic assessments of disasters are unable to take account of the enormous social cost; and economic considerations account for the lesser proportion of disaster impact on developing countries. Were it possible to achieve real economic viability, or positive commercial balance of payments in least developed disaster-prone countries, the social cost of disasters would be largely unaffected. "Development" conceived only within the confines of economics during colonial and recent history have failed to reduce disaster impact; in spite of, or perhaps because of policies constrained by economic considerations, disasters have exacerbated.

Habitation of some island countries came about entirely through colonial exploration (Cape Verde Islands); and habitation and population of others was increased by emigration from the colonial metropol, by the importation of slaves, and by the development of export economies (Cape Verde Islands; Antigua; Comoros; Annexes 1; 5; 7 and 8). These processes were encouraged regardless of environmental hazards; disasters that occurred were grudgingly and only partially compensated by the metropolitan power to whom repayment was usually due, and they were largely ignored as a constraint. The social effects of disasters were ignored to an ever greater extent by the metropolitan power, or left to voluntary relief efforts where these existed. Unintegrated and unalleviated hazard uncertainty therefore contributed over time to population increase.

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"Disaster is the manifest interface of environmental hazard and economic and social presence, distribution and activity. There is therefore some legacy of responsibility incurred by the former colonial powers, now incumbent upon international and national development systems, not to insist upon wholly economic evaluation of development programmes in former colonial territories - especially in small islands where other severe economic constraints prevail".

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Relaxation of economic expectations would allow the integration of social factors and of socio-economic and social-cost-benefit evaluations. Furthermore, environmental considerations, so crucial to island development, would more easily achieve incorporation in a comprehensive development spectrum. The socio-economic development balance thus achieved would more effectively reflect the low permanent economic effects, and take due account of the high social effects of disasters. Development planning would no longer be focused on economic growth, by-passing social needs made manifest by disasters.

Modifications of this kind would require modified monitoring and accounting systems, and national accounts would begin more closely to reflect disaster losses, effects and after-effects in all sectors.

The dearth of disaster accounting, and the difficulty of accurate post-evaluation of disasters from existing accounts, is one very real reason why the present system of economic evaluation of development continues to ignore disaster effects. They are indiscernable in the present system in which economic effects are conjecturable at best, and then only rarely. Where they appear at all they are temporary and recovery is speedy, and interest in economic continuity and growth is quickly regained. Social effects are by-passed because they are unrecognised by the system.

Post-disaster analysis in the field is thus the only currently feasible method of determining the comprehensive effects of disasters - and comprehensive strategies for their mitigation.

#### 4.3 A developmental context for disaster mitigation

Natural disaster vulnerability is a wholistic reality, and requires wholistic strategies from national governments and international agencies. It is impossible to dis-associate famine risk from development of the Cape Verde Islands and yet at least one United Nations agency project did so in proposals for mineral water export development. Famine will not go away if it is ignored, it will exacerbate. So also will disasters caused by earthquake, hurricane, and volcanic eruption; wholistic strategies also being required for "all hazards at a place". But countless development projects, programmes and reports ignore disaster events and disaster potential, or are wholly inaccurate concerning them. As development proceeds to take account of famine in the Cape Verde Islands, earthquake and volcanic eruption will begin to take a greater toll commensurate with increased investment in the islands.

Development strategy has a significant responsibility and crucial role. It is the only operational undertaking that can provide the necessary wholistic context to incorporate the initiation and monitoring of socio-economic and environmental change. What is required are development strategies aimed to identify processes and components of economic and social vulnerability, mitigation strategy, incremental reduction of vulnerable sectors and areas, developmental integration of post-disaster assistance, and the evaluation of post-disaster vulnerability to recurrent disasters.

Islands are eminently qualified as a venue for developing and testing a multi-disciplinary and multi-sectoral methodology. In small islands, events and processes can be seen to have an effect on each other; and in islands they are most easily identified, tested and integrated as a viable strategy. Not only is a wholistic approach most necessary therefore; it is also the most possible.

The Economic Commission for Latin America provide an almost unique official insight into the developmental context necessary for disaster mitigation. An evaluation of damage caused by rainstorm in Grenada (1975) points to the essential need for insignificant expenditure on maintenance of roads and bridges in order both to keep disaster damage to a minimum; and to improve transportation and reduce overheads for agricultural marketing, essential to small island economies. But the same document also called for "massive" injections of capital to improve the total system and to initiate a developmental approach to ameliorate all the needs exposed by disaster. Comprehensive development planning was called for embracing environmental, conservation, infrastructural, physical, economic, and social perspectives; and the integration into implementation programmes /<sup>of</sup> relief and rehabilitation funds for which there would be no lack of donors.

4.4 Preparedness and Disaster-relief integration

The integration of disaster relief and rehabilitation funds, and goods, is critical for the maintenance of economic and ecological (social-environmental) balance in the aftermath of disaster. In island countries the scale of relief input is likely to be very high, especially as is often the case, there are strong international political or strategic

motives. For integration to be effective, comprehensive development planning must be undertaken incorporating hazard constraints, and in readiness for disaster. Such measures require an extended developmental interpretation for disaster preparedness; not only the identification of infrastructural requirements for preparedness improvement (transport; communications; medical facilities). Developmental preparedness should also undertake post-disaster evaluations of its efforts, and of the effects of disaster on processes and conditions of vulnerability to subsequent disaster of the same or different kinds. This kind of preparedness goes beyond an analysis of operations and measures which are possible and can be provided, into a close analysis and identification of needs. A fraction of the effort and resources expended on post-disaster assistance is required for developmental preparedness, integration, and evaluation.

Historical perspective and historical analysis is essential for realisation of economic and social processes which have accrued to conditions of vulnerability. The direction which development (though without that title) has taken in the past can guide future priorities for economic, social, and environmental balance (eg the emergence of earthquake and hurricane as priority hazards only after successful health and nutrition programmes in Western Samoa); and the need to tackle normal conditions, as vulnerable incumbents, before giving priority to the most dramatic and rarer disasters (Population: Western Samoa: Annex 14. Crops; Antigua; Annex 1).

Over-response to the seemingly rare event of high impact magnitude by newly formed organisations, or newly recruited personnel within them, is often clear from study of only recent/<sup>disaster</sup> history. Without historical perspectives, how can the nationally indigenous significance of disaster be judged? International outsider assessments are suspect in new nations for ulterior motives on the part of donors (eg Epidemic in the Maldiv Islands; Annex 10). A history of disaster relief as a subject in its own right, would reinforce the need for modifications considered to be the result of only recent enlightenment. Though problems may be new to new organisations, they may not be new as indigenous experiences for their incumbents. Without historical perspective the way is open for disaster opportunism by prospective recipients, and for disaster imperialism by over-eager donors.



4.5 Insurance

In 1976 insurance in respect of natural disasters was being directed wholly according to the interests of the insurance industry; and there were vast shortcomings between these commercial interests and the needs in disaster of less-developed countries. Since then there has emerged a wider realisation of these needs and of the shortcomings of the insurance industry in its ability to meet them.

The emergence of regional groupings, and regional Funds, should make easier the identification and their application of international re-insurance objectives and resources/at government levels. There remains the requirement of considerable flexibility for the adaptation of systems of insurance to ensure their appropriateness at domestic and local levels in less developed countries.

Only when natural disaster insurance has been made workable and implementable as a viable system, can it be made to become a medium by which risk can be mitigated. Insurance could assist an international sharing of losses; assist increased production; assist the improvement of housing stock; and assist the stabilisation of prices. It could and should become an integrated component of institutional and socio-economic development requiring multi-disciplinary co-operation and flexibility, dependant upon the recognition of natural disaster as a component of environmental reality. The conceptual scope for such an integration is limitless.

What is needed are methods for assessment or prognoses of damage which may result from the known temporal distribution, and projected recurrence, of damaging events. This requires not only temporal and spatial analysis of past events, but field measurement of distribution, type, quality, and construction of properties and activities. There are a number of proposed methodologies for risk measurement based on social as well as technological factors, which will allow risk to take account of other than structural features and where property will be assessed only in its appropriate social context.

The dangerous but probable alternative is that the very separation from their causative processes of risk values upon which the viability of traditional insurance systems depend, will reinforce the separation of

natural disaster from environmental reality. By doing so, the separation of the insurance industry itself from the development spectrum will be regrettably assured. By permitting tax-free reserves to allow re-insurance to accommodate catastrophe losses, and by the authorisation of free transfer of currency, governments of developed countries can continue their co-operation with self-help incentives in less-developed countries. By so doing they will greatly increase the geographical scope and effectiveness of an emergent concept.

#### 4.6 Natural disasters a cause of least-developed status?

How much have natural disasters contributed to the condition of "least-developed" amongst the island countries of that category?

Least-developed countries are the weakest in terms of certain economic and social criteria; low income; low share of manufacturing in total output; and low literacy rate, as expressed by

1. A per capita gross domestic product of £100.00 or less.
2. Manufacture amounting to 10% or less of the GDP.
3. A literacy rate of 20% or less (proportion of literate persons over 15 years).

Though admitted as somewhat arbitrary, and though countries are quite structurally diverse, characteristics of least-developed countries are:

- a) Very poor countries, with high proportions of population dependant on predominantly subsistence agriculture.
- b) Large proportions living in rural areas, with very limited access to transport and communications.
- c) Manufacturing output extremely limited in absolute terms and as a percentage of total output.
- d) Low economic growth, often a decline in income per head failing to keep pace with population increase.
- e) Inability to develop exports sufficient to pay for necessary imports.
- f) Limited or undeveloped natural resources.

These characteristics are all applicable to the five island countries of special reference in this Report, which have the additional problems of smallness, remoteness and dividedness in varying degrees.

No matter to what degree the impact and aftermath of natural disasters have disturbed the fragile economic and social equilibrium of these countries; and though their characteristics (above) have been worsened by natural disasters, the effects have been temporary. All have recovered to their continuum of low development.

It is much closer to reality to consider the impact of these conditions upon the effects of natural disaster. None of the characteristics above has been directly caused by natural disaster. Most seriously the inability of development to incorporate effective mitigation strategies has contributed to the perceived need to insure against them in the only way accessible, by the provision of large families essential for economic and social viability in hazardous environments. Were it possible to demonstrably reduce the risk, family size might reduce. Population increase could be stabilised and per capita values of GDP would improve. The social component of the six characteristics is very high; they are not all addressed in economic terms; they cannot all be responded to by wholly economic measures.

The smallest island countries are the most vulnerable to highest proportional disaster impact in economic and social terms. Only Antigua and the Maldive Islands are in the "smallest" category (Table 5). The other three countries are much larger and have protective advantages as archipelagoes; which again suggests that factors other than natural disasters have caused the least-developed condition of these five (or at least three) countries.

Assessments of the effects of natural disaster must be from the incumbents' viewpoint. It is unrealistic to suggest in Western Samoa that hurricanes such as those of 1966 and 1968 (Annex 11) were not that serious, by taking account of advantageous rainfall brought by hurricanes that did not happen (Annex 12). On Grand Comoro and Fogo fertile soil resulting from successive volcanic eruptions may be a positive consideration, but reasons for habitation are the inaccessibility of alternatives and options.

Economic impact of natural disasters has been temporary, and fluctuations have been no greater than those caused by other factors both before and afterwards. Countries have recovered (eg Antigua: Figure 1 and Antigua: Annex 3), albeit with assistance, but with assistance they were often

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required to repay (Antigua: Annex 3; Comoro Islands; Annex 8). Economic effects have been most severely felt when economy was in a state of decline, as a result of other factors (eg Antigua: Annex 3; Comoro Islands: Annex 8). The commercial and economic decline of the Cape Verde Islands has had a wholly different history; the islands were uninhabited before colonisation, obviously for very good reasons. Such commercial viability as was enjoyed was entirely due, it would seem, to external interests and external activities in shipping, commerce, and above all a slave economy. Strategic importance of similar or alternative kinds may be now the only basis for any "economic" evaluation for development in an inviable place. Massive imports of food aid (US \$ 16 million in 1980 from UN sources) to avert famine are only the first necessary measures against a legacy of population increase which will only subside as risk is seen to decline. Development is now needed for increased self-reliance for which evaluation in economic terms alone is wholly unrealistic; and in the meantime imbalance of payments due to food-aid should not be regarded as a negative accounting factor. The eventual demise of slavery had a far greater impact on Cape Verdian economy than did famine, the high mortality of which was closely dependant on inflated population resulting from slavery. Similarly, though to a smaller scale, in Antigua the burden of earthquake loan repayments was the greater, coinciding with efforts of the sugar industry to recover after slavery emancipation.

There are now two schemes to compensate for export production shortfalls applicable to most developing countries (the IMF Compensatory Financing Facility: CFF; and the STABEX scheme of the EEC, applicable to the ACP countries) these two schemes can accommodate shortfalls due to natural disasters; and natural disasters should not therefore be separated as an element for special treatment. Development emphasis must of course continue to be an avoidance of shortfalls, which could incorporate disaster mitigation strategy. The actual assessment of shortfalls, over what preceeding averages of production, will take temporal analysis of natural disasters into account, and has parallels with some insurance and re-insurance systems. Shortfall compensation should be by commodity as after disasters, as has been shown (Figure 3), some sectors show gains where others show losses.

Incumbent economic and social conditions have counted more for the effects of disaster upon them, than disasters have accounted for the

subsequent level of those conditions. Though economic impact has been temporary, social cost has been high. Deaths are irrevocable; homelessness, deprivation, misery, and injury may be transient but are largely avoidable by environmentally appropriate development; not solely by economic growth.

Because inadequate or inappropriate development is causing exacerbated economic and social effects of disaster, the demand is the greater upon disaster relief resources, and upon the exploitation of disaster to augment development assistance. Long-term, evenly programmed development assistance inclusive of disaster mitigation strategy would be more cost-effective to donors and recipients than erratic injections of over-responsive or ill-considered disaster-relief. Budgets for development aid and emergency aid should reflect this need for practical balance.

Supposed long term benefits of post-disaster reconstruction are unlikely to make disaster a positive experience. The test must be in subsequent recurrent disaster, any interim economic and social benefits being set against the losses of disaster impact. Damage in the 1974 Antigua earthquake largely mirrored in building type, use, and construction, the damage inflicted in 1843 (Annexes 3 and 4); and there had been no reduction in the costs of disaster in the United States over a 90-year period. Post-disaster reconstruction, for not only tangible damage, obviously carries the eventual opportunity for mitigation measures, but unless development strategy itself is redesigned and reconstructed, disaster will join the many processes and influences which will render the economic and social environment more vulnerable to the next.

Natural disasters are not a development game, they are an integral part of environmental reality and should be included as a constraint of socio-economic development policy.

#### 4.7 Lessons for larger countries

Much of this Report in respect of natural disasters in least-developed island countries contains valuable lessons for natural disaster mitigation in larger countries. There is an obvious relevance for larger countries comprised of islands (eg the Philippines; Indonesia; Malaysia; Papua New Guinea) and for larger countries with offshore islands with special hazards.

The inter-relationship of conditions and events is less obvious in large countries, and requires more careful analysis for its identification. Though islands are obviously topographically defined, areas and regions of larger countries can be similarly; and at all local levels "all things come together" as they do at national levels in islands. Rural levels are the most vulnerable to natural disaster; disaster of national scale comprises many simultaneous disasters of local impact, and methodologies and strategies developed for island countries have a relevance at local levels for others.

## 5. RECOMMENDATIONS

- 5.1 Island developing countries are significantly prone to high proportional economic and social effects of natural disasters. UNCTAD should continue a special concern on behalf of island developing countries, and the effects upon them of natural disasters; while recognising that problems caused by disasters cannot wholly be met by measures concerning trade and economic growth only.
- 5.2 Accounting systems by UNCTAD for commodities, exports and imports by type and country are some which come closest to requirements for analysis of the economic impact of disasters. International accounting of the economic effects of disasters is nevertheless quite inadequate.
  - a) UNCTAD should develop accounting systems for the specific identification of the economic effects of disasters, as they occur and over the longer term; and maintain specific systematic accounts of the economic effects of natural disasters.
  - b) Such accounts should be undertaken in the realisation that they represent only a partial reflection of disaster effect; and should be accompanied by parallel analyses of social costs of disaster in short and longer terms.
  - c) Accounting should be presented so that it will eventually illustrate the connection between economic and social changes (as illustrated by current account systems), and variations in economic and social effects of disasters, illustrated by the proposed new accounting system.

d) UNCTAD should initiate and undertake, in addition to new accounting systems, a project for comprehensive post-analysis of existing commodity and export/import accounts. Such analyses should be for islands and other developing countries, where significant disasters have occurred, and should cover years before as well as years following the year of disaster.

5.3 There is little point in keeping account of the economic and social effects of disaster without their integration into processes for modification of the causes of those effects.

UNCTAD should co-operate with other inter-governmental and developmental agencies for the definition and execution of development strategies incorporating measures for disaster mitigation.

These strategies and measures will inevitably be multi-disciplinary and multi-sectoral; and participation may be sought of, for example, UNDP, UNDRO, UNEP, UNCHS (Habitat), WHO, ECLA, etc and other inter-governmental and regional organisations.

A most appropriate <sup>and evaluation</sup> location for the identification, definition, integration/of methodologies for disaster mitigation would be amongst the island developing countries.

5.4 UNCTAD should initiate inter-agency co-operation on behalf of island developing countries for the identification, definition, and integration of wholistic methodologies for developmental disaster mitigation.

Such field-projects may include

- a) assessments of factors and processes of pre-disaster vulnerability, the modification of their causes, and the definition of strategy for developmental disaster mitigation.
- b) post-disaster analysis of economic, social, technological, and institutional shortcomings exposing developmental needs for the integration of subsequent and recurrent disasters.

- c) The integration of post-disaster relief and rehabilitation resources into developmental disaster mitigation.
- d) The establishment of programmes for incremental strategy implementation, which may well seek to first address "normal" environmental conditions as the vulnerable incumbents of disaster impact, eg conditions of health and nutrition.

5.5 Historical analysis is one essential component for the identification of development strategy. The confident direction of future policy can come about only with the incorporation of knowledge of policies of the past which resulted in conditions of the present.

UNCTAD with the participation of other development agencies, should continue this project on the least developed island countries by

- i) Projects for comprehensive current development analysis
- ii) Projects for field observation and analysis of needs.

undertaken in each of the countries of special reference: Antigua; the Cape Verde Islands; the Comoro Islands; the Maldives Islands; and Western Samoa.

The projects could commence with the selection of one country for a Pilot Project.

Results of historical analysis; current development analysis; and field observation and analysis will provide a balanced ecological (socio-economic-environmental) spectrum for the effective direction of disaster mitigation and development policy.

Field studies should essentially be "pre-disaster", but in the event of natural disaster affecting any of these five countries, UNCTAD and UNDRO should launch immediate measures for a project of post-disaster analysis of development needs (Recommendation 4b).

5.6 There is a need for comparisons of temporal analysis of post disaster recurrence, with projections of damage based upon socio-economic cartographic or field measurement for a definition of future risk. There are a number of hypotheses for field measurement of risk and vulnerability which require development testing and integration.



In association with UNDRO, UNCTAD should participate with selected resources and representatives of the insurance industry in order to develop methodologies for socio-economic measurement of risk and its execution; and for their testing in the field.

- 5.7 Reinsurance is the critical need for initiatives taken by national governments and regional organisations in forms of insurance against natural disaster. Without reinsurance, only a small percentage of the indigenous financial resource can be effective.

UNCTAD should initiate the further identification of reinsurance needs for existing insurance and funds for natural disaster, and modifications that may be necessary for effective application of reinsurance resources to these and similar funds.

Methodologies established for this purpose may well be of encouragement for the setting up of other regional, tri- and bi-lateral insurance groupings.

- 5.8 Isolated rural communities are most vulnerable to high proportional damage and destruction in natural disasters. These communities are often by-passed by national development objectives; but self-reliance is the key to local survival in disaster and its aftermath. (Local level projects are often multi-purpose eg improved fishing facilities provide regeneration of communications essential for inter-dependence; as well as an alternative food source.)

Small countries, especially island countries, and more especially archipelagic countries, lose out on development assistance projects where there are objectives for economies of scale in assistance and its administration by donor governments and agencies.

UNCTAD should initiate and implement micro-development assistance for small scale, repetitive projects in island and archipelagic countries; especially projects of rural development for improved self-reliance at local levels. Such projects may include land transportation; inter-island transportation; landing and off-loading facilities (airstrips; jetties etc); health clinics; boats and fishing equipment; agricultural extension; rural potable water supplies; etc).

- 5.9 The avoidance of post-disaster economic and socio-environmental imbalance is essential if one disaster is not to create long-term accrued vulnerability to the next.

Disaster preparedness must be extended to become a developmental concept by

- a) the identification of development needs for improved disaster management (communications, transportation, hospitals etc) but more significantly by
- b) the preparation of developmental strategy for the integration of relief and rehabilitation resources.

UNCTAD should participate with UNDRO and UNDP for the extension of the preparedness concept, preparation of working methods for its adaptation, and its submission, discussion, and eventual integration into development planning systems.

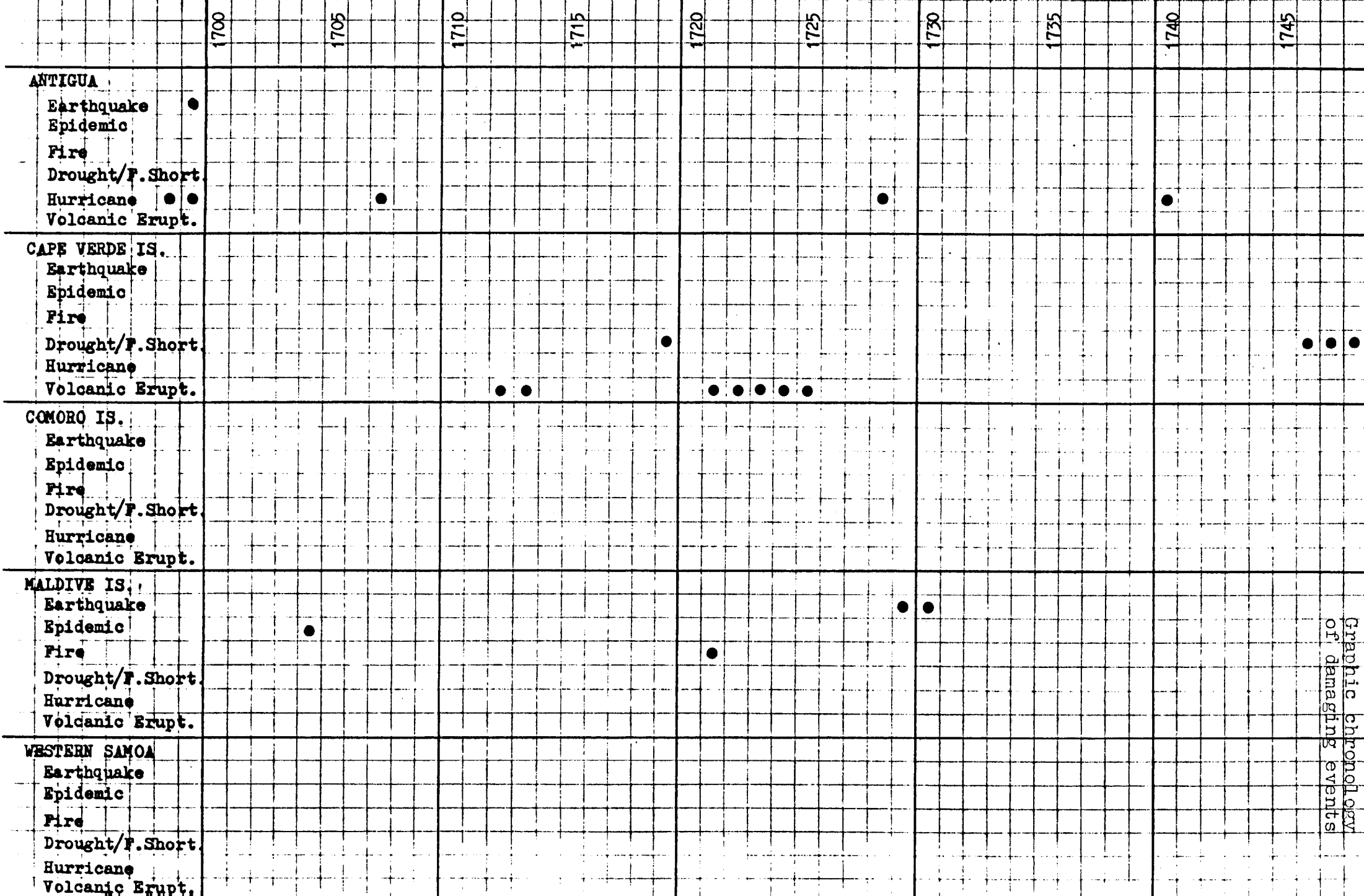
- 5.10 Historical research and analysis is essential for developmental understanding and direction.

UNCTAD (with the participation of UNDRO and UNESCO for example) should continue the historical analyses of this Report by the undertaking of the following projects:

- a) A continuation of archival research for Antigua
  - i) Pre 1845 archives: in London
  - ii) Dispatches from US Consuls in Antigua 1794-1906: National Archives, Department of State, Washington DC.
- b) A continuation of archival research for the Maldive Islands
  - i) Colombo (subject to verification)
  - ii) Verbal, correspondence, and documented reports: (Maldive Island: reference Annex 10 Attachment).
- c) A history of disaster relief, governmental and non-governmental, including
  - i) Archives of the International Relief Union: Geneva; Paris
  - ii) Colonial archives of the former metropolitan powers
  - iii) Post independence disaster relief: multi-lateral and bi-lateral.

Graphic Chronology of Damaging Events

TABLE 8



Graphic Chronology  
of damaging events  
TABLE 8



TABLE 8 (continued)

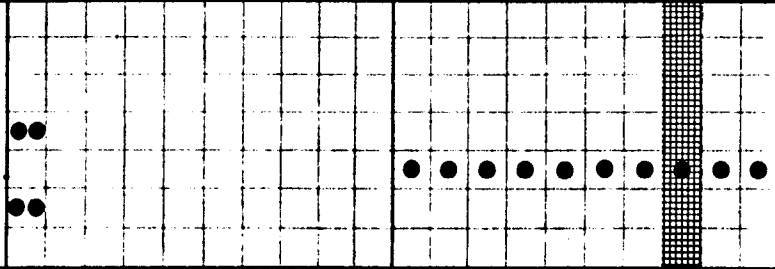
	1800	1805	1810	1815	1820	1825	1830	1835	1840	1845
<b>ANTIGUA</b>										
Earthquake										
Epidemic				•	•			•		•
Fire										
Drought/F.Short				•					•	
Hurricane		•	•		•		•	•		
Volcanic Erupt.							•	•	•	•
<b>CAPE VERDE IS.</b>										
Earthquake										
Epidemic										
Fire										
Drought/F.Short			•	•	•	•				
Hurricane							•	•		•
Volcanic Erupt.				•						•
<b>COMORO IS.</b>										
Earthquake										
Epidemic										
Fire										
Drought/F.Short										
Hurricane										
Volcanic Erupt.							•	•		•
<b>MALDIVE IS.</b>										
Earthquake				•						
Epidemic										
Fire										
Drought/F.Short										
Hurricane										
Volcanic Erupt.										
<b>WESTERN SAMOA</b>										
Earthquake										
Epidemic										
Fire							•		•	•
Drought/F.Short										
Hurricane										
Volcanic Erupt.							•	•	•	•



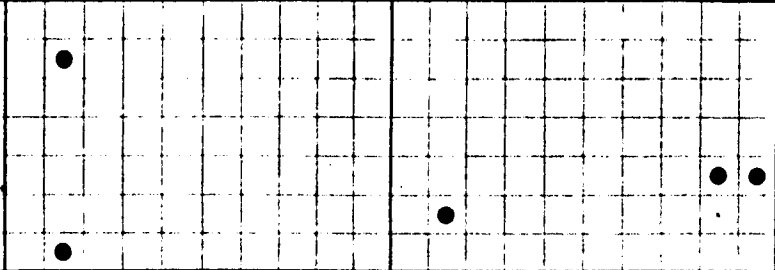


1950 1955 1960 1965 1970 1975 1980 1985 1990 1995

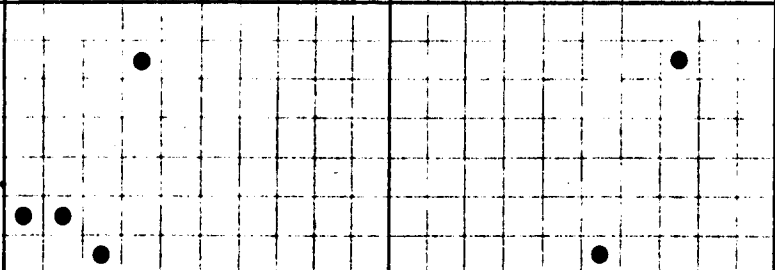
ANTIGUA  
Earthquake  
Epidemic  
Fire  
Drought/F.Short  
Hurricane  
Volcanic Erupt.



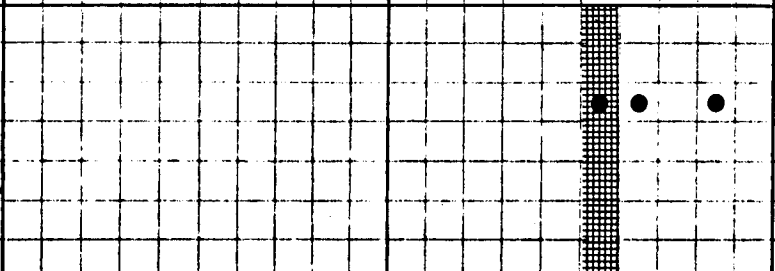
CAPE VERDE IS.  
Earthquake  
Epidemic  
Fire  
Drought/F.Short  
Hurricane  
Volcanic Erupt.



COMORO IS.  
Earthquake  
Epidemic  
Fire  
Drought/F.Short  
Hurricane  
Volcanic Erupt.



MALDIVE IS.  
Earthquake  
Epidemic  
Fire  
Drought/F.Short  
Hurricane  
Volcanic Erupt.



WESTERN SAMOA  
Earthquake  
Epidemic  
Fire  
Drought/F.Short  
Hurricane  
Volcanic Erupt.

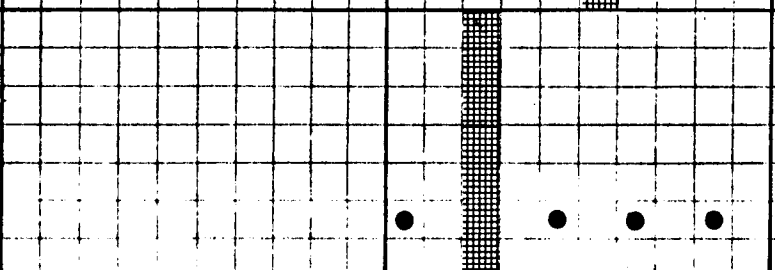




TABLE 9

Chronology of Damaging Events			ANTIGUA	
Date	Event	Effects	Deaths	Cost estimates of damage
1664 October 22-23	Hurricane			
1681	Hurricane	"Antigua devastated"		
1690 April	Earthquake			£2,000
1707	Hurricane			
1728 August 19	Hurricane			
1740 August	Hurricane			
1768	Drought			
1769	Fire	260 houses destroyed in St John's		
1772	Drought			
1772 August 17	Hurricane	"Damaged much shipping as well as plantations and buildings"		
1772 August 31	Hurricane			
1776 September 4	Hurricane			
1779	Drought	"A very severe drought"		
1780	Epidemic	Disease not named 25% of total population died	8,000	

Notated chronology  
of damaging events

TABLE 9

TABLE 9 (continued)

Chronology of Damaging Events			ANTIGUA (continued - 2)	
Date	Event	Effects	Deaths	Cost estimates of damage
1780 October 10	Hurricane	Extremely violent: destroyed stone buildings and shifted canons		
1782	Fire	Destroyed most of St John's		
1785 July	Earthquake	"very violent" "disastrous"		
1789-92	Drought	"Worst drought recorded in the Antilles"		
1792 August 1	Hurricane			
1792 September 10	Hurricane	"Very damaging . . . crops destroyed"		
1792	Epidemic	"A malignant fever imported from Grenada"		
1795 August 18	Hurricane			
1804 4-6 September	Hurricane	Severe: 274 vessels perished (in all affected areas)		
1812 October 1	Hurricane			
1814	Drought	"Almost a state of famine"		
1814 August-September	Epidemic	"Dysentry among the negros"		
1816 August/ September/ October	Epidemic	Yellow fever		

Chronology of Damaging Events			ANTIGUA (continued - 3)	
Date	Event	Effects	Deaths	Cost estimates of damage
1818 September 22-25	Hurricane			
1828	Epidemic	"Dandy fever"		
1831 June 25-27	Hurricane			
1833 February	Earthquake	"Severe" "A smart shock"		
1833	Drought	"Severe"		
1833 August 14	Hurricane			
1835	Epidemic	Yellow fever		
1835 August 12	Hurricane			
1837	Drought	"Severe"		
1837 July 31	Hurricane			
1837 August 2-4	Hurricane			
1839 June 9	Hurricane			
1841	Fire	St John's destroyed		

TABLE 9 (continued)

Chronology of Damaging Events			ANTIGUA (continued - 4)	
Date	Event	Effects	Deaths	Cost estimates of damage
1843 February 8 (11.00 am)	Earthquake	All Government buildings in St John's destroyed or damaged; Cathedral destroyed and 12 of 14 parish churches damaged, 7 totally destroyed; 12 large retail stores destroyed; 15 taverns destroyed; brass/iron foundry destroyed; wharves at English Harbour upheaved or sunken; many dwelling houses, and numerous "free villages" (established after abolition of slavery 1834) destroyed. Out of a total of 172 sugar mills, 35 were entirely destroyed; 82 irreparably damaged; 52 partially damaged; and "works, dwelling houses, labourer's cottages attached to these mills shared their fate in equal proportions". Governor's residence destroyed.	12-40	Direct: £20-50,000 Total & indirect: £2 million
1846 September 21	Hurricane			
1847	Drought	"Long continued"		
1848 August 22 - September 3	Hurricane	Several churches destroyed		
1853	Drought	"These droughts" - changes in poor-relief system		
1861	Drought	Continuous for eight months		
1862-64	Epidemic	Smallpox		
1863-64	Drought	Severest on record "entirely destroying crops and ground provisions . . . water extremely scarce"  High death rate  Heavy mortality for 1863, 1864 and 1865; 5,222 deaths out of population of 36,412 (14.4%) Annual average death rate of 47.8 per 1,000 population	5,222	

TABLE 9 (continued)

Chronology of Damaging Events		ANTIGUA (continued - 5)		
Date	Event	Effects	Deaths	Cost estimates of damage
1871-74	Drought	Severe		
1893	Epidemic	"Flu" : high infant mortality		
1894	Drought	"Excess"		
1898	Epidemic	Dysentery: deathrate increase		
1898	Drought	First six months of year "much distress, and even actual starvation, existed among labouring classes" (required poor-relief funds)		
1899	Hurricane	"Considerable violence" . . . much damage to the huts of labouring classes (Island of Montserrat wholly devastated)		
1909-12	Drought	"Considerable distress in country districts. Acute water famine for some days in St John's"		
1920-24	Drought	Severe and prolonged		
1924 August 28-29	Hurricane	Severe; "moderate" damage Relief expended: £1,356; "several thousand pounds of damage but brought relief in the form of welcome rains" (Ended the severe and prolonged drought 1920-1924) Imperial Government Grant in aid: £450 Also seriously affected Nevis, Montserrat, Tortola, St Kitts; Lord Mayor of London Fund raised £4,000. Total relief including West Indian contribution - £23,000. "Wholly devoted to relief of peasants and labourers and reconstruction of their dwellings"	3	

TABLE 9 (continued)

Chronology of Damaging Events			ANTIGUA (continued - 6)	
Date	Event	Effects	Deaths	Cost estimates of damage
1928 October 5-7	Hurricane	Peasant houses: severe damage and destruction Telephone system damage Public Works (including ecclesiastical buildings)		£2,900 £2,527 £1,695
1929	Drought	"Severe"		
1929 September 12-13	Hurricane			
1945-48	Drought	"Severe" St John's water rationed to 3 gallons per day (per head?) Tank deliveries to villages Pasture failed, many animals died Money short, work scarce, building stopped for want of water "Disastrous" effect on sugar crop		
1950 August 18	Fire	Serious; centre of St John's (90% of buildings in timber) Four-storey hotel completely destroyed, and other commercial buildings		
1950 August 19	Fire	Federal Secretariat destroyed		
1950 August 21	Hurricane	100 mph winds Extensive road damage; telephones and electricity disorganised; livestock lost; severe destruction in rural areas. Total number of houses destroyed: 488 Total number of houses damaged : 636 (many rendered uninhabitable)		

TABLE 9 (continued)

Chronology of Damaging Events			ANTIGUA (continued - 7)	
Date	Event	Effects	Deaths	Cost estimates of damage
1950 August 31 - September 1	Hurricane	<p>165 mph winds recorded in Antigua Damage generally as for 21 August, but St John's suffered more than rural areas Considerable damage to Government, private and commercial buildings</p> <p>1348 small houses completely destroyed } 2343 small houses damaged } Totals for both hurricanes of 1950 ("leaving out large houses which were either insured . . . or whose owners could afford to repair them unaided")</p> <p>6477 homeless people (+ Barbuda: 84 houses destroyed; 109 damaged; 320 homeless people) Total homeless: 6797 (15% of population)</p>	3	
1960-69	Drought	"prolonged"		
1974 July/August	Drought			
1974 October 8	Earthquake	M 7.5 "moderate" damage		EC \$ 14 million

TABLE 9 (continued)

Chronology of Damaging Events		CAPE VERDE ISLANDS		
Date	Event	Effects	Deaths	Cost estimates of damage
1461(?)	Volcanic eruption	(Fogo)		
1500 (?)	Volcanic eruption	(Fogo) lava flows (?)		
1563	Volcanic eruption	(Fogo)		
1580-82	Famine			
1594	Famine			
1596	Volcanic eruption	(Fogo)		
1604 March	Volcanic eruption	(Fogo) lava flows (?)		
1609-11	Famine	Food procured from Gambia: slaves "freed" by owners unable to feed them.		
1614	Famine			
1664	Volcanic eruption	(Fogo) lava flows		
1675	Volcanic eruption	(Fogo)		
1680	Volcanic eruption	(Fogo)		
1689	Volcanic eruption	(Fogo) Earthquakes, with lava pouring towards Monte d'Aipo.		
1693	Volcanic Eruption	(Fogo)		



TABLE 9 (continued)

Chronology of Damaging Events			CAPE VERDE ISLANDS (continued 2)	
Date	Event	Effects	Deaths	Cost estimates of damage
1695	Volcanic eruption	(Fogo)		
1697	Volcanic eruption	(Fogo)		
1699	Volcanic eruption	(Fogo)		
1712	Volcanic eruption	(Fogo)		
1713	Volcanic eruption	(Fogo)		
1719	Famine			
1721-25	Volcanic eruption			
1746	Famine			
1747-50	Famine			
1754	Famine			
1761	Volcanic eruption			
1764	Famine			
1769 (or 1774)	Volcanic eruption	(Fogo)		
1775	Locusts			

TABLE 9 (continued)

Chronology of Damaging Events			CAPE VERDE ISLANDS (continued 3)	
Date	Event	Effects	Deaths	Cost estimates of damage
1774-75	Famine	Famine followed by epidemic; more than half the population of San Thiago died	22,000	
1785	Volcanic eruption	(Fogo) Earthquakes, explosions; lava flowed towards Fonte Pedra river and Anohuila e Relva Arable land destroyed		
1789-91	Famine			
1799 24 January - 25 February	Volcanic eruption	(Fogo)		
2-28 June				
August		Explosions and lava flows Arable land destroyed		
1810	Famine			
1813-14	Famine			
1816	Volcanic eruption	(Fogo)		
1825	Famine			
1831-33	Famine		12,000	
1845-46	Famine	Some inhabitants ate grass		
1847 April 9	Volcanic eruption	(Fogo) Moderate strombolian activity with lava flows, most of which destroyed arable land and other property near the east coast. Casualties due to accompanying earthquake		

TABLE 9 (continued)

Chronology of Damaging Events			CAPE VERDE ISLANDS (continued 4)	
Date	Event	Effects	Deaths	Cost estimates of damage
1847	Earthquake	(accompanied volcanic eruption) Casualties		
1850-51	Famine			
1855-56	Epidemic	Cholera (on Fogo; S. Antao; Fogo)		
1857 June 27	Volcanic eruption	(Fogo) Explosions		
November				
1863-65	Famine	"loss of all agriculture"  "loss of all hope"	30,000 (40% of popula- tion)	
1875-76	Famine			
1883-84	Famine			
1885-86	Famine			
1889-90	Famine			
1892	Famine			
1896-97	Famine			
1902-04	Famine		15,000 (10% of popula- tion)	
1909	Volcanic eruption	(Fogo)		

TABLE 9 (continued)

Chronology of Damaging Events			CAPE VERDE ISLANDS (continued 5)	
Date	Event	Effects	Deaths	Cost estimates of damage
1920-22	Famine		17,000 (10.6% of the total popula- tion)	
1927	Famine			
1930	Famine			
1931-35	Famine			
1940-43	Famine		24,463 (13.5% popula- tion)	
1946-48	Famine		20,813	
1951 June 12-August	Volcanic eruption	(Fogo) Explosions, lava flows Arable land and castor-oil plantations burnt Roadway broken Water main broken Water storage cisterns ruptured by initiating earthquake 34 houses destroyed (no casualties)		1½ million escudos
1951	Earthquake	(initiated volcanic eruption) Fractured water storage cisterns		
1961 September 5-6	Tropical cyclone	Agricultural damage: bananas, coconuts, maize Trees felled (Flash?) Flooding Dyke destroyed on Fogo (no description of dyke's purpose)		

TABLE 9 (continued)

Chronology of Damaging Events		CAPE VERDE ISLANDS (continued 5)		
Date	Event	Effects	Deaths	Cost estimates of damage
1968-1977	Drought	<p>("eight years up to 1977": since transitional/ independent Government)</p> <p>(UNDRO files show international drought concern for 1975, 1977, 1979 and 1981)</p>		
1972 October	Earthquake			
1979 December	Drought			

TABLE 9 (continued)

Chronology of Damaging Events			COMORO ISLANDS	
Date	Event	Effects	Deaths	Cost estimates of damage
1828 May	Volcanic eruption	Karthala Grand Comoro		
1830	"			
1832	Volcanic eruption	lava flows: no casualties (not as serious as 1889)		
1848	Volcanic eruption	Karthala Grand Comoro		
1855 July				
1857		Summit and SE flank: Massif Badjini		
1858		NE flank		
1859		NW flank Plateau de Diboini 1,400 m lava flow		
1860		West (Itsandra)		
1861	Fire	Village of Mossi-be		
1862	Volcanic eruption	Karthala Grand Comoro SE flank		
1864 October 25	Storm/Cyclone	Damage to buildings Damage to roads and bridges		Fr. 300,000 Fr. 1,670,000
1865	Volcanic eruption	Karthala Grand Comoro		

Chronology of Damaging Events		COMORO ISLANDS (continued 2)		
Date	Event	Effects	Deaths	Cost estimates of damage
1867	Fire	sugar factory; Debeney		
1872	Volcanic eruption	Karthala Grand Comoro NW flank: Plateau de Diboini		
1876				
1880		SE flank: Massif du Badjini		
1883 March				
1884				
1889 (1885?) (1884?)	Volcanic eruption	lava flows north side: no casualties		
1898 February 27-28	Tropical cyclone			
1898 April 22-23	Tropical cyclone			
1898	Cyclones	Mayotte Financial ruin of several sugar establishments, sugar production recontinued only in 1904; to a lesser degree and accompanied by diversification into other crops		
		losses to 23 <u>colons</u> (sugar plantations)		Fr. 90,000
1898	Epidemic	Smallpox		

TABLE 9 (continued)

Chronology of Damaging Events		COMORO ISLANDS (continued 3)		
Date	Event	Effects	Deaths	Cost estimates of damage
1904 February 25- March 11	Volcanic eruption	Karthala Grand Comoro Three lava flows on the north side: one to the west two to the east  Accompanying tremors and earthquakes Two deaths and cattle lost		
1904 December 14	Cyclone	Anjouane, Mayotte, and Moheli Total cost of damage to government, <u>colons</u> and indigenes		Fr. 480,000
1905 December 16	Cyclone	Anjouan; Moheli, and Grande Comore Total cost of damage to government, <u>colons</u> and <u>indigenes</u> 150 injured	30	Fr. 1,173,000
1904-1905	Food shortage	Followed cyclones of 1904 and 1905	490	
1908 February 3	Storm	Anjouan		
1908 April 14	Cyclone	Anjouan, Moheli and Grand Comore Damage not serious, no special financial advance required Cloves, coconuts, cocoa, cassava, maize, and sweet potatoes damaged Cyclone marked end of, and caused damage, after a dry season 50 tonnes of rice sent from Mayotte 300 tonnes of rice sent from Zanzibar Five ships ("boutres") lost with 54 lives 9 natives died		
1918 August 11-26	Volcanic eruption	Karthala Grand Comoro Cheminee nord accompanied by earthquakes: August 23 and 25 felt in Grand Comoro and Moheli Ash column of 5000 metres: Boboni, M'youni and Moroni		



TABLE 9 (continued)

Chronology of Damaging Events		COMORO ISLANDS (continued 4)		
Date	Event	Effects	Deaths	Cost estimates of damage
1948 April 22-June 16	Volcanic eruption	Karthala Grand Comoro north shaft within Caldera		
1950 December 22/23	Cyclone	Anjouan and Moheli 585 deaths 70,000 injured 40,000 without shelter 2 million francs material damage to private and public buildings, roads, and factories 850,000 coconut trees felled 1½ million vanilla plants destroyed Other plantations severely damaged (sisal; ylang-ylang etc) Loss of more than half of all budgetary resources)		
1951	Storm	500 affected		
1952 February	Volcanic eruption	Karthala Grand Comoro		
1953	Earthquake	Grande Comoro		
1965 July	Volcanic eruption	Karthala Grand Comoro		
1967 April	Earthquake			
1970 July and September	Earthquake			
1972 September 8- October 5	Volcanic eruption	Karthala Grand Comoro north end of summit crater		

TABLE 9 (continued)

Chronology of Damaging Events		COMORO ISLANDS (continued 5)		
Date	Event	Effects	Deaths	Cost estimates of damage
1975	Food shortage	Caused by suspension of economic activity		
1975-76	Civil strife	Following food deficits		
1977 April 5-10	Volcanic eruption	Karthala Grand Comoro SW flank 5,000 homeless 20,000 affected		
1977	Food shortage			
1977	Repatriates	20,000 returnees from Madagascar		
1980 November	Cyclone			
1981	Drought	Ngazidja Is		
1982	Drought	G. Comore Anjouan Diminished crops Deaths to livestock		

TABLE 9 (continued)

Chronology of Damaging Events			MALDIVES	
Date	Event	Effects	Deaths	Cost estimates of damage
1704	Epidemic	Smallpox		
1721	Fires	Disastrous series during 17 years previous		
1729/30	Earthquake	"Two destructive earthquakes occurred in the East; August 1729 and March 1730"  (Also passing reference to three other earthquakes 1730)		
1759	Fire	All bazaars and many buildings destroyed in Male		
1773	Fire	All houses burnt down in Himiti Island (Nilandre Atoll)		
1815	Earthquake	"Felt from Tiladummati Atoll to Fivaku on Miladummadulu Atoll . . . caused houses to fall"		
1818-19	Famine	". . . which reduced people even to eating grass"		
1819	Storm	"Great storm . . . twelve buildings fell in the Palace enclosure"		
1820	Tornado	14 islands of Tiladummati Atoll and 12 islands of Miladummadulu Atoll, plus 3 other islands devastated, many fishing boats wrecked, and a large number of people drowned		
1887 February 3	Fire	Male; ". . . all merchant shops and some of the Maldivians' houses and other shops burnt down, also shops and houses belonging to the Government"		
1922 October-November	Epidemic	A type of influenza; "Maldivian gift fever"  300 deaths in Male "noble and plebian alike"		

TABLE 9 (continued)

Chronology of Damaging Events			MALDIVES (continued - 2)	
Date	Event	Effects	Deaths	Cost estimates of damage
1965	Epidemic	gastro-enteritis		
1966	Epidemic	typhoid		
1968	Epidemic	diarrhoea		
1978-79	Epidemic	Cholera 11,258 people affected 7.5% of population Over 7,200 cases reported on 50 islands	219 (in 1978)	

TABLE 9 (continued)

Chronology of Damaging Events			WESTERN SAMOA	
Date	Event	Effects	Deaths	Cost estimates of damage
1690 (?) 1750) 1760) approx	Volcanic eruption	Surrounded village of Aopo, and overwhelmed the coast from Sasina to Asau.(Mauga Afi)		
1830	Epidemic Influenza	First occurrence; returned almost every year for a long period		
1830 approx	Inter-tribal warfare	Continued for several years		
1831 December	Hurricane	Upolu and Savai'i Earthquake at the same time (Savai'i) ?		
1836	Gale	"Some damage" at Apia		
1839	Epidemic	Influenza "over all the islands of the group" "The preliminary symptoms are very similar to what they are in England, but the secondary effects are far worse"		
1840 December	Hurricane	Upolu and Tutuila		
1842 15 December	Hurricane	Apia and Sapapalii		
1846 March	Cyclone	3 ships aground in Apia Harbour		
1847	Epidemic Influenza	Especially severe		
1848	Inter-tribal warfare	"Half the island of Upolo desolated by war"		

TABLE 9 (continued)

Chronology of Damaging Events			WESTERN SAMOA (continued - 2)	
Date	Event	Effects	Deaths	Cost estimates of damage
1848 26-28 December	Cyclone			
1848-49	Epidemic	Influenza Whooping cough - "fatal among children and some adults" Savai'i	150	
1850 April	Hurricane	Upolu Eastern part of the island ". . . a great scarcity of food, and diarrhoea and dysentery are very common among the people" "The oldest Samoan living never saw a storm anything like it before" "All the island (Upolu) having suffered more or less by it" All ships in harbour foundered. Upolu devastated as if by fire (Savai'i hardly suffered)		
1851	Epidemic	Mumps		
1854	Hurricane	Eight European vessels wrecked, and famine amongst the natives		
1856 26 April	Storm	"Desolating . . . not a chapel is left in all Aleipata, and only here and there a small dwelling house . . . escaped . . . great rain . . . in torrents"		
1869-1873	Inter-tribal warfare			
1877	Inter-tribal warfare			

TABLE 9 (continued)

Chronology of Damaging Events		WESTERN SAMOA (continued - 3)		
Date	Event	Effects	Deaths	Cost estimates of damage
1883 March	Hurricane	Disastrous. Seven or eight ships in Apia harbour blown ashore and wrecked (earthquake tidal wave at the same time - or sea surge?) ("possibility of tsunami can't be ruled out" - a slight quake and a strong hurricane, two big waves). small loss of life		
1889 March 16	Hurricane (60 km/hr winds)	"The Great Hurricane" "Hurricane and great losses in Apia harbour, due in part to failure of vessels to put to sea earlier through tenseness of political situation" 6 warships and 12 merchant ships destroyed with total loss of 247 crew Severe damage to Apia and district		
1893	Epidemic	Measles		
1902 October 30- November 22	Volcanic eruption	Mauga Mu Lava flow over an area of 150 sq km		
1905-11 August 4, 1905 September 10, 1911	Volcanic eruption	Matavanu Savai'i New crater inland of Saleaula and ash Continuous lava flow to the sea Nearly whole of Lealatele district overwhelmed Considerable section of Saleaula destroyed Evacuation necessary (no figures given) Some people moved to their adjacent lands; others were established by the Government at Salamanu and Aana South on Upolu Plantation and agricultural damage		
1905-11	Tsunami	Savai'i (N coast) Eruption of Matavanu volcano. Lava flow reached coast		

TABLE 9 (continued)

Chronology of Damaging Events			WESTERN SAMOA (continued - 4)	
Date	Event	Effects	Deaths	Cost estimates of damage
1917 June	Earthquake R. 8.3	Tsunami and fires in Apia Considerable damage to buildings and contents - Apia Saluafata: landslides, trees uprooted Lotofaga: tidal wave flooded houses and plantations. Sea wall demolished Tutuila: church shaken down		
1918	Epidemic	Influenza New Zealand Report: Population 1918 September 38302 (before epidemic) Population 1918 December 30738 (after epidemic)  7000 more deaths than registered births; one fifth of the total population lost	Between 6,000 and 7,542	
1918 September	Tsunami 0.2 metres	Much damage		
1923 March	Cyclone 50 km	Worst hurricane for 25 years, 48 hours' duration General damage to roads and public works and considerably reduced copra output		
1925 June-September	Drought	6.49" rain during the period (but May had been unusually wet with 23.58")		
1926 January 1	Intense storm	Winds exceeded 75 mph at Apia; 300 miles in diameter, moved at 15 mph Damage to vegetation increased by dryness during February Tug blown onto reef Coastal trading vessel beached Damage to plantations Copra production reduced by 2608 tons (17% of 1925/26 production)	3	£1,000 property damage



TABLE 9 (continued)

Chronology of Damaging Events			WESTERN SAMOA (continued - 5)	
Date	Event	Effects	Deaths	Cost estimates of damage
1926 March 31	Intense storm 60 mph	Not so violent as January hurricane		
1927 July 3	Earthquake	Seismograph put out of action No other reports of damage		
1929 January 17-18	Cyclone wind gusts to 48 mph	Damage to plantations "Small" financial loss - mainly to bananas		
1931 January	Cyclonic storm	Flooding in Apia		
1932 February 6	Storms	"As a result of cyclone over Tonga"		
1936 January	Hurricane	Aleipata Strong winds in Apia Considerable damage, all but strongest houses were demolished		
1939 January	Storm 65 mph	Apia - 15.95 inches rain in one day 52 inches rain in 48 hours (mountain rainfall stn)		
1939 December	Gale	Upolu devastated		
1941 March	Violent storm	Havoc in unprotected plantations of S Upolu		
1960 January and March	Storms	"Banana shipments suffered heavily . . . neither imports nor Government Revenue were unduly affected"		

TABLE 9 (continued)

Chronology of Damaging Events			WESTERN SAMOA (continued - 6)	
Date	Event	Effects	Deaths	Cost estimates of damage
1960 May	Tsunami 4.9 m max	Some damage at Apia		
1964	Windstorm		250	
1966 January	Tropical storm 60 km (69 mph) (gusts of 82 km 94 mph)	WFP emergency food aid operations 2135 tonnes food supplies Plus £20,000 from Samoan government and voluntary donations Plus £26,000 from "other" mostly overseas government donations Copra Board estimated 40% loss of production, timing uncertain		
1968 February	Severe tropical storm 58 km 78 km gusts	Apia "Confusion; breakdown of communication and lack of transport did not allow . . . warnings to be dis- seminated until after many hours had elapsed" "Some determined effort must be made to improve communications and transport" <u>Bananas</u> 70% of all banana producing stems. Cessation of revenue from banana production to be considered. Corresponding drop in overseas earnings. "Rapid" recovery expected however. Planters in meantime unable to acquire loans or to provide adequate food supplies for themselves. Moratorium - loan repayments proposed. <u>Cocoa</u> 25%-35% reduction below anticipated crop for 1968. 60% of new cuttings destroyed - setback to cocoa project. <u>Coconut</u> 1969 production expected to be as low or lower than 1967 following 1966 hurricane. Some agricultural building damage and some flooding. Buildings:		Government property: \$ 171,300 20,560 <hr/> \$ 191,860

TABLE 9 (continued)

Chronology of Damaging Events			WESTERN SAMOA (continued - 7)	
Date	Event	Effects	Deaths	Cost estimates of damage
1972 December	Tropical storm 46 km wind speeds	"Elenore" 475.7 mm rainfall in 6 days		
1974	Drought	Food shortage		
1975 January 26	Hurricane "Val" windspeeds at Apia: 52 knots	Considerable amounts of rainfall Flooding in the Apia area caused by new springs Many springs formed along the northwest coast of Upolu		
1977 April-September	Drought	Northern and northwestern parts of Savai'i and Upolu islands Reduced agricultural production estimated at "several tens of thousands of tala" (Tala 0.787 = US \$ 1.00 : 1977)		
1981 September 1	Tsunami	21 cm "slight damage on coast"		

TABLE 14

Adjustment of Contemporary Damage Assessments to Current US Dollar Values

	1972=100	1979=100		1972=100	1979=100
1979	166	100	1915	14½	8½
1978	151	91	1910	13½	8
1977	142	86	1905	12	7
1976	134	81	1900	10½	6½
1975	127	76	1895	9½	5½
1974	115	70	1890	10½	6½
1973	106	64	1885	10½	6½
1972	100	60	1880	10	6
1970	91	55	1875	11½	7
1965	74	44	1870	12	7
1960	69	42	1865	12	8
1955	61	37	1862	8	5
1950	54	33	1860	7½	4½
1946	44	27	1855	8	5
1938	27	16	1850	7½	4½
1933	25	15	1840	7½	4½
1929	33	20	1830	6	3½
1925	28½	17	1825	6½	4
1920	34	20	1820	7	4
1919	25	16	1800	6½	4
1917	20	12	1790	5	3

Based on implicit price deflator for 1929 to present as given on page 42 of 1979 INFORMATION PLEASE ALMANAC, and building materials and building trades wage information for 1790 through 1929 as given in Historical Statistics of the United States, Colonial Times to 1957, US Department of Commerce.

Source: Ganse and Nelson (1979).

Figure 1

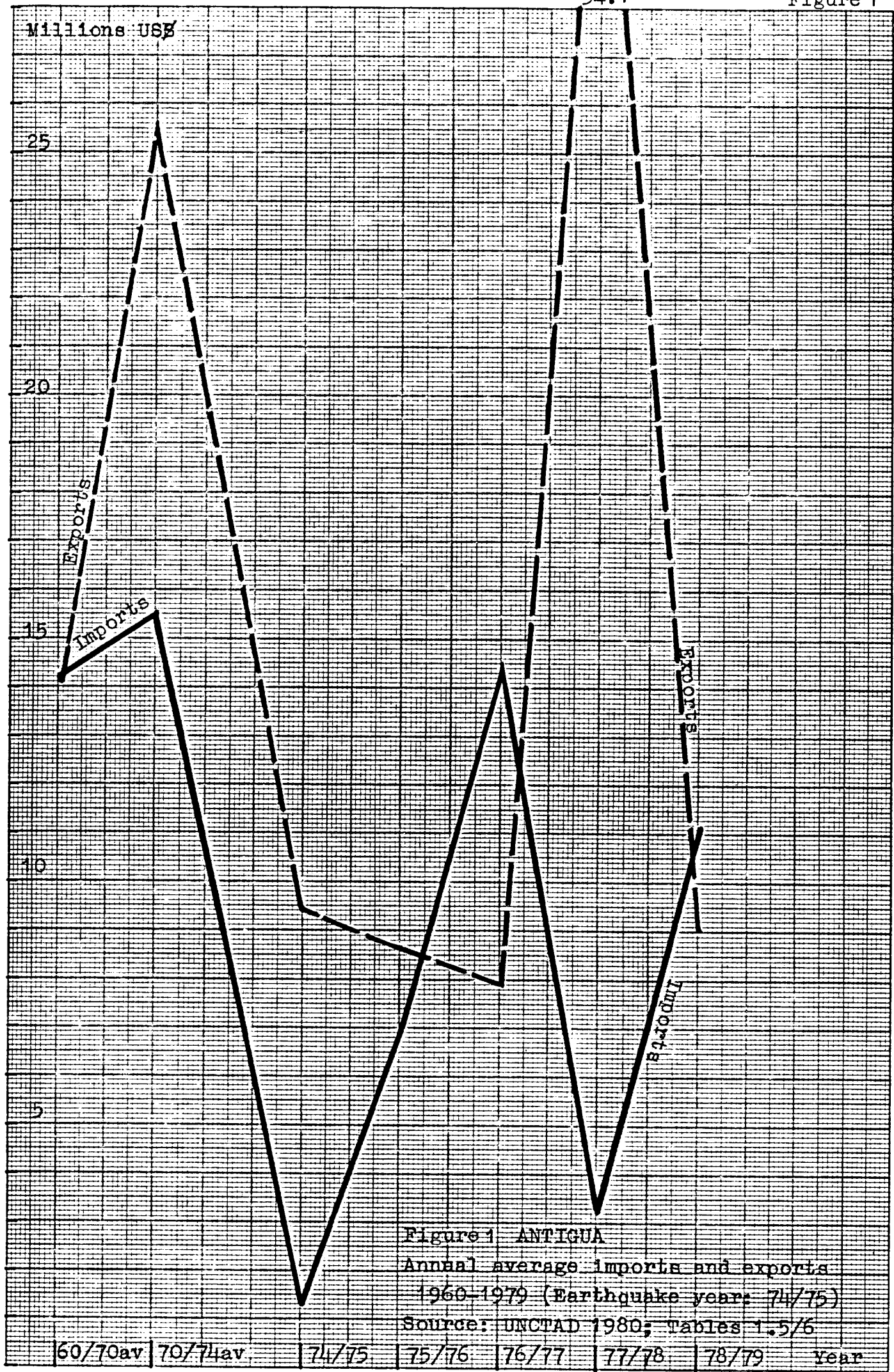


Figure 1 ANTIGUA  
 Annual average imports and exports  
 1960-1979 (Earthquake year: 74/75)  
 Source: UNCTAD 1980; Tables 1.5/6

60/70av	70/74av	74/75	75/76	76/77	77/78	78/79	Year
---------	---------	-------	-------	-------	-------	-------	------

Figure 2 ANTIGUA

Import Structure: percentage shares of main categories 1970-1975

(Earthquake year: 74/75)

Source: UNCTAD (Supplement) 1980; Table 4.2

(NB: e and c x 10)

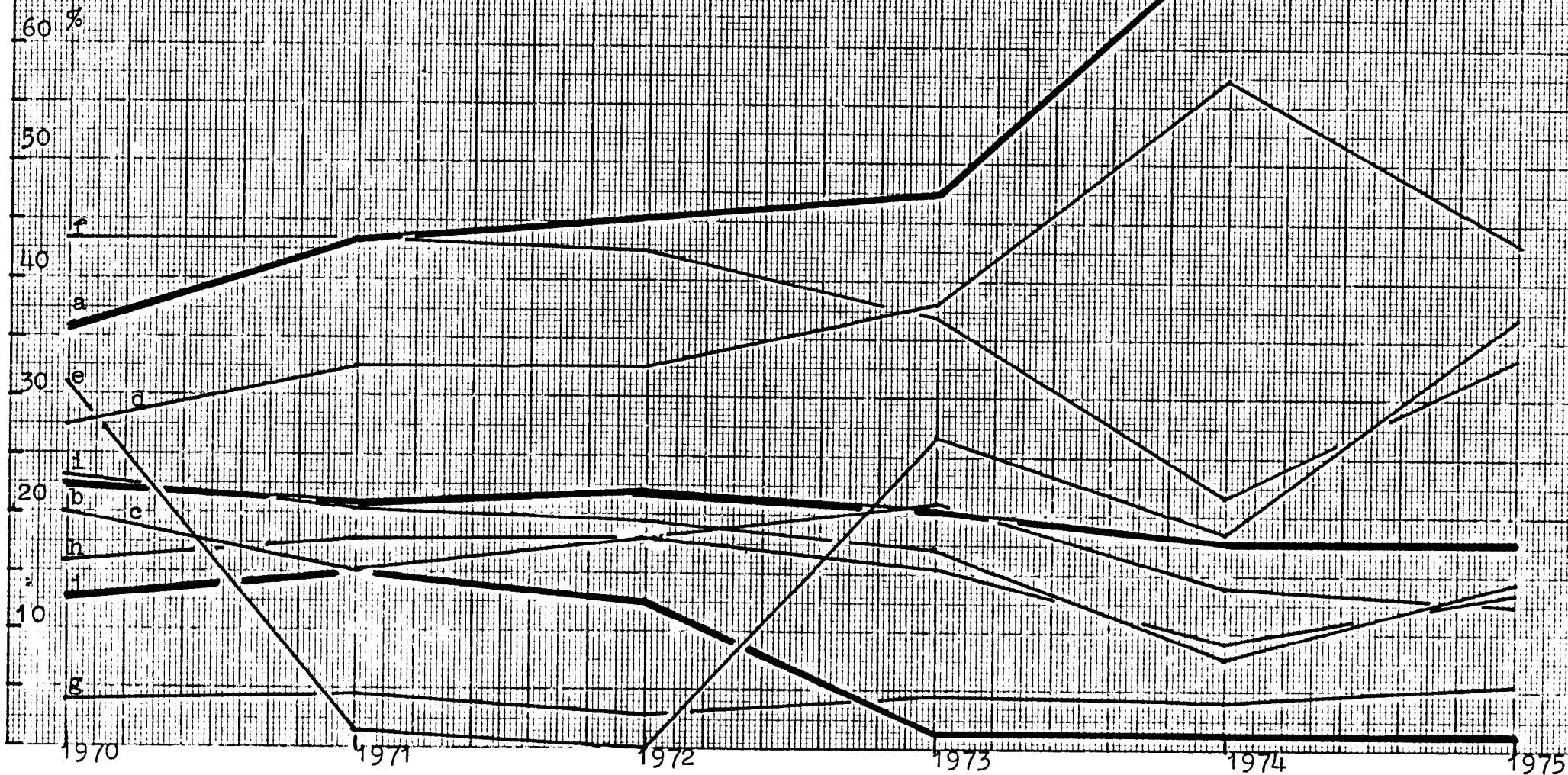


Figure 2

Figures 3 and 4

KEY

- a - Total value (Millions \$US)
- b - All food items
- c - Agricultural raw materials
- d - Combustible fuels
- e - Ores and metals
- f - Manufactured goods
- g - Chemical products
- h - Other manufactured goods
- i - Machines and equipment
- j - Unallocated



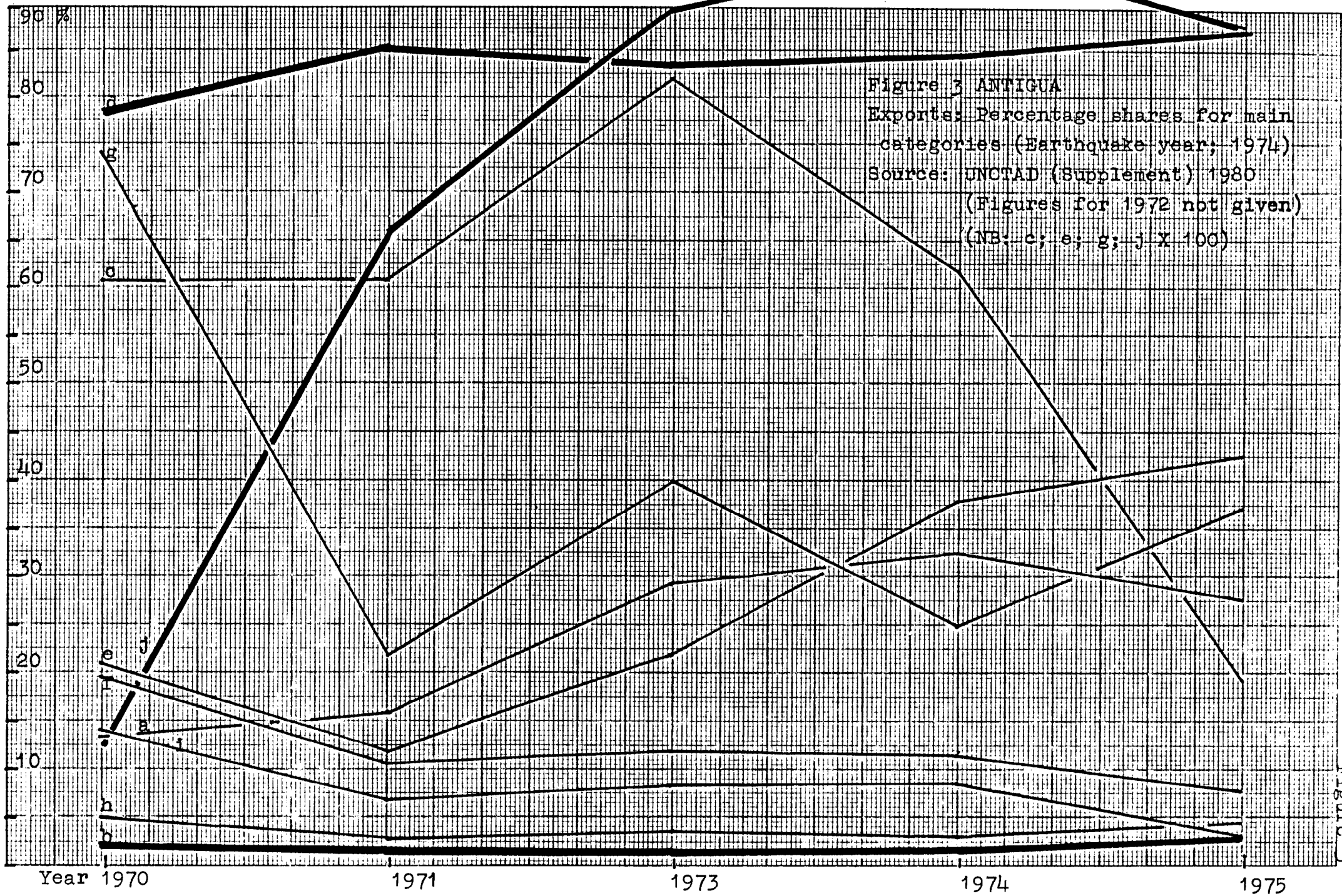


Figure 3



Figure 4

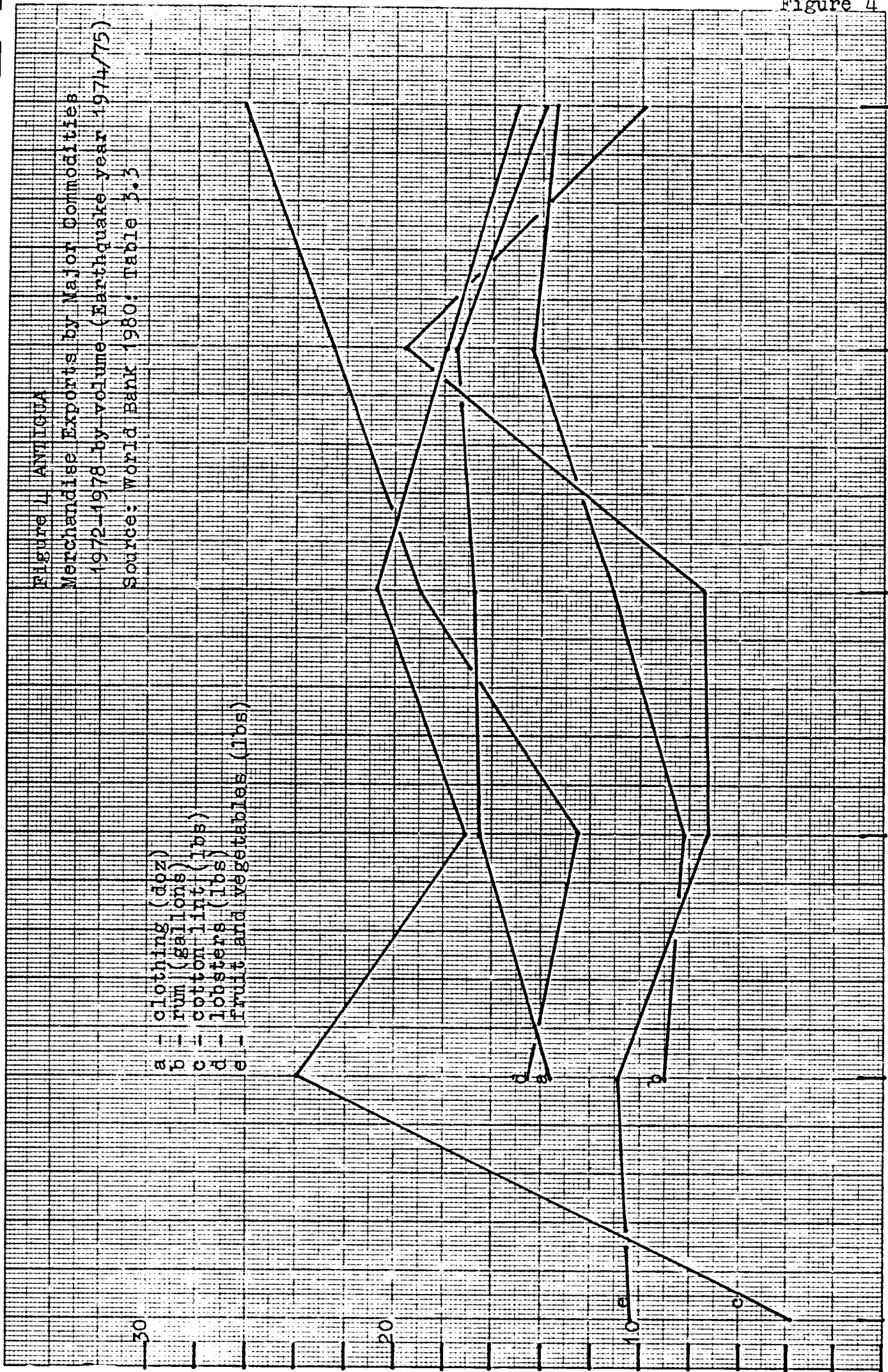
Figure 1 ANTIGUA

Merchandise Exports by Major Commodities

1972-1978 by volume (Earthquake year 1974/75)

Source: World Bank 1980: Table B.5

- a - clothing (doz)
- b - rum (gallons)
- c - cotton lint (lbs)
- d - lobsters (lbs)
- e - fruit and vegetables (lbs)



Year 1972

1973

1974

1975

1976

1977

Figure 5 ANTIGUA  
The Court House, St. John's 1823  
Source: Oliver (1894)

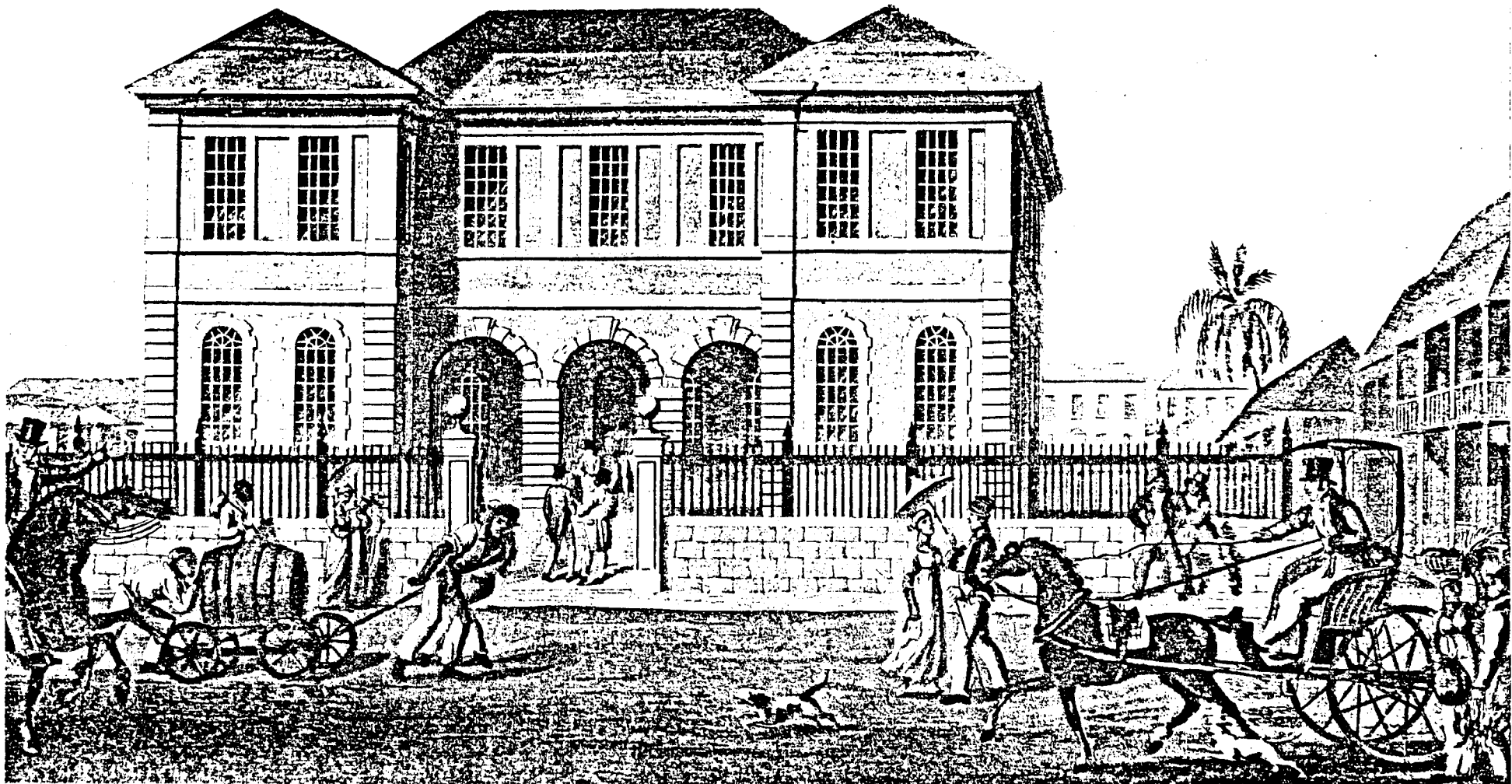


Figure 5

UNITED NATIONS OFFICE OF THE DISASTER RELIEF CO-ORDINATOR

UNDRO / UNCTAD

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

The Economic and Social Effects of Natural Disasters on  
the Least Developed and Developing Island Countries:

With special reference to

Antigua and Barbuda

Republic of Cape Verde

Comoros Federal Islamic Republic (and Mayotte)

Republic of the Maldives

Western Samoa

A REPORT FOR UNCTAD VI; BELGRADE 1983

**PART TWO**

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ANNEX 1Rainfall, Drought and Sugar Production in Antigua

During the period of colonial administration in Antigua, by far the most important crop was sugar cane. Its success or failure in any year was the indicator of success or failure of the Colony. Although Colonial Reports available for the period make reference in varying degrees to living conditions and other social factors, there is a continual over-riding concern for income from sugar production. The success of a Governor's term of office was clearly dependant on revenue.

Up to about 1900 international fluctuations in the price of sugar itself, had much more serious impact than any other factor. Low prices often confounded high production, but in 1895 when very low prices accompanied very low production it seemed that the sugar industry was doomed to extinction. Had 1896 not risen to average production, that is probably what would have happened.

Before 1898 cane disease was the prevailing factor on production. It seems to have taken many years of experience to distinguish the effects of disease and drought. Successful experiment with resistant cane brought disease under control by 1898. Thereafter the relationship between rainfall and sugar production was made direct, though still masked in small degree by changes in agricultural methods, variations in acreage, new varieties of cane, and factory efficiency. Though the years immediately following 1900 were below average, due entirely to deficient rainfall and the damage caused by hurricane in 1899, the construction and equipping of centralised sugar factories and the introduction of mechanised ploughing and transportation, indicated a confidence in the future of the industry and, as it turned out, a period of increased annual average production.

The relationship between rainfall and sugar production, known to be so close during the years of the twentieth century, was examined in a retrospective study of the 25 years 1930-54. Years of rainfall values are grouped and set against annual sugar production of the same years.

<u>Rainfall of preceding year</u>	<u>Number of years</u>	<u>Tons of sugar: yearly average</u>
Below 30 inches	1	4,442
30-40 inches	4	15,626
40-50 inches	7	19,041
50-60 inches	9	20,010
60-70 inches	1	27,713
Above 70 inches	3	28,657
<hr/>		
<u>av.</u> 50.88 inches	25	<u>av.</u> 19,761

The average rainfall for the period of 76 years (1874-1949) was lower than that above, at 43.26 inches. Years of rainfall significantly below this average were 1874; 1875; 1882; 1890; 1905; 1910; 1912; 1920; 1921; 1922; 1923; 1925; 1928; 1930; 1939; 1947. In addition to these sixteen years of severely low rainfall, there were a further seventeen years with rainfall below average. As Antiguan rainfall was gathered from a number of measurement stations, it is likely that some local conditions were worse, and some better, than the national average.

Over the same 76 years (1874-1949) there are however, only fourteen years where drought has been a significant claim in the Colonial Records. It can be accepted therefore that drought conditions, when officially reported as such, were economically and socially serious in the national experience.

Drought in 1863-65 had an obvious impact on a mortality of 47.8 per 1,000 population. 5,222 deaths were recorded for the period, 14.4 per cent of the population.

The sugar crop of 1874 was the smallest since 1864, and the total value of all exports fell accordingly from £170,977 in 1873 to £106,705 in 1874.

Related years were:

	1871	1872	1873	1874
Imports (£)	175,740	200,577	169,156	146,758
Exports (£)	247,630	153,190	170,977	106,705

At the end of 1912 Antigua had "suffered from three successive years of drought, which caused considerable distress in country districts. . . . The drought culminated in an almost complete failure of (water) supply in St John's, and for some days an acute water famine prevailed".

The beneficial effect of hurricane, in bringing rainfall and ending a serious three years period of drought was apparent in 1924; "Hurricane brought damage of several thousand pounds but also brought relief in the form of welcome rains". Rainfall for the year was 41.57 inches, the heaviest on 27 August (preceding the hurricane of the 28/29th), and was almost ten inches above that of the preceding year.

#### References

Colonial Reports, Antigua: (1845-1938 and 1947-1954); Watts, F (1906); and Auchinleck (1956).

#### Measurement

One inch = 254 milimetres.

ANNEX 2

Hurricanes, hurricane relief and preparedness in Antigua

Although hurricanes on and near to Antigua have brought beneficial rain, and consequent sugar production benefits of employment and income at all levels, their immediate consequences have nevertheless occasionally been very serious.

The effects of hurricanes recorded before the Colonial Reports (earliest available Colonial Reports: for the year 1845) can be only surmised from very brief descriptions concerning shipping and damage to buildings from which overall effects on housing and crops have to be deduced. The most serious appear to have been in 1681; 1772; 1780; 1792; and 1804, although a total of 22 are recorded for the period of 183 years 1664-1846.

The hurricane of 1848, though of serious impact, receives scant mention in the Colonial Report for the year, still preoccupied with the aftermath of the 1843 earthquake.

The hurricane of 8 September 1899 caused damage to houses, but no loss of life, though "much damage to the huts of the labouring classes, who consequently suffered from exposure and distress".

The hurricane of 28/29 August 1924, which ended three years of serious drought, caused "moderate" damage. A relief fund established by the Lord Mayor of London reached £4,000 which was "devoted to the relief of peasants and labourers and the reconstruction of their dwellings" in Nevis, Montserrat, Tortula, St Kitts Nevis, as well as Antigua whose share was £1,356, 5 shillings and 9 pence. Of this amount, a sum of £500 was placed on deposit "as the nucleus of a fund to meet further similar disasters".

Contributions of clothing and food were sent from other West Indian Colonies and England, the French West Indian Colonies, the Government of the Virgin Islands; and the USA. The cost of reconstructing and repairing Government property was met partly from a £10,000 grant from Parliament (London) and from Surplus Funds (the total cost is not given). Total aggregate revenue for the year 1924/25 was £78,983, 8 shillings and 9 pence, and total national expenditure was £85,244, 13 shillings and 9 pence - a rare excess of expenditure over revenue.

Following the hurricane of 1928 a special Commission visited Antigua to assess and report upon hurricane damage. Under "General Observations and Recommendations" their Report stated:

"1. Peasant Houses. We have in all cases taken into consideration the age and condition of the houses at the time of the hurricane, and the ability or otherwise of the owner to meet the total or partial cost of repairs or rebuilding. The allocation of any hurricane funds for such destitute owners can in our opinion be left in the hands of the local authorities".

"2. Damage to Government Buildings, Services, Telephone System, Press etc. . . . (we) have differentiated between actual damage caused by hurricane effects and damage which may be attributed to normal wear and tear or natural causes . . . have endeavoured . . . to apportion the estimated cost of renovation or renewals between Hurricane Relief Funds and the funds of the Presidency concerned . . . " (1)

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(1) At this time (1928) Antigua was the principal seat of Government in the Leeward Islands Colony, which comprised the Presidencies of Montserrat, Dominica, Nevis, St Kitts, and Antigua.



"3. In view of the well-known periodicity of hurricanes in these islands we would recommend that some general form be drawn up for universal use in each Presidency indicating the nature of damage, and its assessed value and the quantity of nails, lumber, boards, and shingles, if any, issued as relief or estimated as required for reconstruction".

Damage was assessed in categories: A. for private houses (exclusive of estate property); B. for private houses (requiring some possible assistance); C. for private houses (poor and destitute persons) and D. for Government property.

Total damage assessments for Category C. came to £2,900; for Category D. to £2,527, a sum £355 less than the local estimate.

The Commission recommended special consideration for rebuilding the poor house at a cost of £2,500 (extra to come from Presidential Funds) "as the Poor House is 28 years old having been hastily built to house Boer War prisoners, but never used for the purpose".

In 1927 the principal author of the 1928 Report had amended (a then existing?) hurricane code which focused principally on domestic precautions concerning shuttering for the prevailing wind, and warning symptoms of a falling barometer. "Mutual telegrams (were to be) exchanged between islands of the Leeward Island Colony by the West Indian and Panama Telegraph Company". A red flag with a square black centre would be hoisted as storm warning signal at Rat Island signal station. If a hurricane was to be definitely expected, (or at night), "two detonating rockets will be fired in rapid succession from the hill near the Botanic Station".

The 1928 Report does not comment on the efficacy of these measures of hurricane preparedness.

In 1950 there were two serious hurricanes in addition to two serious fires in St John's. The first, on 21 August brought winds of up to 100 mph and severe destruction in rural areas, deaths of livestock, and extensive local damage. 488 houses were destroyed and 636 houses were damaged - "many being rendered uninhabitable". The second hurricane, ten days later on 31 August, brought 165 mph winds and greater damage in the capital St John's than in rural areas. There was considerable damage to Government, private, and commercial dwellings and "leaving out an account of large houses, which were either insured by their owners or whose owners could afford to repair them unaided, 1348 small houses were completely destroyed and 2343 damaged in both hurricanes". 6477 people were made homeless in Antigua. In Barbuda, an additional 84 houses were destroyed, 109 damaged, and 320 people made homeless. The total of 6,792 homeless were 15% of the total population of the Colony.

His Majesty's Government (London) made a grant of £50,000 for relief, and British West Indian Government made gifts of clothing, food and medical supplies. Jamaica gave £5000. American and French territories also gave relief supplies. The homeless sheltered for many weeks in churches, schools and halls, and by the end of 1950 there were plans for a relief housing scheme.

#### References

Colonial Reports, Antigua: (1845-1938 and 1947-1954); Garriott (1900); Collens (1927) and Collens (1928).

#### Values

20 shillings = £1.00 ; 12 pence = 1 shilling.

### ANNEX 3

#### The Antigua Earthquake of 1843

##### The Earthquake

Earth tremors had been a common occurrence during the eighteenth (and early nineteenth?) century. On 16 May 1778 ". . . the earth shook violently three or four times . . . many of the whites as well as negroes were much alarmed and ran out into the street".

But "At 20 minutes before 11 o'clock on Wednesday morning the 8 February (1843) Antigua was visited by a dreadful earthquake . . . there arose clouds of dust from every part of the town, the crash of falling buildings was heard, blended with the piercing shrieks of the people and accompanied with that horrid heaving and trembling of the earth beneath our feet. . . . Almost every piece of masonry in St John's is in ruins".

"The stone dwelling houses and stores were crashed and crushed . . . the wooden buildings waved to and fro. . . . The damage done is immense. In the capital (St John's), some of the finest stores are a mess of ruins . . . and in many parts the earth is opened, forming deep fissures".

##### Damage and effects

In St John's, the courthouse (Figure 5), police-office, arsenal, new jail, and barracks were "fearfully dilapidated. The Register Office, treasurer's office, Governor's Secretary's Office (just erected) and Colonial Bank were all much injured". All the stone buildings on Barbuda (except one school-house, were destroyed.

At the dock-yard of English Harbour the "wharves all rocked and rent; in some places they have sunk down to the margin of the sea, in others they are literally heaved up. . . ."

Five stores built since the fire of 1841, and seven others, three taverns (one three-storey in brick); a brass and iron foundry ("the only one of its kind in the West Indies"), a bakery, private dwelling houses ("that is those built of stone or brick"), "almost every kitchen and oven on the island" and cisterns were destroyed or very severely damaged.

All the 172 sugar mills and estates received damage, 35 were entirely destroyed, 82 irreparably damaged; 52 partially damaged; and "works, dwelling houses, labourers' cottages attached to those mills shared their fate in equal proportions".

Numerous "free-villages" built by their own labour by ex-slaves (slavery was abolished in 1834) were destroyed. "Many of the estates that have fallen prey to the earthquake have been established since emancipation, by men who have exerted themselves to the utmost . . . and how they will be able to rebuild them it is impossible to say. Indeed it will take many years to restore Antigua to its former position".

St John's Cathedral was badly damaged and declared "unfit for public service" and several parish churches were destroyed or badly damaged, as were eight chapels or mission houses, one "not much, being a wooden structure"(1). The largest, the Ebenezer Chapel requiring £3,000 to be rebuilt (according to an estimate from "Her Majesty's Civil Engineer").

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(1) St John's had been destroyed by fire in 1841, and it seems that much re-building had been completed in "fire-proof" masonry. It is a source of contemporary comment that masonry buildings suffered most damage in the earthquake of 1843. Many houses were left with their outer masonry walls collapsed, and the inner walls supporting the roof; wooden houses remained standing.

"Nearly all our (Methodist) members in both town and country, are sufferers . . . some of them to an almost ruinous extent. Even the labourers, of whom a large proportion had invested the savings of eight years (since emancipation) of toil in the dwellings they had built have been reduced to such a state of destitution by the destruction of their tenements as to be literally homeless and penniless. . . ."

There were various estimates of deaths, from 12-40, and total damage to the island including the loss of the sugar crop, was placed at £2 million.

#### Rehabilitation

An Act was immediately passed requiring "inhabitants to pull down all injured buildings, in order, if possible to guard against any further accidents. In case of neglect, a committee is appointed to do so, and £100 sterling granted to defray expenses, to be refunded by each individual, either in money or by sale of a part of the broken fragments".

A grant of £500 was placed at the disposal of the committee to support the Cathedral roof, the restoration of some of the parish churches being commenced in 1845, the repair of those more seriously damaged having been completed with Government funds by that time. A new Cathedral was finally completed in 1846 at a cost to Government expenditure of £35,000, "a heavy drain on the public resources; and the effects of this extravagance will, I fear, be sensibly felt for some time to come." (Colonial Report for 1847) Methodists received nothing from public funds ". . . all is bustle and activity in the Establishment. The Legislative grants large sums of money for repair rebuild . . . church after church rises from its ruins. . . ."

Public Accounts

The first Colonial Report available after the year of the earthquake 1843, that for 1845, was pleased to record an excess of revenue over "a very liberal expenditure" and a balance in hand at the end of 1845 of £13,717, 11 shillings and 10 pence. In spite of increased expenditure for relief and reconstruction, the increase in imported materials necessary for reconstruction had produced duty revenue for government funds. "The increase in the actual receipts has arisen, for the most part, from the augmented consumption of dutyable goods, and particularly the productions of the United States; although the declared value of imports generally was less in 1845 than the preceding year".

However, "the nett excess of expenditure amounts to £8,232 sterling, which has been caused, in great measures, by the unavoidable and heavy expense incurred in rebuilding the Cathedral and restoring other public buildings. . . ."

(2)

There was an accompanying decrease in the value of exports for 1845 of £107,530 indicating "a considerable failure in the produce of island staples".

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(2) There is no record of how the decision was taken to rebuild the Cathedral, and from public funds; but the cost of rebuilding was evidently a thorn in the side of HM Governor!

		1844	1845	Deficit
Sugar:	Hogsheads (3)	15,357	11,809	3,548
	Tierces (3)	1,562	1,012	550
	Barrels (3)	4,512	2,745	1,767
Molasses:	Puncheons (3)	9,020	8,780	240
	Hogsheads	127	-	127
Arrow-root	Boxes	665	407	258
	Barrels	104	-	104

The year 1846 saw a diminution in both imports and exports as compared with 1845. "Falling off of imports appears to be chiefly attributable to a diminished quantity of supplies being introduced in the past year from the United States; arising partly perhaps from the more contracted demand for them than in previous years, when an unusual quantity of supplies of various kinds was required for the restoration of damages occasioned by the earthquake of 1843, and partly perhaps from the very short crop of 1846 causing money to be less freely circulated".

The Colonial Report for 1847 is unusual in its inclusion of a detailed statement of accounts comparing 1847 with 1846. Significant increases in expenditure are shown for highways, purchase of land, and "cost of iron tanks for Court-house" (rebuilding). There are decreases for 1847 shown, amongst other items, for forts and parishes, indicating perhaps higher expenditure in 1845 more closely following the earthquake. The largest item

- 
- (3) A hogshead was 15 hundredweight (average)  
 Three tierces = 2 hogsheads  
 1 hogshead = 8 barrels  
 A puncheon was a large cask "holding from 72 to 120 gallons"  
 20 cwt = 1 ton (virtually the same unit as a metric tonne)

of decrease (£1,940, 16 shillings and a half penny) is in fact against the item for "Expenses from earthquake" with an aggregate expenditure (1846/47) of £9,791. Revenue accounts showed increases on almost all duties, and licences, the marked decrease in tariff duties. "Expenses of Earthquake" for 1847/48 were £2,060, and that year showed an even more marked falling off of post earthquake reconstruction expenditure.

#### Public Loan

Parliament in London sanctioned an advance in 1844 to Antigua "towards remedying the destructive consequences of the earthquake in the preceding year". At the end of 1854, the consequent public debt was £65,000 and "the reductions which have been lately conceded by HM Government by the amount of the annual instalments of repayment of the principal, from one tenth, to one twentieth, and of the interest from a rate of 5 to one of  $3\frac{1}{4}$  per centum, have rendered this obligation a comparatively light and easily manageable one". (Governor MacKintosh).

These concessions had been hard fought for (reading between the lines of Colonial Reports) and the obligation eased only temporarily. Governor Hamilton, in his Report for 1855 wrote "The heaviest liability under which the Colony suffers is the loan from Her Majesty's Government on the occasion of the calamitous earthquake of 1843. I do not now allude to the bulk of the amount lent, which was appropriated to the relief of the necessities of the individual sufferers, but to that portion of it which was retained for the public service, and was expended in the repairs of public buildings . . . the strain of this engagement is only now beginning to be felt". The advance was made available in the form of loans by the Antiguan administration to borrowers who were due to repay by instalments to coincide with Antigua's ten yearly repayments to HM Treasury in London. Had the petition to HM Government been for the remission of the portion which must be raised by



taxation on a community only just recovering from the struggle of competition between free-labour and slave-grown sugar, their proceedings would at least have met with sympathy, even if they had not met with concurrence. . . ."

In 1860 "the debt to the Government has been reduced to £14,857 yet, as no separate provision has been made for the liquidation of any part of it, and as the ordinary income of the Colony was inadequate for that purpose, the means by which it has been reduced have been obtained by local loans, indicated by the debt due to the Savings Bank and issue of Treasury Notes. By the subsisting arrangement the debt to the Government is to be reduced in 1865 to £10,000 by the payment of annual instalments; and such £10,000 are being paid in moities in the years 1866 and 1867".

The earthquake loan had disappeared from Colonial Reports only at 1868. In 1867 construction commenced of a waterworks which continued for three years at a cost of £30,000, and a capacity of 500,000 gallons. Attention to drought had to wait until the burden of the earthquake loan had disappeared.

#### References

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Luffman (1789)  
Woodcock (1843)  
Robson (1964)

ANNEX 4The Antigua and Barbuda Earthquake of 1974

There were no significant foreshocks for the earthquake of magnitude Richter 6.7 at 05.51 hrs on 8 October 1974. That there were no deaths incurred is attributed to the early hour of the event; when few people would have been about and places of work, centres of congregation and commerce, and public buildings would have been unoccupied.

Severe damage was inflicted upon Government buildings, the port, and infra-structural services of roads, electricity and telephones, and water supply. Government buildings severely damaged and rendered uninhabitable were Parliament, Judiciary, Treasury, Central Registry, two Government Ministries, the Secretariat of the East Caribbean Common Market, the Public Health Service Complex, the Library, Printery and Prison. The Anglican Cathedral, rebuilt after the 1843 earthquake, received some significant damage, the Prison was built in 1735 and severely damaged in 1843. The list of Government buildings damaged in 1974 is very similar to those damaged in 1843, and the reasons much the same, all being of unreinforced masonry or inadequately constructed reinforced concrete frame buildings. Half of the total accommodation being utilised for Government operations was rendered unusable.

The authorities were quick to make emergency repairs to damaged water mains, and damage to the dams which reserved drinking water. Concern for failure of water supply systems in Antigua is historic, and endemic, due to the regularity of drought hazard (Annex 1).

Principal industrial damage was to the oil refinery, rupturing tanks and pipelines, causing a severe pollution hazard (and fire risk) and, as the island's largest employer, the laying off of up to one third of the workforce.

The private sector suffered severely and an immediate scarcity of bread resulted from the destruction and damage caused to bakeries. Lobster reefs of the fisheries sector were damaged by the earthquake with immediate commercial impact (Figure 4).

Three areas of concern were expressed for housing. First was the 40 homeless households; second, 800 habitable but damaged housing where there was no insurance coverage and family earnings too low to effect repair without assistance; third, damaged housing with insurance cover inadequate to compensate the full cost of repairs. Housing losses were sustained mainly in the rural areas, and mostly to buildings of traditional construction inhabited by the lowest income earners.

One hundred and thirty two years of time passed since 1843 had caused the Anglican and Catholic Cathedrals, parish churches, and chapels to become eligible for reconstruction assistance as Places of Historical and Cultural Interest as essential elements in the history of the country. In a country heavily dependant on tourism, these are items as important as hotels themselves, which were less seriously damaged.

A Comparison of Contemporary Estimates of Reconstruction and Repair After Earthquakes of 1843 and 1974

Building	1843	Rec	1974	Rec	1843	1974
	£	Rep	(EC \$)	Rep	Cost @ 1974 value (£1=EC\$ 4.8) (x 7½) (1)	Cost
Cathedral	35,000	Rec	1,000,000	Rep	262,500	108,333
Ebernezer Chapel	3,000	Rec	50,000	Rep	22,500	10,416
Missions; St John's Total	2,500	Rep			18,750	
Missions; Island Total	4,100				30,750	
Parliament			400,000	Rep		83,333
Total cost	20-50,000		14,000,000		150,000- 375,000	2,916,666

(1) From Table "Adjustment Earthquake Damage to Current Dollar Values" included in Ganse, R A and Nelson, J B (1981). (Table 14)

Rec = reconstruction; Rep = Repair

References

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Colonial Reports (1845-1847)

Annex 3.

ANNEX 5Famine in the Cape Verde Islands: Effects, Responses and Causes

From 1774 to 1948 (175 years) there were seven periods of severe famine<sup>(1)</sup> in which a total of 141,000 people died. Those periods were

1774-76:	22,000 deaths
1831-33:	12,000 deaths
1863-66:	30,000 deaths
1902-04:	15,000 deaths
1920-22:	17,000 deaths
1940-43:	24,463 deaths
1946-48:	20,813 deaths

In addition to these especially severe periods of famine, since the beginning of population in the archipelago there have been more frequent periods of food shortage caused by drought, plagues of locusts, and tropical cyclones (Tables 8 & 9). In this context, volcanic eruption of Fogo has not been regarded as the cause of serious disasters (Annex 6 ). Famine has occasionally been exacerbated by the coincidence of more than one of these hazards.

Refer to Table 8 and Table 9 for comprehensive listing of famines and/or food shortage (under "famine"). During these more frequent food shortages numbers of deaths are either not given by social historians, or are uncorroborated, or available in respect of certain individual islands. In other words, the overall number of deaths is very likely to have been higher. Apart from a certain registration of deaths at the capital, Praia, there appears not

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(1) Corroborated by several references: see final page of this Annex.

to have been a national register of all deaths resulting from famine; comprehensive estimates of deaths have been made by social historians from population estimates and census ( Table 10 ).

A very high proportion of Cape Verdian population were slaves before abolition was finally achieved in 1854 and concluded in 1856 (with the exception of some continued clandestine trading). Slaves amounted for eighty-seven per cent of total population in 1582 declining to 9.5% in 1844. Slaves were subject to forced transshipment and emigration as well as becoming victims of famines. In a famine of 1609-11, slaves were "freed" when their owners could no longer feed them.

In addition to their staggering death toll, famines and food shortages have induced a higher than normal birth rate and higher than normal emigration combining in an erratic demographic evolution (Figure 6 ). A decrease in animal population, decreases in agricultural and commercial production and increases in imports have brought about an increasing deficit in the commercial balance of payments for the islands.

Emigration

Figure 7 combines population and emigration figures. There is an obvious correlation. Emigration followed famine fairly consistently up to around 1955, and famine has followed consistently low rainfall (Figure 8 ). The scale on Figure 7 for emigration is ten times the scale for population. Figures for deaths given above are contained in the fall of population which obviously takes account also of emigration, the greater figure. It is striking that after the 1960's, in the absence of severe famine, rapid increase of population has been paralleled by an equally significant increase in emigration. Cape Verdians have traditionally migrated to New York and Massachussets,

the Azores, Madeira, Portuguese West Africa, Sao Tome and Principe, Angola, Mozambique, and Chile, Uruguay and Brazil - and to the Antilles (including Antigua); as well as to Portugal.

#### Natality and Mortality

Higher than normal natality has been associated with periods of famine; as high as 39 per 1,000 population, considerably in excess of normal mortality of 22 per 1,000 population. Mortality in the famine of 1942 reached 207 per 1,000 population or 20% (1 person in 5). In 1940 mortality was 173 per 1,000 population. Figures of births and deaths taken from census for 1900-1969 are given in Table 10 .

Annual birth rates have normally fluctuated between 2.5 and 3.5%, being at their highest in relation to famine periods. There is, it is said, social acceptance of unmarried-mothers, children often being borne by the same father, of different mothers, occasionally on the same day. It would appear that social custom has adjusted to a psychological need to insure family or community survival against severe hazard. Where the cynical view might suggest that without famine, population would quickly become unbearably high in a small country, a realist view might be that could hazard demonstrably be reduced, the psychological need for a high birth rate might be ameliorated.

#### Animal population

Animals are unable to emigrate from islands, and become the first victims as other supplies of food for human population diminish. Census figures for domestic animals given in Table 11 and Figure 9 clearly show the decline of animal population, in relation to periods of famine and overall.

Many animals are said to be now extinct (cows, nanny-goats, mules, horses and cats), though goats and donkeys were more able to resist drought.

#### Agricultural and commercial exports

Emigration, as well as drought, has had a severe effect upon economic production, though remittances from expatriate Cape Verdians bring about an overall positive balance of payments. Famine itself brings about a labour shortage - before, after and during the incidence of death. Drought and emigration are associated with periods of low commercial exports, and like animals, some exports have expired. Table 12 shows erratic variation in exports and the overall decline of all but salt. In the seventeenth and eighteenth centuries (with a large slave-labour force), Cape Verde exported tobacco, bananas, cotton, dyestuffs, beef, dried fish and salt; to Guinea (Guinea Bissau); San Tome and Principe, French and British West Africa.

As a result of the decline of sugar production, sugar is now imported for domestic use and for the traditional manufacture of brandy and/or aqua-vitae (aguardente). Imports have increased from 3010 tonnes (11 356 contos<sup>(1)</sup>) in 1962, to 6057 tonnes (28 042 contos) in 1972.

During the decades of 1920 and 1930, Cape Verde was an exporter of maize, albeit in small quantities; in following years production only equalled increase in population; and commencing with the severe famine of 1941-43 imports began to increase. Imports of rice between 1942 and 1949 were 8 989 tonnes which increased to 28 689 by 1970-1973.

The overall deficit in the commercial balance of payments is shown in Table 13 . "The curve of commercial deficit 1969-1972 follows precisely the curve for emigration".

This national commercial deficit is for the greater part covered by remittances from expatriate Cape Verdians.

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(1) One Conto = 1,000 escudos.



Known periods of famine are coincident with erratic variations in exports, but though the overall decline in exports may be also attributable to famine there were at the same time certain changes taking place brought about by influences other than famine (Annex 7 ).

#### Official Response to, and relief assistance for famine

The Official Bulletin of the Cape Verde Islands for 1865 lists monthly figures of "Movements from the mortuary to the cemetery of the City of Praia, S. Thiago". The total for 1864 is 3,855 and that for 1865 is 1,123, far short of the estimated 30,000 for 1863-65. Were these selected figures a means of understating the crisis? Were slaves excluded from the figures? Was the catchment area of the cemetery at Praia the island of San Thiago only, and was official interest only in the capital?

On the other hand, the Official Bulletin is at length in its detailed balance sheets of relief assistance income and expenditure and in its lengthy reports of relief aims and programmes. Maize, rice, wheat and rice flour were distributed in the islands of Brava, Maio, Fogo, Sal, S. Antao, S. Nicholau, and in the City of Praia. There is a note to the balance sheet of distributed goods that they do not form part of the national balance of payments.

Measures were taken in 1959-61 which "reduced wholesale death" and there was no increase in mortality for the period. In 1969 there was some increase in mortality "but not great".

#### The Causes of Famine

Insufficient and irregular rainfall may be the primary and obvious cause of famine. Crops also fail through lack of attention due to shortages of labour in the early stages of famine, shortages of water caused by drought, excessive

sun, and successive shortages of seed. In the longer term, successive interruption in attention to land and crops and the abandonment of some due to emigration or death, prepare the way for erosion of soil by wind, and by torrential rain, of exposed and progressively under-vegetated and unenriched land. The overall process is one of inexorable decline and exacerbation.

#### Indigenous survival

Cape Verdians have traditionally taken every extreme measure against death from famine. It is recorded that as well as his cattle and domestic animals he would eat grass, wild roots, and the dried skin of his drums. One source of 1832 suggests that cannibalism of the dead was practised. After questioning the reasons why the Cape Verde Islands were ever colonised in the first place, social historians have pointed out the innate resilience of the Cape Verdian "He seems to be borne to face adversity and privation without complaint, and the collective misfortunes which he has to endure leave him a natural bounty of unlimited patience".

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CAPE VERDE ISLANDS

TABLE 10

Indices of Natality and Death

Source: Carreira (1977)

	Births	Deaths
1900-1909	49 107	49 811
1910-1919	62 826	43 669
1920-1929	26 960	42 127
1930-1939	73 723	43 824
1940-1949 (two great famines)	62 224	90 354
1950-1959	79 679	27 400
1960-1969	100 578	31 407
	<hr/>	<hr/>
	455 007	328 592
Population census 1900:	174 424	
Population census 1970:	272 000	
Difference in relation to 1900	124 576	

CAPE VERDE ISLANDS

TABLE 11

Numbers of Animals 1960-71

Source: Carreira (1977)

SPECIES	Animal Census		
	1960-63	1964-67	1968-71
Horses	2401	2647	1886
Mules	1331	1802	1911
Donkeys	13749	15247	8659
Bullocks	18988	23981	15148
Sheep	1008	2158	2167
Goats	55705	69448	39881
Pigs	46568	-	18825
TOTAL	139750	115283	88477

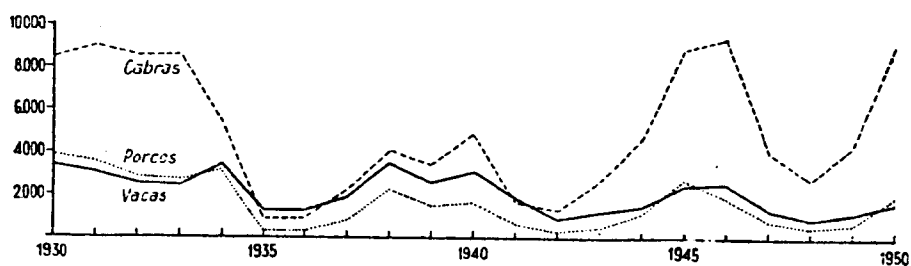


Figure 9

CAPE VERDE ISLANDS Fogo

Numbers of animals 1930-1950

Source: Ribeiro (1954)

Cabras: goatsPorcos: pigsVacas: cows

CAPE VERDE ISLANDS Agricultural ExportsTABLE 12SUGAR

<u>Periods</u>	<u>Tonnes</u>
1839-1864	158
1872-1888	116
1892-1900	92
1901-1910	3
1911-1929	3
Exports ended in 1929	

CASTOR OIL PLANT

<u>Periods</u>	<u>Tonnes</u>
1899-1904	17
1909-1918	29
1923-1928	77
1929-1938	75
1939-1948	149
1949-1958	146
1959-1970	75
Exports ended in 1970	

COFFEE

<u>Periods</u>	<u>Tonnes</u>
1892-1901	349
1902-1911	314
1912-1920	303
1921-1932	69
1933-1942	63
1943-1953	63
1954-1962	105
1963-1970	30
Exports ended in 1970	

SALT

<u>Periods</u>	<u>Tonnes</u>
1901-1909	4294
1911-1917	4590
1920-1929	10468
1930-1939	18111
1940-1949	12097
1950-1959	21282
1960-1969	30097
1970-1973	35771
(continuing)	

PURGUEIRA

<u>Periods</u>	<u>Tonnes</u>
1873-1883	4813
1884-1886	4229
1892-1910	4750
1911-1918	4080
1924-1930	2334
1931-1940	1737
1941-1950	1795
1951-1960	1927
1961-1970	461
Exports ended in 1970	

CORAL

<u>Periods</u>	<u>kg</u>
1843-1874	593
1875-1884	1900
1885-1904	600
1895-1903	550
Exports ended in 1903	

Source: Carreira (1977)

CAPE VERDE ISLANDSTABLE 13Commercial Balance of Payments 1963-73

Year	IMPORTS (contos)			EXPORTS (contos)		Deficit
	Food goods	% in relation to total	Total	Agricultural products and extract industries	Total	
1963	52 188	30.7	170 242	18 771	24 116	146 126
1964	62 767	31.3	200 718	22 299	27 536	173 182
1965	75 007	32.9	228 283	21 728	27 961	200 322
1966	69 293	28.4	244 203	28 051	32 926	211 277
1967	69 237	26.8	259 790	26 820	30 913	228 877
1968	77 306	27.4	281 926	35 662	40 772	241 154
1969	168 471	40.2	418 801	37 268	44 556	374 245
1970	145 240	30.9	469 418	38 432	47 731	421 687
1971	222 537	38.8	573 464	28 663	45 642	527 822
1972	246 110	37.5	656 876	19 709	47 970	608 906
1973	241 350	29.0	833 052	32 294	47 802	785 250

Source: Carreira (1977)

Figure 6 CAPE VERDE ISLANDS  
Demographic Evolution: 1496-1900

150 (000) Population

140

130

120

110

100

90

80

70

60

50

40

30

20

10

Year

1470

1570

1580

1730

1770

1780

1800

1810

1830

1850

1860

1880

1900

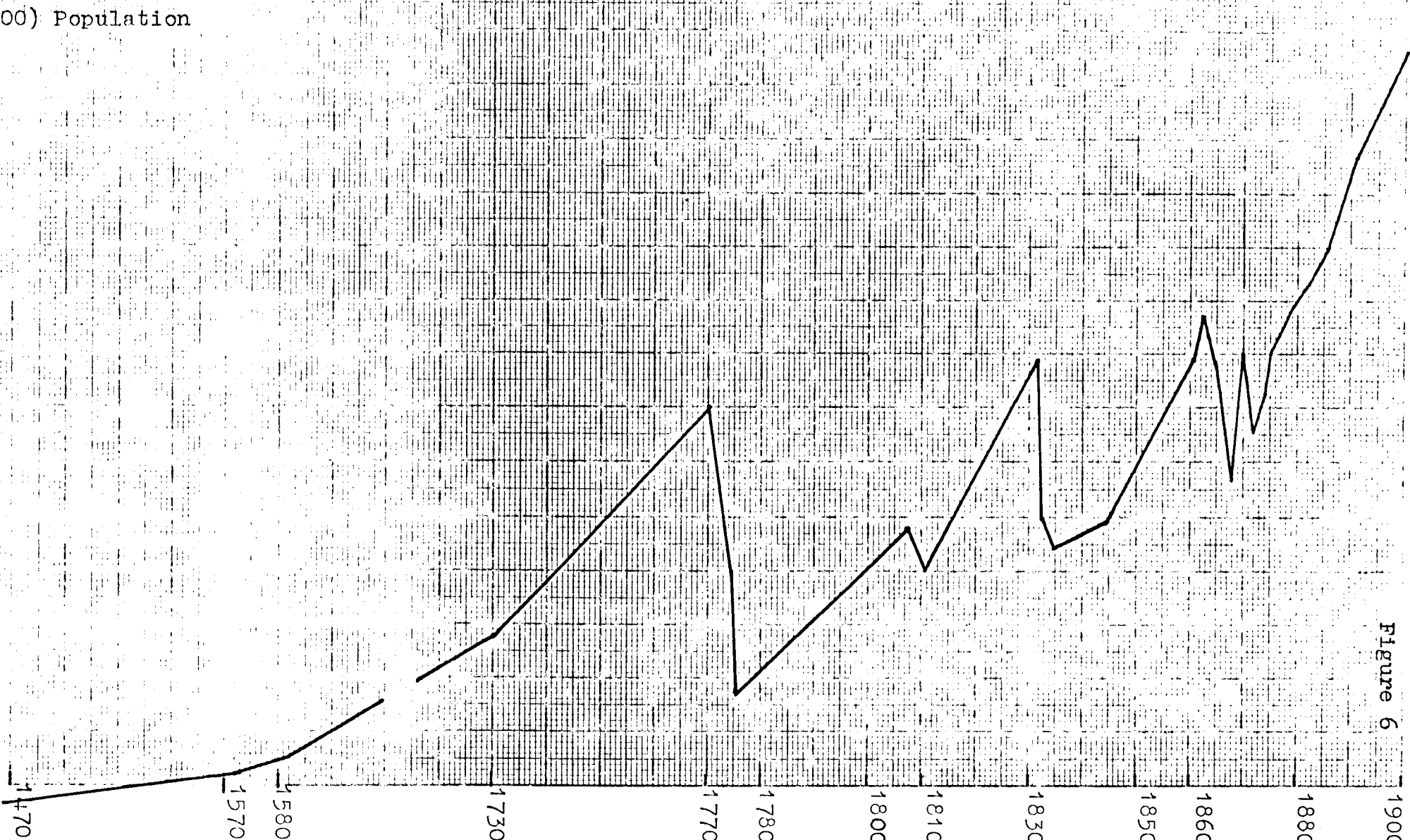


Figure 6



Figure 7 CAPE VERDE ISLANDS  
Population and Emigration 1900-1972

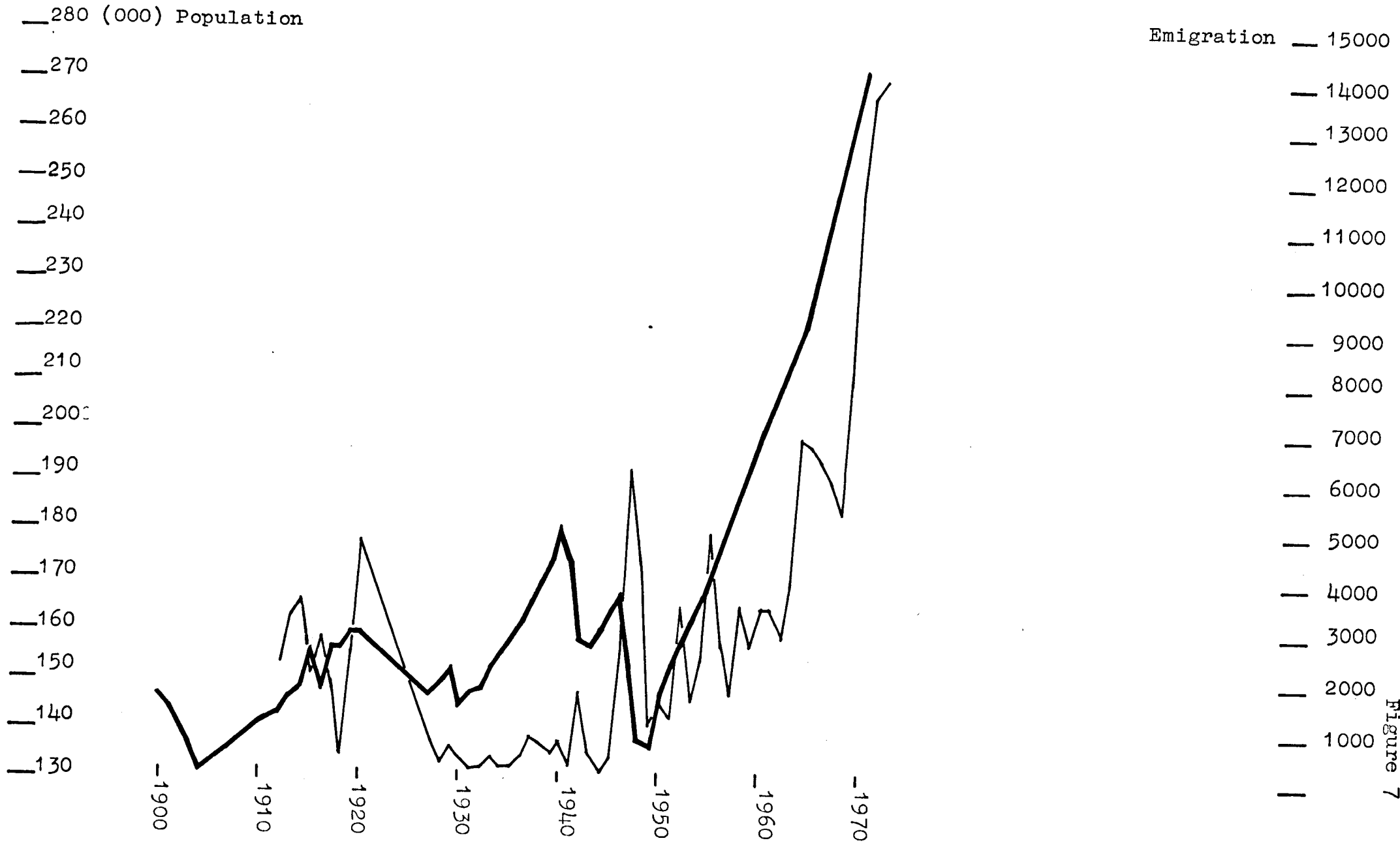


Figure 7

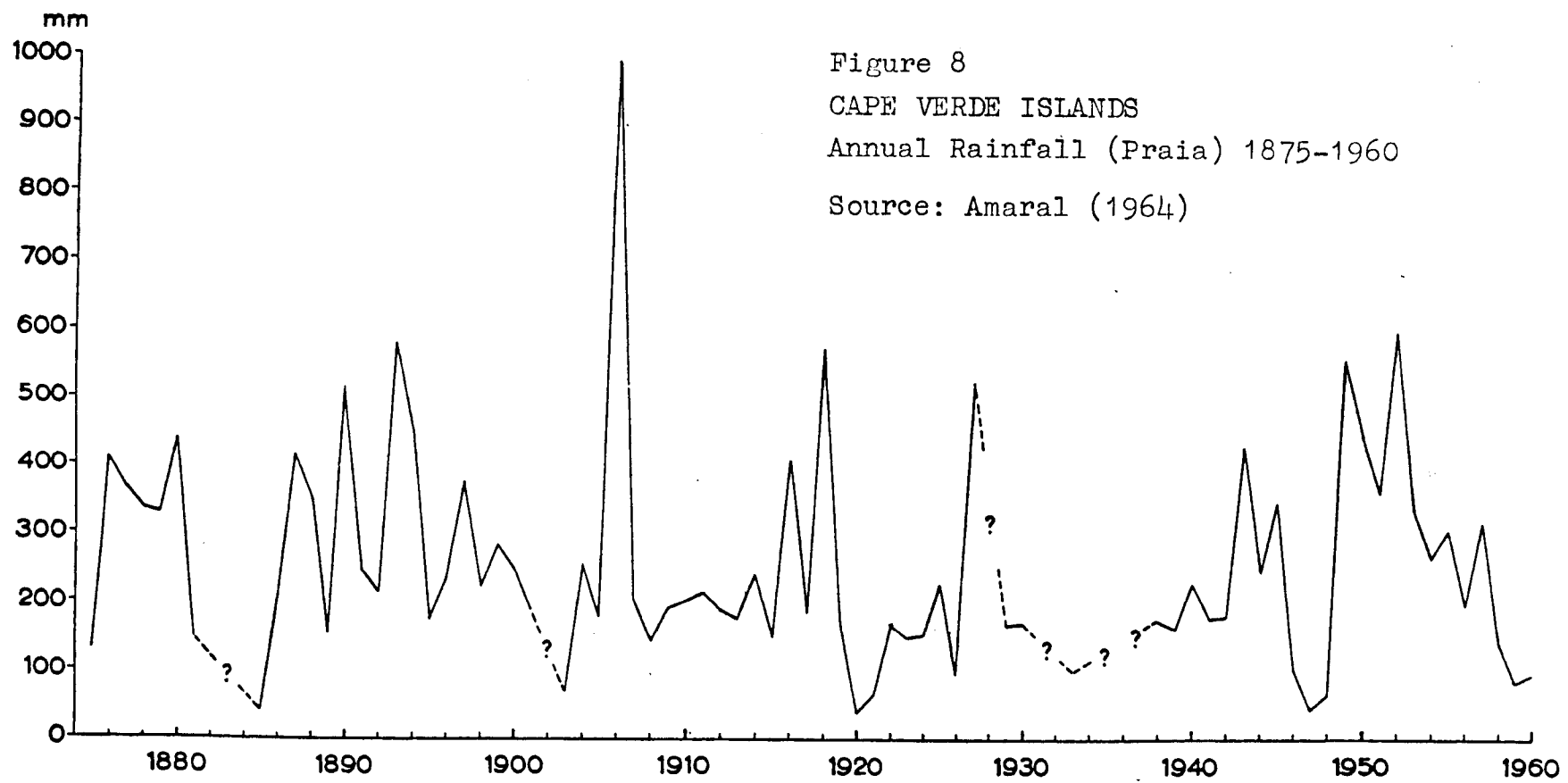


Figure 8

ANNEX 6

The eruptions of Fogo; Cape Verde Islands

Fogo is one of the nine islands of the Cape Verde Archipelago (Map 4), the only one which is volcanically active. With an area of 476 square kilometres, a circumference of 81 kilometres and a height of 2822 metres, Map 9 ) the island is three times the size of Vesuvius though of a similar form. A caldera (rim height 2700 m) contains at its centre the cone of the most recent eruptions. The caldera rim is much reduced to the east, accounting for lava flows on that side of the island, and the consequent minimal (though not entirely absent) population ( Maps 9 & 10).

There are recorded 25 various eruptions since 1500, the latest being in 1951 (Tables 8 and 9 ). Several eruptions have been explosive, and/or have produced flows of lava which can be assumed to have been damaging in some degree if only to arable land. Accounts of damage are non-existent except for the 1951 eruption, though the eruption of 1785 appears to have been relatively serious with explosions and lava flows damaging arable land (Table 9 ). There were casualties caused by the earthquake which accompanied the eruption of 1847.

The eruption of 1951 ( Map 10 ) burnt several fields and castor-oil plantations. The road and a water-main were broken, and 34 houses were destroyed though there were no casualties. Several water storage cisterns were ruptured by the earthquake which initiated the eruption. The total cost of damage in 1951 was estimated as one and a half million escudos.

The year of 1951 happened to be a year of rain and of good harvests, and though this must have meant some losses to crop production due to damaged arable land it is said that in the context of this good year, the inhabitants

of Fogo paid little attention to this volcanic eruption and "among the factors which influence human living conditions on Fogo, volcanic eruption and earthquakes count for very little".

Given the comparative frequency of eruption, and the severe frequency of famine and food shortage often of several years at a time (Annex 5 ) it is surprising that all volcanic eruptions appear, as far as is known, to have occurred outside periods of crisis caused by other factors. The eruption of 1847 (one source gives this date as 1846) comes closest - following the famine recorded for 1846; and the eruption of 1857 closely followed the epidemic (on Fogo and two other islands) and famine of 1855-56.

Whereas in other contexts it might have been the sectors of agricultural production or housing that received most significant damage, it is certain that on Fogo the damage to the water main and water storage cisterns would have been regarded as the most serious.

In this climate of marginal possibility for habitation by man, with rare and uncertain rainfall there are two crucial and principal sources of water on Fogo. Though there are springs, most are below the cliffs on the otherwise inhospitable coastline and accessible only with great difficulty. Only a few springs are above the locations available for habitation, and only one of these (in 1958) was tapped. It was the main from this spring serving San Felipe that was broken by the earthquake of 1951. There are both private and public fresh-water cisterns which are the most certain source of water; from which water is sold and used solely for drinking purposes being conserved "as one would wine". None is used for irrigation.

This one island of the Cape Verdian archipelago demonstrates the significance in a small land area of one hazard upon another, not by coincidence and

accrued consequent impact, but by conditions created by one threatening exacerbation of another. By the same containment of hazard in separate confines, cholera epidemic affected only one-third of the total archipelago.

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ANNEX 7The Cape Verde Islands: A Strategic Location versus Climatic and Production Uncertainty

The Cape Verde Islands became a cross-roads for all shipping to and from Europe and Portugal, Brazil, the West Indies, and the East, due to the pattern of favourable winds and trading opportunities in hides, salt, and salted meat and fish, which also served as a cheap source of ship's provisions. Its attraction to shipping was the greater as a haven remote from areas of colonial and anti-colonial warfare.

The opening of the Suez Canal in 1869 created<sup>only</sup> a temporary decline in Cape Verdian shipping trade, as by then coal refuelling facilities for shipping had become established for Atlantic shipping. Imported coal from Wales was transhipped at Mindelo on the island of S. Vincente which itself developed as a port out of the coal trade.

To complete the refuelling and re-victualisation services for shipping, water was conveyed from the island of S. Antao (Cape Verde) to Mindelo and stored in a 100,000 gallon tank for transhipment.

With the other natural harbour of Porto Grande on S. Vincent (formed by a sunken volcanic crater) strategic and commercial advantages to shipping continued until coal began to be replaced by oil at the end of the 19th and early twentieth centuries.

The strategic importance of the Cape Verde Islands has not evaporated as a result of shipping evolution. Its natural harbours and location remain and if it had not been for the effects of climatic unreliability on its services and provisions, Cape Verdian ports and their islands would have been of greater commercial and governmental interest.

As it was, the irregular and unreliable climate, dispersed production areas and difficult land transportation, low product values, high costs of internal sea transport, and coal transshipment managed and profited by expatriate interests, militated against a comprehensive commercial and governmental investment and development that was instead to favour the Azores. Nevertheless as a base for military, civil and commercial communications its strategic location remains a not unrecognised potential.

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LERENO



ANNEX 8The Comoro Islands: Tropical cyclones and financial assistance

There are 9 storms and cyclones recorded for the Comoro Islands from 1864 to 1980 (115 years), but though their frequency is not great, their effect has been the more serious as a result of their grouping ( Table 8 ) and of their timing.

Of the 9, two occurred in 1898, two more in 1904/1905, two in 1908, and two in 1950/51. The four cyclones of 1898-1904 occurred at a time of significant political and economic change which the cyclones exacerbated and in which their effects were severely felt.

The sugar industry was in recession at the turn of the 19th/20th centuries as a result of international price fluctuations, and the cyclones which destroyed and damaged a large number of sugar refineries on Mayotte were the "last straw" to an industry already in severe decline. Exports of sugar did not reappear until 1904 but then only in meagre quantities. There was at the same time considerable diversification of export crops, citronella, was introduced in 1904, ylang-ylang<sup>(1)</sup> in 1905, lemon grass in 1908, and sisal in 1904 and 1911, as well as basil, cinnamon, pepper, nutmeg, and bitter-orange - all in place of formerly predominant sugar cane. This situation persists today except for small quantities from one particular sugar producing area (Dzoumougne on Anjouan). Vanilla was introduced before 1902 and with ylang-ylang, has wholly superseded sugar as principal exports.

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(1) Ylang-ylang is an oil used in perfume manufacture.

One source suggests that the hurricanes of 1898 were wholly responsible for the demise of the sugar industry, but it is unlikely that, if this had been so, plant products of even greater fragility and vulnerability would have been selected to take the place of sugar. The establishment of vanilla had already commenced before the first cyclone of 1898, in time to share damage with sugar but after which the vanilla industry recovered and increased.

The cyclone of February 28 1898 destroyed a large number of buildings of sugar and vanilla industries, and houses. "Enormous" damage was inflicted on harvests of sugar cane and coffee, but "Les habitants . . . confiants dans les sympathies de la Metropole, ils se misent courageusement au travail . . ."

The second cyclone, of 22/23 April hit a population struggling to rehabilitate after the first.

Amounts of financial assistance by "the Metropole" were assessed for both cyclones at; first a total of Fr. 100,000 to cover losses sustained by 23 colons, one half to be received immediately, the remainder to be received in four quarterly payments during 1899. Second, Fr. 100,000 "special advance" to compensate losses sustained by indigènes who suffered an epidemic of small-pox as well as the cyclone. Third, Fr. 500,000 for the colony administration; this last sum to be repayable without interest over 25 years commencing in 1903. Of this amount Fr. 400,000 were to be spent on public works and 100,000 by local administrators.

#### Cyclone: 14 December 1904

The cyclone of 14 December 1904 damaged vanilla and coffee, and food crops of the indigènes. The Madagascar administration sent emergency supplies of rice and meat. The three islands of Mayotte, Anjouan and Moheli suffered most; government buildings were damaged, as was property of colons and many villages. A large number of people were without shelter or resources. Food crops of

cassava and bananas were severely damaged. An "approximate evaluation" of damage to government buildings (hotel, hospital, post office, police station, prison, schools, morgue, roads, bridges, jettys, and various government administration offices) was set at Fr. 106,000.

A private letter of 16 February 1905, addressed to a Minister of the government in Paris, assessed the crop reduction for 1905 as 9%; and calculated what the value of vanilla would have been from estimates per hectare of plants lost:

Mayotte: 393 hectares = 1,965,000 vanilla plants (vines)  
of which 176,850 destroyed (9%)  
= 7 tonnes annual vanilla crop  
= Fr. 140,000 value.

As each plant would have given four harvests, total loss = Fr. 560,000.

This would have given each vanilla plant a total damage figure of Fr. 3.17.

Some concern was expressed from Paris about the high cost of assistance following disasters of various kinds in overseas territories. There was an unwillingness to subsidise every request for assistance, some of which must, it was said, be met from current budgets. (Refer postscript for credits allowed for other disasters). Estimates of losses made by the administration were cut by the assessors, most severely in respect of the colons; but estimates of losses by the indigenes, not included by the administration in respect of Mayotte, were added by the assessors.

Summary of losses:

		Administration	Colons	Indigènes	Total
MAYOTTE:	Administration estimates (Fr)	106,000	760,000	-	866,000
	Assessor's estimates (Fr)	60,000	260,000	80,000	400,000
ANJOUAN:	Administration estimates (Fr)	28,300	471,000	60,000	559,000
	Assessor's estimates (Fr)	28,000	295,000	60,000	375,000
MOHELI:	Assessor's estimates (Fr)	-	85,000	20,000	105,000
Total:	Administration estimates (Fr)	1,530,000			
	Assessor's estimates (Fr)	880,000			

Cyclone: 16 December 1905

The cyclone of almost exactly a year later, on 16 December 1905, caused 30 deaths and 150 injured. The islands of Anjouan and Moheli were the most seriously affected.

This second cyclone seems to have occurred before settlement of the amounts of assistance for the first. Both were finally assessed together, but the second met with a severely rigorous official assessment of the cost of damage sustained. The assessment mission (from Madagascar?) was made from 25 December to 9 January 1906, and its report submitted on 23 January 1906. Almost all plantations on Anjouan and Moheli, and the "most important" of the villages of indigènes in the island were visited.

Assessment of losses were based on a value per plant and value per product;

	<u>Value per plant (Fr)</u>	<u>Value per product (Fr)</u>
Vanilla:	0.50	15.20 and 20.00 (kilo)
Coconut:	1.70	
Cocoa:	2.00	
Coffee:	0.50	
Sugar:	-	300.00 - 350.00 (tonne)

These values were expressly exclusive of costs of transport and other overheads that planters would have incurred had the plants produced a harvest.

Animals lost were assessed as Fr. 60.00 for cattle and Fr. 5.00 for goats.

Estimates were assessed under four categories of: colons, administration losses, plantation employees and indigènes.

#### Colons' losses

Losses for 16 colons were in all cases severely reduced, often by as much as two-thirds. Losses to colons can be summarised as:

	Buildings etc	Vanilla destroyed	less cost of harvesting	various	Total	Colons' own assessment
ANJOUAN	230,200	233,600	206,500	64,700	735,000	2,951,646
MOHELI	29,840	79,755	40,250	20,335	170,200	424,772

#### Administration losses

Administration losses on Anjouan were set at Fr 20612, having been reduced by the mission from the administration's own calculations to take account of rent to be received from a merchant for use of the damaged custom house.

Administration losses on Moheli were similarly cut to take account of free and available labour by prisoners which is what it would only need to make certain repairs.

	<u>Anjouan</u>	<u>Moheli</u>
Administration assessment (Fr):	20,612	5,000
Mission assessment (Fr)	19,000	3,500

Losses to indigenes

It was considered by the mission that the administration's assessment of losses to the indigènes had been made with very great moderation. These losses, covered growers of coconuts, vanilla, cocoa, coffee, cassava, bananas and other foods; damage to houses of stone, houses of palm thatch; and losses of cattle and goats. The totals were accepted without reduction being imposed.

"Les indigenes n'ont pas cherche a speculer sur le secours qui pourrait leur etre alloue par le metropole, ils se sont bornes a indiquer avec sincerite le montant de leurs pertes".

Assistance for indigènes was to be administered by village chiefs, who were "controlled" by the Police.

A summary of the assessor's estimates of assistance necessary after the December 1905 cyclone is (Francs):

Island	Administration	<u>Colons</u>	<u>Indigènes</u>	Total
Anjouan	19,000	744,000	178,000	941,000
Moheli	3,500	172,000	48,500	224,000
G. Comoro			8,000	8,000
Mayotte				
	22,500	916,000	234,500	1,173,000

The assessors report acknowledged that losses were most seriously felt by indigènes, employees on plantations, small colons,<sup>and</sup> planters recently arrived not having had time to realise benefits from their harvests. Vanilla, they observed, requires very great care and begins to give best results only after three years; losses during that period are critical to planters - who may abandon their efforts if help is not forthcoming.

Help was forthcoming, though there was probably more satisfaction in Paris than in the Comoro Islands with its amount. A "credit extraordinaire" of Fr. 360,000 was made for both cyclones, of 1904 and 1905. Fr. 60,000 were to be spent on the repair of government buildings, and Fr. 300,000 were to be allocated to colons and indigenes according to need. The period for repayment of the financial obligations incurred by the credit of 1898 was to be extended.

Food shortage followed the cyclones; on Grand Comore there had been no rain from January to November 1905. 130,000 kilograms of rice were distributed in Moheli, Grand Comore and Anjouan, being sent from Zanzibar in November and December 1905. Deaths attributed to famine had commenced in the third quarter of 1905 and continued during October and November. A total of 490 are recorded for the period August 1905 to January 1906. Improved communications (by steamboat) were observed as being necessary if recurrence was to be avoided.

After the cyclones, people gathered fruit and bought food from Indian and Arab traders; and plantation employees continued to receive food rations according to their contracts, but there was not enough for long enough and migration commenced towards urban centres (eg Hombo on Anjouan).

#### Postscript

Since 1900, the Government in Paris had made credits of 4½ million francs in respect of "cataclysms" in various possessions and colonies:

1900	Guadeloupe	Fire	Point-a-Pitre	17 April	Fr.	50,000
1901	Guadeloupe	Fire	Grande Bourge		Fr.	15,000
1902	Martinique	Mont Pelee		May-August	Fr.	3,025,000
1904	Reunion	Cyclone		21/22 March	Fr.	1,000,000
1904	Tahiti	Cyclone		January (1903)	Fr.	80,000
1905	St Pierre et Miquelon				Fr.	20,000
1906	Oceania	Cyclone		7/8 February	Fr.	200,000
	New Caledonia	Cyclone		19/20 March	Fr.	50,000
					Fr.	<u>4,440,000</u>

References

Archives National; Section outre-mer: (MAD:c.251; d.566)  
(MAD:c.398; d.1064)

Fourec and Manicacci (1970/1975?)



ANNEX 9Volcanic eruption, lava flows, and their socio-economic effects on Grand Comoro

As Tables 8 and 9 indicate, there have been frequent eruptions of Mount Kartala on the island of Grand Comoro. Between 1828 and 1977 (148 years) there are 24 recorded eruptions, most of which have involved lava flows, some with discharge of ash and/or explosions. By no means have all eruptions emitted from Kartala's peak; most have occurred from fissures which radiate from the central cone along the length of the island which is itself the projecting peak of a subterranean volcano. Having emitted from points on these fissures, lava has followed a series of usually well-defined long and narrow flows towards, and sometimes into, the sea. The most recent of these flows, those which could still be identified from aerial photography in 1967, form a series of radial corridors from the peak, plateaus and massif of the island. ( Map 11 ). Large areas surrounding the peak itself are natural forest; most agricultural activity being coastal or at higher levels up to 1000 metres, (Figure 10 ) forming essentially circumferencial band of settlement food growing, and economic activity.

Though lava flows are likely therefore to cross this coastal zone and cause damage and economic losses, they are unlikely to follow along the zone. Damage is restricted to narrow corridors, likely to be well defined and locally known or predictable / (Map 12). Though at first sight the map of lava flows shows an impressive proportion of Grande Comoro having been affected, this has not been simultaneous, but in different places and at different times.

The eruption of 1904 occurred on 25 February and caused three flows of lava, two to the sea to the east in the province of Orchini, and one to the south east. ( Map 13 ). They were accompanied by earthquakes and tremors in the night of 25/26 February; several houses were destroyed, there were two

deaths of indigènes and the loss of several cattle. The eruption continued until the 11 March. The previous lava flow, said to have occurred in 1889 (1884 or 85?) had been very slow, allowing inhabitants to more quickly get out of the way.

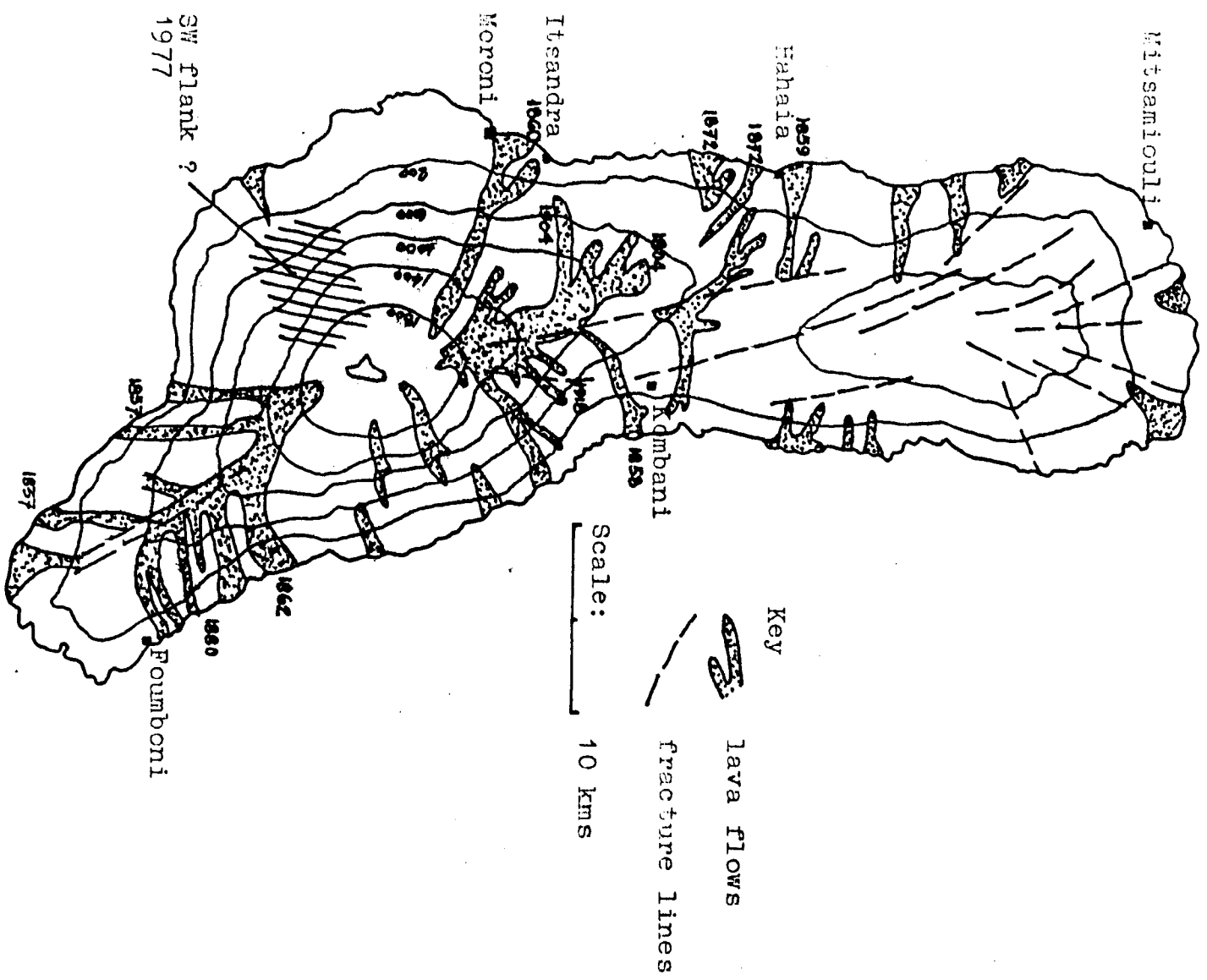
Volcanic eruption and consequential lava flows are perhaps spectacular and dramatic but appear to have been the cause of little concern on Grand Comoro before 1977, and of even less impact and less concern in the Comoro Islands as a national whole. It is a point of concern however that nationally and on Grand Comoro, the proportion of cultivatable land is small, and efforts are being made to increase the area and increase food production. It is likely therefore that future lava flows will cause increased amounts of destruction and loss, and have more severe social and economic effects. It is important that in efforts to gain more cultivatable land, local knowledge concerning areas vulnerable to lava must not be ignored.

The eruption of April 1977 may have been the first manifestation of this process of increasing vulnerability and the signal of future events of similarly more severe impact. Causing a reported 3000 victims and 5000 homeless, it was of far greater social and economic proportions than ever before recorded! The south west flank of Mount Kartala is an area largely unaffected by eruptions in the past ( Map 11 ) which may partially amount for high losses especially if the eruption was sudden and rapid.

References:

- Archives National; Section outre-mer: (MAD.C.406 d.1086)
- Battistini, R. (1967)
- Simkin et al (1981)
- UNDRO Files.

Map 11  
 Lava Flows on Grand Comoro  
 Source: Battistini (1967)



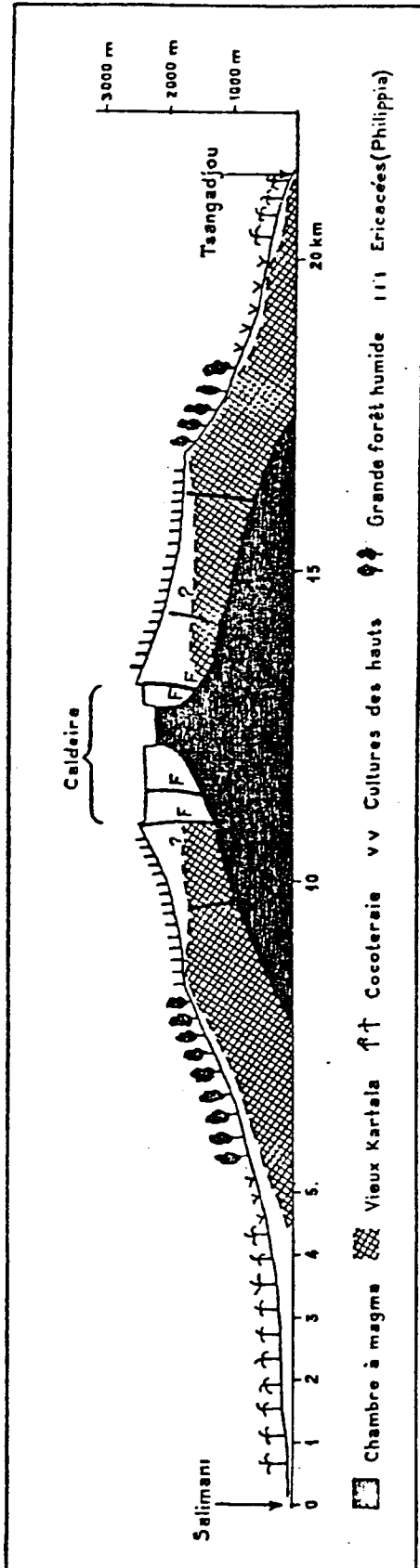


Figure 10

COMORO ISLANDS  
Kartala; Grand Comoro  
Cross Section SW-NE

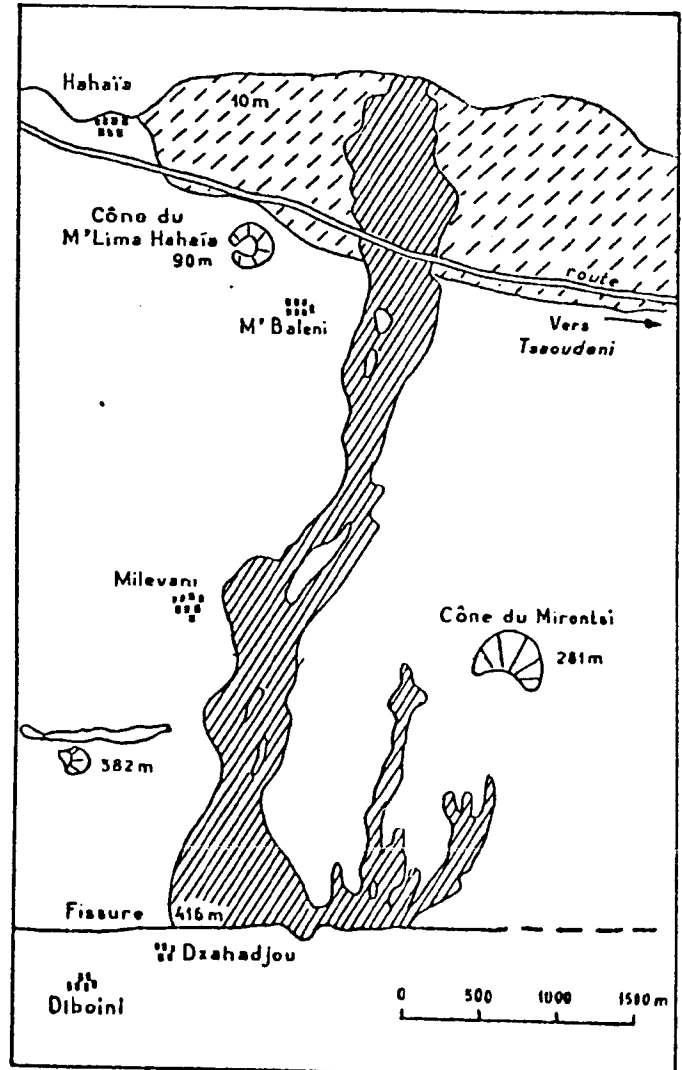
Source: Battistini (1967)

Map 12

COMORO ISLANDS  
Kartala; Grand Comoro

Eruption 1859; the large lava flow of Hahaïa.

Source: Battistini (1967)





ANNEX 10Natural disasters in the Maldive Islands: Information and reality

The disaster history of the Maldive Islands comes from only three <sup>archival</sup> sources. H C P Bell was a Colonial administrator and archeologist in Ceylon who visited the Maldive Islands in 1920 and 1922; the Colombo Secretariat published (restricted) in 1910 a collection of Papers relating to the Maldive Islands covering the periods 1897-1902 and 1904-10; and Laval was a French explorer who was shipwrecked in the Maldive Islands and lived there in consequence for five years.

Scant or absent information does not always mean insignificant or no disaster; any more than large amounts of information mean very serious disaster. It is difficult to achieve balance between recent moderate or minor disasters on which there may be much information, and historic and severe disasters about which there may be little accessible information. Where information is scarce it may be a researcher's pitfall to make too much of what little there is!

The Maldive Islands are within 2°S and 7½°N of the equator, a zone in which tropical cyclones are extremely rare. The islands to the north of the group occasionally receive the side effects of rain, wind and strong seas from cyclones directly affecting the Lacadive Islands, adding to the considerable climatic variation between islands in the South and islands in the North of the Maldives archipelago.

Estimates of the exact number of islands vary, and it is possible that the total itself varies from time to time at around 1090 in 19 atolls extending over 725 kilometres. Experiences of many kinds will vary from atoll to atoll, if not island to island, and it is probably not realistic to assume national proportions for all events. Fires, earthquakes, storms and tornadoes, where

they have been described at all, are specific to certain islands and atolls. Epidemic is the only event ever reported to have been of national significance.

An observation common to all three sources was the poor quality of catchment or lense water available for drinking, an apparent cleanliness, and according to the timing of the visit, either a freedom from disease, or occasional epidemics which Laval in 1601 stated occurred every 10 years and was like smallpox, from which many people died. At one time, drinking water was imported by the Sultan, and the rich, from Colombo.

Bell's visit in 1922 coincided with an outbreak of what was described as "Maldivite fever", a "deadly type of influenza" from which 300 people died in October and November of that year. Bell blamed "bad water and abominable sanitary conditions." Bell also records several fires and storms, the earthquakes of 1729/30, wars with the Lacadivians, and the famine of 1818/19.

The Colombo Secretariat Papers relate mostly to the gradual formalisation of the relationship between the Maldivite Islands and Great Britain. They also contain Reports and observations regarding Male, by naval captains and record a number of fires. It seemed to one Captain in 1900 that the islands were then much the same as they had been described by Laval in 1601.

Historic records of disasters are coincident with traveller's visits, and their writings. Had there been more historians, perhaps there would be more recorded disasters; but this must not be assumed. As a British Protectorate, as distinct from a Colony in its own right, the Maldivite Islands were administered for that purpose from Colombo. The Colonial Reports for

Ceylon contain minimal information concerning only population figures for the Maldives. It is likely that detailed and regular reports concerning the Maldivian Islands have not been forwarded to London. It may be that the Ceylon Sessional Papers will be available amongst archives held in Colombo, and that they would provide the necessary detail for a thorough disaster history to be formulated. It has been further and reliably suggested that the real source of information is verbal, from those whose traditional role has been its storage and transmission (Attachment).

From the few historical sources available to this study it is clear that environmental health hazards have been the predominant source of "disaster" since pre-history; that fire has been a constant risk in markets and bazaars and famine a rare one; that earthquakes have occasionally <sup>u</sup>caused damage to masonry buildings; and that storms which can be assumed to have been frequent to small islands surrounded by sea were either not damaging or regarded so much a normal occurrence to have escaped record by a nation of skilled sailors.

International allegations in 1977 of serious food shortage, and accompanying health hazards, were refuted by the Maldives Government. Was international humanitarian concern triggered by political awareness of strategic significance, anxious to woo with gifts of disaster assistance? Was disaster exacerbated in the western media to create opportunity for political advantage? Was refutation made in an awareness of vulnerability to international pressure?

The cholera epidemic of 1978/79 appears to have been more serious, affecting about 5% of the population and causing 200 deaths. But neither was this a new phenomenon to Maldivians.



References

Laval, F P de (1601)

The Colombo Secretariat (1910)

Bell, H C P (1921)

Bell, H C P (1940)

ANNEX 10 (Attachment)

UNICEF



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UNITED NATIONS CHILDREN'S FUND

OFFICE IN THE REPUBLIC OF MALDIVES

FILE NO: M/6.1.0.  
OUR REFERENCE: MIS-041  
YOUR REFERENCE:

ADDRESS { FOR CABLES: UNICEF MALE'  
FOR MAIL: ALIYAAGE 20-02  
MALE'  
TELEX: 66011 UNDP MF  
TEL: 2017

11 August 1982

rec'd.  
27 AUG 1982

Dear Mr Lewis

The Socio-economic Impact of Natural  
Disasters on Island Developing  
Countries. UNCTAD VI 1983

Thank you very much for your letter of 30 July requesting assistance in locating points of reference for researching to the above-mentioned subject.

Before giving you what little advise I can, let me first of all apologise for any misconceptions I might have concerning the scope and extent of your investigation. The words "natural disasters" usually conjure up earthquakes, cyclones, hurricanes, tidal waves, etc. However, the most common disasters which Maldives has faced in recent years have been epidemics. Working on the assumption that more information is better than less I shall assume that you also wish to consider this point.

I am not sure to what extent you are aware of the history of Maldives. It was never a British colony but was a British protectorate from the late 18th century up until 1965. As you mentioned in your letter, Maldives was administered from Ceylon as the Governor General, and subsequently the High Commissioner, was concurrently British Resident to the Republic of Maldives. Very few written records exist which would seem to indicate to me that a lot of your work would need to be done on the basis of personal contact with the few people in Maldives who are knowledgeable on its history and on significant events which occurred during that history. Of these the most knowledgeable known to me are the following:

.... /2

Mr James Lewis  
UNDRO/UNCTAD Consultant  
Consultancy Services for Disaster Mitigation  
101 High Street  
Marshfield  
Avon SN14 8Lt  
ENGLAND.

- 2 -

- a) Hon Mr Ibrahim Shihab, President, Council for Research on Maldivian History and Culture, Male'
- b) Mr Hassan Ahmed Maniku, Director, Department of Information & Broadcasting, Male'
- c) Mr Mohamed Loutfi, Construction Co-ordinator, Educational Development Centre, Male'.

I am sure that the Gentlemen mentioned above would be happy to answer any enquiries you may care to put them in writing.

Regarding epidemics, your best sources of information would be Dr Abdul Samad Abdulla, Director of National Health Services, Ministry of Health, Male' and Dr R R Arora, WHO Programme Co-ordinator and Representative, Male'.

Concerning archival material which may be held in Colombo, I am afraid I do not know the precise points of reference. However, I would suggest that you contact a demographer who is known to UNICEF and whom we have used to do research work both in Sri Lanka and Maldives. His name is Dr Ananda Meegama, and he may be contacted c/o UNICEF, P O Box 143, Colombo, Sri Lanka.

In order to pave the way for your contacts with all the people noted above, I am sending them copies of this letter and photocopies of your letter. I would suggest that any correspondence with persons in Maldives be copied to the Ministry of External Affairs of the Republic of Maldives, so that the Government Ministry concerned with External relations is fully informed on this point.

You have asked for documentation on UNICEF co-operation with the Government of Maldives. I have pleasure in enclosing with this letter copies of our Analysis of the Situation of Children in Maldives and of the draft Plan of Operations for UNICEF Co-operation during 1982 to 1987. May I further suggest that following might be useful to you as background reading:

- a) The Maldives, an Introductory Economic Report (published by the World Bank, Washington);
- b) People of the Maldivian Islands by Clarence Malony (published by Orient Longman, New Delhi).

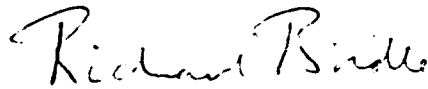
.... /2

- 3 -

Please let me know if there is anything further I can do to help you in your work.

With best wishes,

Yours sincerely,



R J J Bridle  
Resident Project Officer

cc: Mr Mohamed Shareef, Senior Under Secretary,  
Ministry of External Affairs, Male'  
Hon Mr Ibrahim Shihab, President, Council for Research  
on Maldivian History and Culture, Male'  
Mr Hassan Ahmed Maniku, Director,  
Department of Information & Broadcasting, Male'  
Mr Mohamed Loutfi, Construction Co-ordinator,  
Educational Development Centre, Male'  
Dr Abdul Samad Abdulla, Director of National Health Services,  
Ministry of Health, Male'  
Dr R R Arora, WHO Programme Co-ordinator and Representative, Male'  
Dr Ananda Meegama, c/o UNICEF , Colombo.

RJJB/sa

ANNEX 11The Hurricanes of 1966 and 1968 in Western Samoa1 January 1966

The storm of January 1966 intensified as it approached Western Samoa and passed just to the south. The maximum sustained wind speed at Apia was 60 knots, with a peak gust of 82 knots in the evening of 29 January. Full hurricane force winds were probably experienced in other parts of the islands. A survey by the Prime Minister's Department concluded:

1. The banana industry had been temporarily wiped out.
2. Copra production in 1966 could be down by as much as 50 per cent, and cocoa production would also be considerably reduced.
3. Bread fruit production would be nil for approximately 6 months and from then on less than half the normal supply would be available for at least 5 years.

On the basis of these findings it was estimated that total exports for 1966 would be 40 per cent lower than in 1965, and the Treasury estimated that revenue would be reduced by more than £102,800 in 1966. The cost of repairing or replacing Government buildings, radio and telephone system, and including village schools, was estimated as £33,584. Ten people were killed.

The World Food Programme mounted emergency food aid of 980 tons of flour, rice, corned beef and evaporated milk, in five shipments from Australia, New Zealand and Rotterdam (Evaporated milk).

The first shipment arrived in May but distribution did not commence until the arrival and distribution of the second shipment on 10 June 1966. Distribution of these two shipments had been completed by the end of June. The three subsequent shipments were mostly distributed during July 1966, with the exception of some quantities stored for distribution in August.

Other disaster relief provisions were sent by the New Zealand Red Cross and by Church Missions. Some small amounts were air-freighted for arrival in February, but most was shipped for arrival in May and afterwards.

Whether or not the food consigned was appropriate to Samoans' needs;

"In the island of Upolu (on which is situated Apia and the principal port) transportation of emergency food aid to villages and its distribution may take three days to complete. In the island of Savai'i, where receiving centres have been established, food aid supplies are freighted across from Upolu by a small coastal vessel to one centre at a time, the balance for other centres being usually completed within a period of from eight to twelve days. Whenever possible food aid supplies for one centre in Savai'i are freighted across at the same time the distributions in Upolu are being handled".

This experience obviously placed severe burdens on government services. More particularly it was 4½ or 5 months after the hurricane on 29 January that this food aid was received by the communities for whom it was intended.

#### 2 February 1968

Western Samoa was in the area of influence of a hurricane in the Niue area, when a small but vicious secondary cyclone caused serious damage to the islands. Maximum sustained wind speeds were 55-60 knots, with peak gusts of 78 knots.

Losses were comparable to those suffered in the 1966 hurricane. The banana crop was the most seriously affected with approximately 70 per cent of mature and bearing stems lost. Recovery was expected after 6 months. Damage to cocoa trees was expected to reduce production in 1968 by about 30 per cent.

Coconut trees were not so seriously affected. Damage to Government property, including schools and hospitals, and roads, bridges and power and telephone lines, etc was estimated as £176,280.

Three warnings of the hurricane were issued. "However, confusion, breakdown of communications and the lack of transport did not allow these warnings to be disseminated until after many hours had elapsed. Some determined effort must be made to improve communications and transport. It is insulting as well as pathetic to have to work under such conditions. If no immediate efforts are made . . . some serious shortcomings will be found in the future".

#### References

Government of Western Samoa (1966)

Hurricane Relief Committee (1966)

Prime Minister's Department (1968)

Kerr, I S (1976)

ANNEX 12Rainfall and hurricane in Western Samoa

As a mountainous pair of comparatively sizeable islands in the midst of an ocean, Western Samoa receives a significant rainfall - a normal yearly total of 112.28 inches (2851.9 mm). Naturally there are intermittent years when rainfall is less than normal "as low even as 66% of normal". This abnormal low, a point of concern for one source for Western Samoa, is double an annual rainfall of slightly less than average in Antigua.<sup>(1)</sup> Only one drought has been declared before 1974, that of 1925 reported as a result of "only 6.49 inches of rain during the period June to September<sup>11</sup> of that year. The reporter acknowledged that May had been an unusually wet month with 23.58" of rain! Drought can be dismissed as a Western Samoan hazard; requiring re-examination of "drought" declared for 1974. Drought of 1977 was localised in northern and north-western parts of Savai'i and Upolu, an expression of regional viscidities of larger islands as well as of subjectivity.

Rainfall fluctuations can nevertheless have a commercial impact of their own. Cocoa, a principal crop of Western Samoa, cannot survive long "drought", and coconuts do not produce well in wet seasons. The preparation of copra is dependant on appropriate climatic conditions. The monthly distribution of rain throughout the year is as important to plantations as the annual total, especially of that which falls during the driest (summer) months.

It is without doubt that many, if not all, of the 27 hurricanes, storms, or gales, recorded for Western Samoa for the years 1831-1975, have caused at least local damage. Some have caused widespread damage to either one of the main islands of Savai'i and Upolu, and one or two have caused catastrophic destruction on a national scale. It is hurricanes however which are largely responsible for comparative freedom from drought. Hurricanes which have

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(1) NB Antigua's average annual rainfall is four and a half times greater than that for the Cape Verde Islands (Table 7 and Annex 5).



been proximate to Western Samoa, causing no damage but bringing supplies of rain, have been in number at least one third of those recorded or assumed as having caused localised or greater damage. (They are not included in the chronology of damaging events). Hurricanes as environmental phenomena to Western Samoa, on balance overall and over time, are a benefit as a source of rain and water supply.

Nevertheless, hurricanes as a frequent local, and occasional national experience have been anything but a benefit at the time of their occurrence.

From his mission on Upolu, the Rev M Harbutt wrote on 8 May 1857:

"My district has been swept by a desolating storm; not a chapel is left in all Aleipata and only here and there a small dwelling house, which being sheltered from the extreme violence of the storm, escaped with little damage . . . about 3 o'clock in the morning of the 26th the hurricane burst upon this end of the island with a fury which nothing could withstand; in a few moments a great rain descended in torrents. . . ."

and on 20 May 1856:

"The natives are working hard at their houses . . . But a famine is before them. Not a bread fruit tree is left and they were just recovered fully from the effects of the great Storm of 1850".

and on 7 August 1856:

". . . but most of the large houses for the reception of visitors and for business meetings are still as the storm left them, the disturbed state of the islands (warfare or hurricane?) having prevented their re-erection. We are suffering from the famine which I named as sure

to follow the extensive destruction of the Bread fruits and other trees . . . years must pass before the district will have another crop of bread fruits to gather - remarks which I have often heard in conversation and in public addresses respecting the fearful visitation. . . ."

After the severe storm of April 1850, the Rev G Stallworthy wrote on 26 November of the same year:

". . . gale we had in April . . . was succeeded by myriads of caterpillars which did great injury to the taro, stopping the growth of the plant, and destroying the offshoots from which the succeeding crop is derived. The bread fruit trees, which the gale left standing, were so much injured by it, that they have not yet begun to bear again. Thus there is a great scarcity of food, and diarrhoea and dysentery are very common among the people".

(There are a number of references in the London Missionary Society Archives to plagues of caterpillars following hurricanes, refer also Annex 13 ).

The Rev G Drummond wrote from Saluafata on 19 June 1850 regarding the April hurricane of that year:

". . . bread fruit trees were torn up by the root or broken down by the wind, and a very great quantity of the cocoanut trees destroyed. The oldest Samoan living never saw a storm anything like it before. I hoped it might have some effect in putting a stop to the war, but it seems to have produced no lasting impression on the minds of the people".

(After the "Great Hurricane" of 1889, Robert Louis Stevenson was of the opinion that the losses of ships and men of the British, German and United

States navies was significant in putting an end to hostilities and in bringing about the Treaty of Berlin in 1899).

Refer Annex 13 for Missionary's observations from the Cook Islands on traditional responses to hurricane, on one of the first ever disaster relief efforts in the Pacific, and on islanders' views of it.

Refer Annex 11 for a review of the hurricane of 1966.

#### References

London Missionary Society Archives: Navigator Islands and Samoa.

Stevenson, R L (1912)

Department of Statistics (1975)

ANNEX 13Indigenous, and exogenous, responses to hurricane in the Cook Islands

Writing from the Cook Islands, the Rev Charles Pitman appears as a particularly astute and forthright observer and correspondent. Hurricanes provided opportunity for insights not found in other correspondence, but are introduced simply from Rarotonga on 7 January 1832:

". . . nearly all the bread fruit trees and principal food of the natives have been destroyed. Already they begin to feel the effects . . . and are obliged to seek their food in the mountains, just at the time when they were encouraging themselves with the prospects of a good harvest. The natives themselves fear that a great sickness will be the consequences".

Pitman has a concern for "the natives" to a degree not expressed by other correspondents, but it is essentially his insight into their relationship with the missionary which is so valuable, and not at all one-sided:

From Rarotonga 26 March 1841:

". . . represented to the Natives as a great man, that the King of England sent out to tell the Natives to plant plenty of arrow-root, and sugar cane. . . ."

and on 1 October 1841:

"Owing to the dreadful gale of wind in February and April last our poor people have suffered from scarcity of provisions so that the last year's collections (of arrowroot) has been scarcely anything worth mentioning".

A particularly severe hurricane struck the Cook Islands in about February of 1841, which was followed by another hurricane in the same year.

Descriptions reaching London of conditions following the hurricanes prompted a disaster-relief consignment of clothes for distribution to "orphans and other cases of real distress". After acknowledging receipt Pitman wrote (Raratonga 31 December 1841):

". . . but after all, dear Sir, generally speaking, the giving system is a bad one. There are many, as long as you will give, they will not work, plant, or strive to obtain what is necessary. If the people could get a sure market for what they could grow, I have no doubt that they would plant so as to obtain what was needful for their comforts, and what more is wanted? What makes our poor people so destitute for clothing at present is, the destruction of their bread fruit trees by the repeated hurricanes with which we have been visited, and also the death of so many women, on whose labours in beating cloth from the bark of the above tree . . . the family depends for clothing".

The hurricane of 1846 was also very severe in the Cook Islands. Writing from Rarotonga on 14 May of that year:

"Dreadful havoc has been amongst their Bread fruit and coconut trees, and indeed trees of every description, not a Banana or Plantain standing. The loss of the natives in this respect is very great. Their subsistence are the roots of the ti and mountain plantains. I also deeply regret to state that the Society's loss is very great in books, arrow-root and etc - all having been washed away by the sea and flood".

". . . in this season of great scarcity, for in consequence of the destruction of their food they have scarcely anything to eat but the roots of the ti and plantain trees, nor will they have for months to come".

In spite of (or perhaps because of) Pitman's protestations concerning consignments of clothing following the 1841 hurricanes, relief consignments of food were despatched from London in response to descriptions of this hurricane in 1846. On 7 July 1847, a letter "written by the Chiefs, Governors, Landholders" was despatched to express the gratitude of the islanders:

"Now the food you sent us has reached us. It was made known that the Churches in Britain had sent it to the churches in Rarotonga. It came here in a ship from (Sydney), and was divided on the settlements. Our division was  $8\frac{1}{2}$  bags of rice and five bags of Biscuit. This was given out to the Chiefs and Governors of the district, and they divided it among the households of this station Avarua. . . . We then asked our teacher how we were to cook it, the rice. When he told us we were much amused. Having received our portion we began to cook it. Some baked theirs in the native oven. Some boiled it in pans; and others tied up portions in the leaves of the ti tree and then cooked it. There was no measure to our joy. You would have thought we were English. Children and Men, and Women; thus eating our "Rice and Biscuit". . . . After the gale we had nothing but pumpkins which we used to eat with the root of the te and the ae plants. Such was our food after the gale. We then planted potato and taro. No-one stood still. We were diligent in planting. So that we are now eating mixed food: Bread fruit, Banana, Plantains and etc. We are still planting and should another gale come, this year, it will make an end and we shall have nothing left. This is a strange land. There can be no other like it".

But Pitman wrote, from Raratonga on 30 June 1847:

"I cannot however let this opportunity pass without stating my private views in reference to the articles of food sent out for the use of the natives, viz, Biscuit, Rice and Flour. And I am constrained to say that it is an almost useless expenditure, and will really benefit the people but little, owing to the length of time intervening between the hurricane and the arrival of supplies, nearly 16 months. After the dreadful desolation occasioned by the hurricane, our first concern was, soon as they had erected huts to dwell in, to get their lands cleared and plant extensively the sweet potato, being a plant of speedy growth, which they did universally, men, women and children: and in about five months, they had abundant crops, and by keeping up the system, have not wanted, till the present time; tho' they have been greatly tired, owing to subsequent heavy gales of wind blowing down whole plantations of Bananas just about to bear, and from an immense number of caterpillars, laying waste their taro patches, and potato beds, but enough has been spared to supply the whole population.

In seasons of scarcity in these Islands, the Directors must not consider it a parallel case with famishing districts in England, as the consequences are not so alarming and fatal; for when the food on which they chiefly subsist fails, they have immediate recourse to the roots of the ti and mountain plantain, and should these fail, their country abounds with a great variety of fern, which is a kind of food of very little nourishment, yet it keeps the people from actual starvation for a long time, till planted food comes to perfection, and can be procured by all classes. Where the loss of accustomed food is mostly felt is among the sick, as the sweet potato alone has not those nourishing qualities requisite to sustain their feeble frames, and it is an article of food which hunger alone compels most of them to taste during their sickness. In such cases an occasional meal of Rice or biscuit would be most acceptable.

Rice is an article of food to which the people here are not at all accustomed, and the want of utensils for cooking it, will be a great difficulty, as scarcely a person in our whole settlement possesses such a thing as a pot or pan to boil it in, their own food not requiring such articles for the purpose. Buscuit when good, I consider the best, that now sent is very inferior.

You will perceive the above remarks refer to articles of food. Dr Ross informed us that the Directors were shipping a large supply of tools and other articles to assist the people in rebuilding their houses, schools, Chapels etc. These will be invaluable, and enable us I hope to erect more substantial buildings than they have hitherto been able to accomplish. Of this we shall aprize as soon as received".

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ANNEX 14Epidemic and Population in Western Samoa

Epidemics of diseases newly introduced by explorer and trader Europeans, have been serious in the Pacific since the eighteenth century. Influenza first occurred in Western Samoa in about 1830, and in almost every year for a long period thereafter. An especially severe attack occurred in 1847. Whooping cough reached epidemic proportions in 1849, as did mumps in 1851.

Inter-tribal warfare began a few years before 1830, and continued for several years. Warfare occurred again in 1848, and again in 1869 for four years until 1873, and again in 1877. The destruction of crops was a technique of war.

Though some contemporary population estimates are open to question, they are consistent in suggesting a severe population decline during the period covered by these events from 1830 to the 1880's. Military and missionary estimates of population made during the nineteenth century were:

Year	Estimated population
1839	47,000
1845	40,000
1849	32,000
1854	29,237
1881	28,000
1886	29,000

During this period there were eight recorded damaging hurricanes which are known to have caused temporary shortages of food according to season by destroying coconut and garden crops and by killing livestock. Though knowledge of wild plants and roots which could be used as food was traditional, some malnutrition probably resulted in post-hurricane periods. It is not possible to determine precisely whether post-war or post-hurricane malnutrition

contributed to epidemic, but there is the occasional suggestion that it did (ref Table 8).

Measles occurred as an epidemic in 1893; dysentery in 1907, a year in which there was no population growth; dysentery and measles occurred in 1911; and measles in 1915.

There were epidemics of influenza in 1918 throughout the world, but in terms of the national proportion of attributable deaths, the Western Samoa influenza epidemic of 1918 was one of the most disastrous epidemics anywhere in the world during the first half of the 20th century. 8,400 people died; over one-fifth of the national population, and 7,000 more deaths than registered births. The national population was reduced to below that of 1911.

<u>Census years</u>	<u>Population</u>
1906	37,320
1911	38,084
1921	37,157
1926	40,229

Figures of "native" population reported by New Zealand are

<u>Year</u>	<u>Native population</u>
1902	32,815
1906	34,962
1911	34,063
1917	37,223
1918(Sept)	38,302 (before the epidemic)
1918(Dec)	30,738 (after the epidemic)
1921	32,953

There was a further unspecified epidemic in 1923 but rigorous attention to public health finally brought epidemic outbreaks to an end by application of village sanitation, systems of notification of communicable diseases, food and drug inspection, purification of water supplies, examination and quarantine

of incoming vessels, instruction in hygiene for schools, organisation of women's health committees in villages, and extensive treatment of endemic diseases (hookworm, yaws and filiarasis).

References

New Zealand (1921)

UN Department of Social Affairs (1948)



deducting costs which would have been incurred if the shortfall had not happened. The annual premium was in the order of 4.5% of the value of sugar insured. The value of sugar insured was the average for the three years preceding normal years (now the three preceding best years of twelve).

There were no claims until 1957 which was declared a drought year; 9 million rupees were paid in compensation. 1958 was a cyclone year for all the island; 1959 was a drought year for half the island. During these two years 27 million rupees were paid in compensation for a period when 24 million rupees were collected as premiums.

Compensation for cyclone "Carol" in 1960 amounted to 140 million rupees whereas the reserves of the fund stood at 124 million rupees. Reinsurance cover had been bought, preventing the collapse of the fund.

The severe 1961 drought and cyclones of 1962 seriously reduced the credit balance of the fund and a first loss percentage was introduced to be borne by all insurers.

#### The Sugar Insurance Fund Board

The Board encourages the improvement of cultivation methods by revising assessments of insurable sugar where certain improvements have been made in the field. Compensation is reduced in case of bad farming practices. The income of cane planters is stabilised in years of shortfall, and savings are imposed during prosperous years. Insurance is compulsory.

The Sugar Insurance Fund Board has a total staff of 300 (at 1979) including an inspectorate in 107 sub-offices. Administrative expenses amount to only 7% of the gross premium income for the same period. The island is divided

into 21 "Factory Areas"; the planters located in a certain factory area being obliged to send their cane to that factory for crushing.

Planters and millers share 76%-24% the insurable sugar value.

#### Reinsurance

The Board was in existence from 1946 until 1958 before re-insurance was first negotiated. Various excesses-of-loss covers were arranged between 1958 and 1968, after which covers were not renewed being considered too expensive. The table below shows the premiums received by reinsurers and the losses they paid; the reasons for increased cost of reinsurance became obvious:

<u>Year</u>	<u>Premiums received</u>	<u>Losses paid</u>
1958/9	3,753	-
1960	2,524	34,120
1961	3,126	-
1962	3,059	2,711
1963	3,518	-
1964	5,838	20,450
1965	No reinsurance effected	-
1966	2,953	-
1967	4,158	-
1968	3,092	-
	<hr/>	<hr/>
	32,121	57,281

Reinsurance was reinstated in 1972 on a stop-loss basis.

In 1975 the Board recovered 126 million rupees after cyclone "Gervaise".

Thus the importance of reinsurance cover is illustrated.

References

Bellerose (1979)

Sugar Insurance Fund Act (1974)

Cyclone and Drought Insurance Board (1971)

The Sugar Insurance Fund Board 1975-76 (1977)

ANNEX 16The South Pacific Bureau for Economic Co-operation (South Pacific Forum):Disaster Relief Fund

In 1976 the economic arm of the South Pacific Forum, the South Pacific Bureau for Economic Co-operation (SPEC), requested the Commonwealth Secretariat for a project to establish guidelines for the management of a regional fund to provide insurance for natural disasters. The Report, accepted by the Forum in the same year, analysed natural disaster occurrence in the region of the (then) nine member countries<sup>(1)</sup>, and the needs which arose in the aftermath of disasters. The Disaster Fund had been established in 1973 by an initiating gift from the Republic of Nauru of A \$ 250,000 and agreements for equal annual contributions from participating Governments of A \$ 5000. The Report established management guidelines whereby A \$ 10,000 could be committed, when requested, for any disaster in any member country. The earthquake centred on Honiara in the Solomon Islands in April 1977 was the first occasion for the commitment of the Fund, which continued to be administered by SPEC on the basis of the guidelines established in 1976 until 1981 when certain modifications were made.

During the first five years of the Fund, financial assistance was made for at least eight natural disasters in five countries ( below ). Allocations have been Fiji \$ 10,000<sup>(2)</sup>, except in the case of Hurricane "Isaac" in Tonga (1982) when a total of F \$ 25,000 was allocated, F \$ 15000 from the Disaster Fund. In 1980 SPEC allocated a total of F \$ 20,000 in respect of Cyclone "Wally" in Fiji, F \$ 10,000 from the Disaster Fund.

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(1) In 1976: The Cook Islands; Fiji, The Gilbert Islands (now Kiribati); Nauru; Niue; Papua New Guinea; The Solomon Islands; Tonga; and Western Samoa.

(2) Fiji \$ 1.00 is currently rated at US \$ 1.04.



In December 1981 the maximum disbursement for any single disaster was raised from F \$ 10,000 to F \$ 15,000, Tonga (Hurricane "Isaac") being the first recipient of the increased sum. At the same time, the Fund having reached its self-sustaining target level of F \$ 500,000, it was determined that annual contributions from member countries were no longer necessary.

Details of financial assistance to member countries affected by disasters are:

Fiji:

1979 March 26-28 Hurricane "Meli".

Effects: A loss of at least 52 lives with larger number of seriously injured. Destruction of root crops and houses, eleven vessels lost or damaged. Amount allocated from Disaster Relief Fund F \$ 10,000.

1980 April 3-5 Cyclone "Wally", severe gale.

Effects: 14 deaths, 2 missing, 10,000 homes heavily damaged from flooding and landslides. Extensive damage to roads. Heavy loss of livestock, pasture and crops in certain areas. Amount allocated from SPEC Disaster Fund F \$ 10,000. Total allocated to Fiji to date is F \$ 20,000.

Tonga:

1977 December 25-26 Hurricane "Anne".

Effects: considerable damage to crops and houses. No records indicating any loss of life. Amount allocated from SPEC Disaster Fund F \$ 10,000.

1982 March 3, Hurricane "Isaac".

Effects: five deaths, and extensive and widespread damage to houses and crops. Considered the worst storm in recorded Tongan history, "a colossal disaster". Amount allocated from Disaster Relief Fund F \$ 15,000. Both the 1977 and 1982 contributions were utilised for relief work, housing, food, medical etc. Total allocated to Tonga to date is F \$ 25,000.

Solomon Islands:

1977 April, Cyclone.

1979 February, Cyclone "Kerry".

Effects: extensive damage to eastern and southern parts of the country, including 7000 homeless and three children dead, three bridges washed away and three ships forced aground. Amount allocated from SPEC Disaster Relief Fund F \$ 10,000 - utilised mainly for purchase of food for three to four months.

Niue:

1979 December, Cyclone "Ofa".

Effects: considerable damage to agricultural crops, taro etc, minor damage to buildings but significant damage to wharf area and fishing fleet. Amount allocated from SPEC Disaster Relief Fund F \$ 10,000.

Federated States of Micronesia

1979 November, Cyclone "Tip".

Effects: extensive damage sustained in Truk, Ponape and Yap. Damage in Truk: 41 houses, productive coconut trees, pandanus, breadfruit trees, banana trees and taro gardens. Damage to public utilities and private properties was estimated at US \$ 87,000. In addition docks, schools, dispensaries, sea walls, crop dryers and warehouses were damaged. Amount allocated from SPEC Disaster Relief Fund F \$ 10,000 - used mainly for assistance with relief work.

References

Commonwealth Secretariat (1976)

Correspondence: South Pacific Bureau for Economic Co-operation/James Lewis, 27 August 1982.

## Annex 17

### The Five Countries of Special Reference (Map 1)

#### 1. Antigua and Barbuda (Map 2)

Discovered by Christopher Columbus in 1493 and first colonised by the English in 1632, Antigua was declared a British Possession in 1667 and governed as one of the Leeward Islands Colony. Since 1967 Antigua, with Barbuda and Redonda, has been an Independent State associated with the United Kingdom, and a Member of the Commonwealth. Antigua has full internal government, the United Kingdom remaining responsible for external affairs and defence.

Sugar cane and sea-island cotton are cultivated, and principal products are sugar, molasses, rum, and cotton. Tourism is of increasing importance.

The capital and chief sea-port is St Johns on the eastern side of the island (Map 3).

#### 2. The Republic of Cape Verde (Map 4)

Five hundred and sixty kilometres WNW of Cape Verde (Senegal), the Cape Verde Islands are an archipelago of ten islands and five islets in two groups - the Barlavento (Windward) and the Sotavento (Leeward) recognising the north-east as the direction of the prevailing wind.

The islands were uninhabited before discovery in 1460 and colonisation by Portugal, and are more widely known now as the birth place of trans-Atlantic hurricanes than for the deaths of thousands of people in recurrent famines.

The capital is Praia on Sao Thiago in the Sotaventos. The islands are of volcanic origin and the island of Fogo is active and is the highest peak (2831 m).

Fish and fish products are exported: large quantities of cereals are imported.

3. The Comoro Islamic Republic (and Mayotte) (Map 5)

Between the Mozambique coast of the African mainland, and Northern Malagassy, the Comoro Islands are also of volcanic origin of which Grand Comoro is the active peak of Kartala. There are three other islands of Anjouan, Mayotte and Maheli and many islets.

Grand Comoro is the largest island with the national capital Moroni, and contains over half of the national population. The islands are mountainous and fertile, chief crops being vanilla, copra, and oils of citronella and ylang-ylang (perfume).

The population of the Comoro Islands comprises Arabs, Malays, Kaffirs, Malagech, Persians, Creoles, and Europeans from successive colonisation by Portuguese, German, English, and French. Common languages are Swahili, Arabic and French.

Mayotte came under French administration in 1841; Moheli in 1886; Grand Comoro and Anjouan in 1909. Formed as a group administered from Madagascar from 1914-1946, the territory became administratively and financially autonomous in 1947 (severing traditional links with Madagascar), and Independent and a Member of the United Nations in 1975. Mayotte remains a "territorial collective" of France.

In 1975 1800 Comorians were repatriated from Madagascar.

4. The Republic of the Maldives (Map 6)

A total of about 1000 coral islands, 200 of which are inhabited, in 12 atolls; the capital of which is Male on the island and atoll of the same name. No island exceeds thirteen square kilometres area, none is more than a metre and

172  
a half above sea level, and only 19 islands have more than 1000 inhabitants. Male is the crowded capital with 29,000. Masonry for building is obtained as sawn coral.

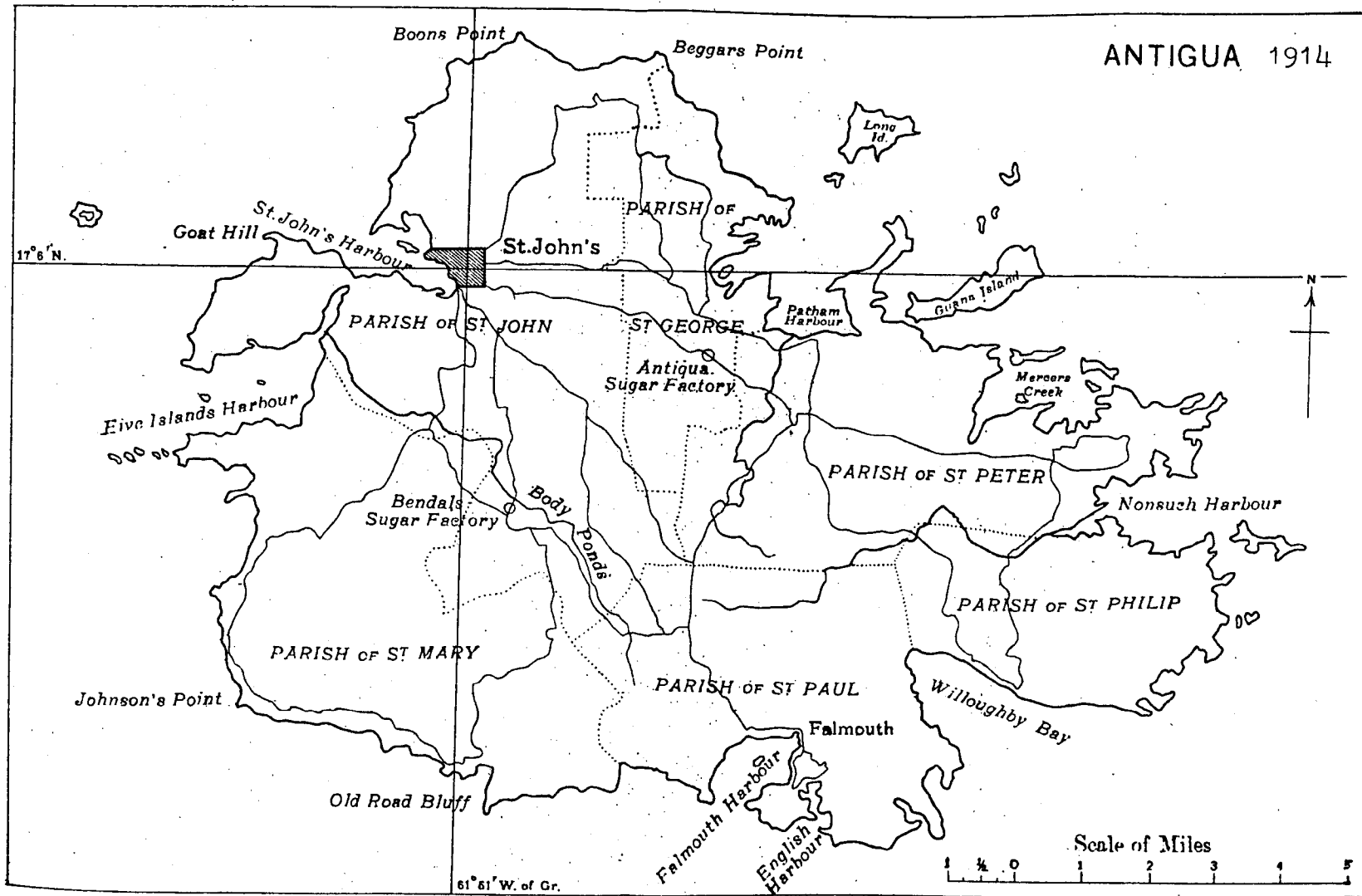
Coconuts are the main export; millet and fruits are also grown. The islanders are famed as fishermen and sailors. Salted fish was formerly exported to Colombo and rice imported from Calcutta.

Formerly a dependancy and protectorate of Ceylon from 1807, the islands became a sultanate protected by Britain in 1948, and an independent Republic in 1965. Britain never had a presence in Male, and the Republic is free from any colonial or neo-colonial dependent relationships.

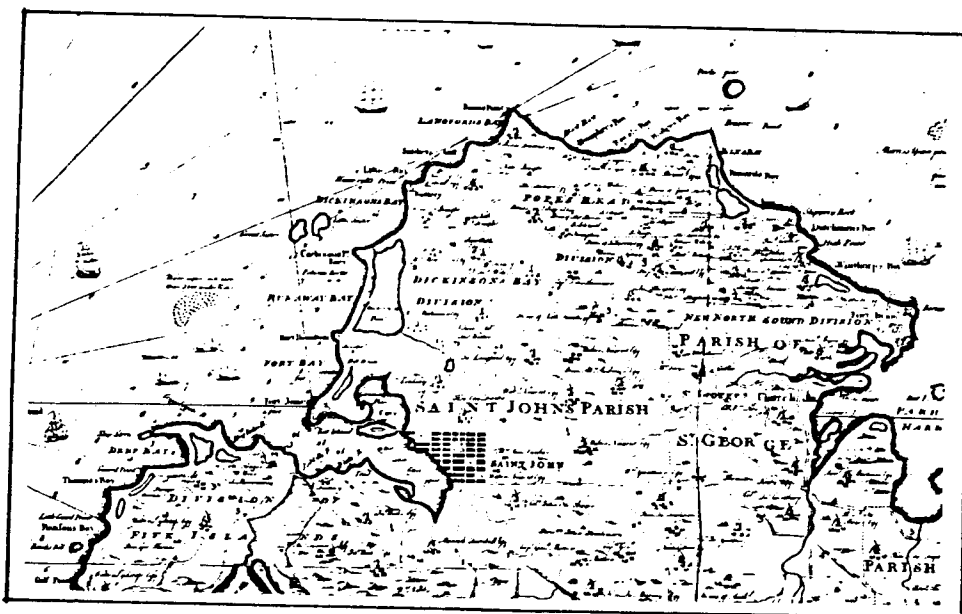
The Republic of the Maldives was admitted as a Member of the United Nations in 1965, and became a Special Member of the Commonwealth in July 1982.

##### 5. Western Samoa (Map 7)

Savai'i and Upolu, two small islands of Manono and Apolima, and several uninhabited islets form Western Samoa. Formerly part of the Navigator Islands, Western Samoa was established at the Treaty of Berlin in 1899, made politically separate from American Samoa, and governed by Germany. At the outbreak of the First World War, administration of Western Samoa until 1920 when the country became a Mandated Territory of the League of Nations under which New Zealand continued administration until 1947; and afterwards under a UN Trusteeship Agreement until 1962. Western Samoa became Independent and a member of the Commonwealth in 1962, and a Member of the United Nations in 1972.



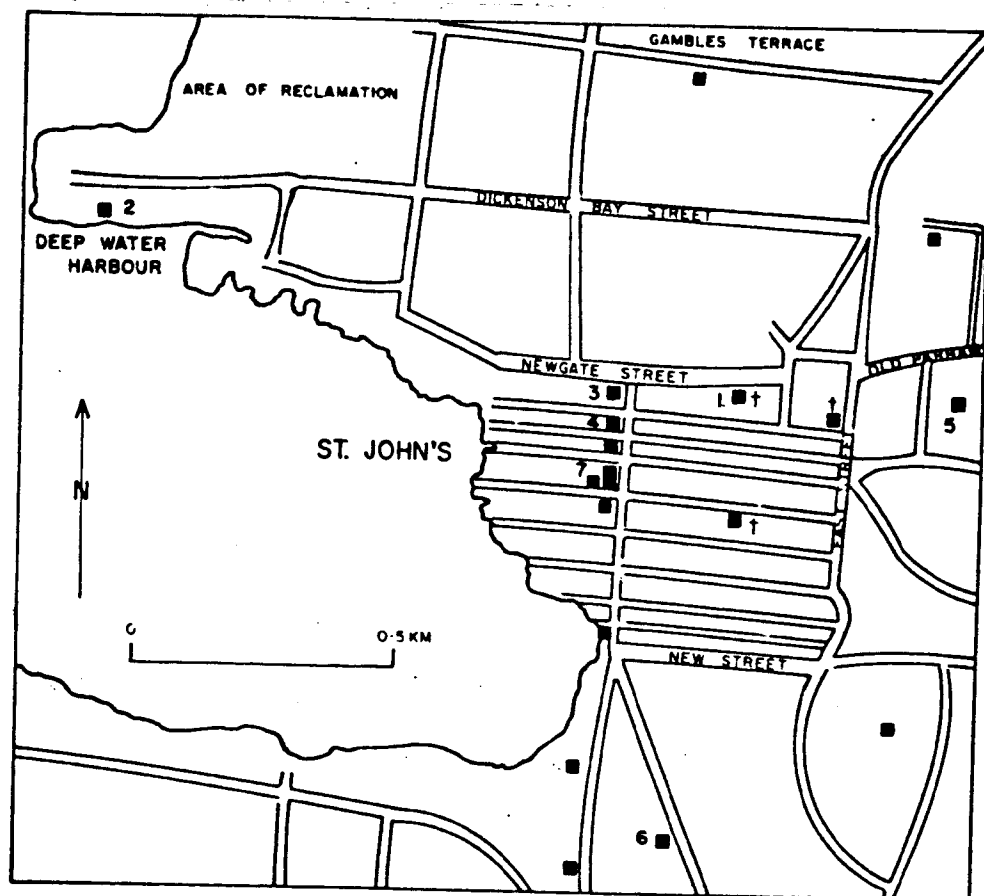
Map 2



Map 3 ANTIGUA 1748 (Baker)

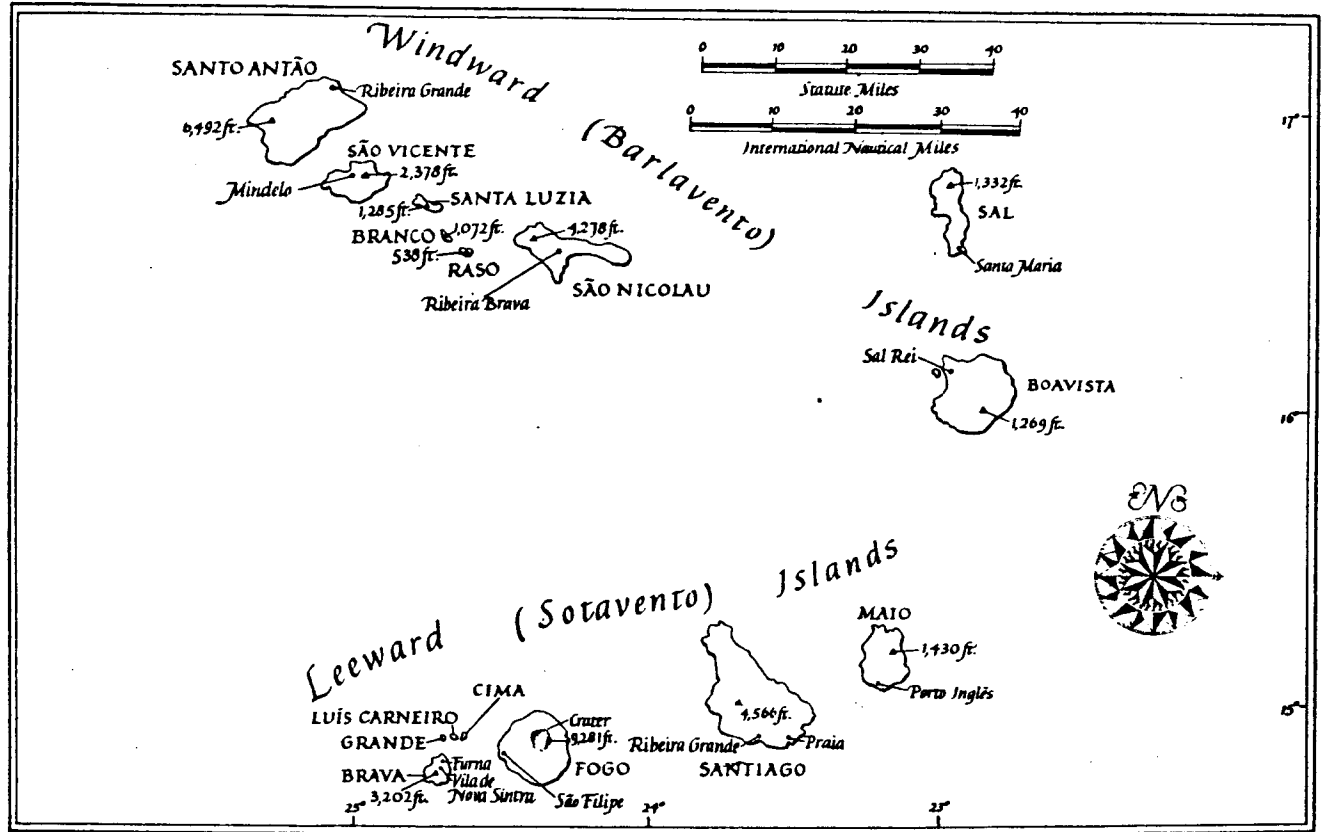
Note: Unless on Baker's map of 1748 St John's has been exaggerated in size, the capital was larger then than in 1974.

Map 8 ANTIGUA St John's 1974 showing damaged buildings



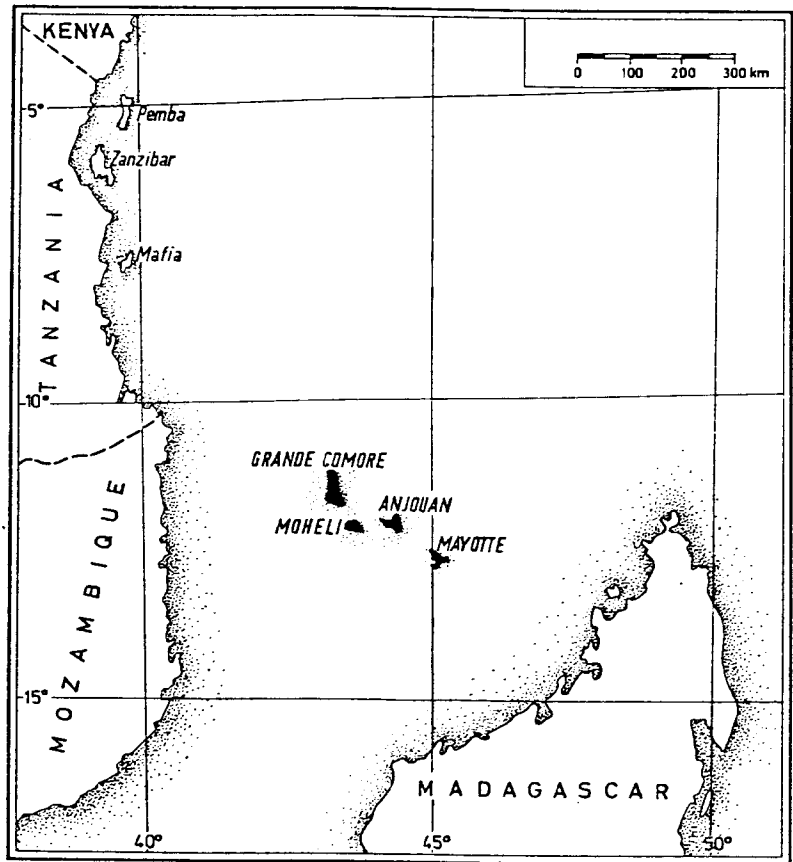
1. Anglican Cathedral
2. Deep Water Harbour
3. Police Station
4. Court House
5. Prison
6. Health Centre
7. Various Banks

Source: Tomblin and Aspinall (1975)

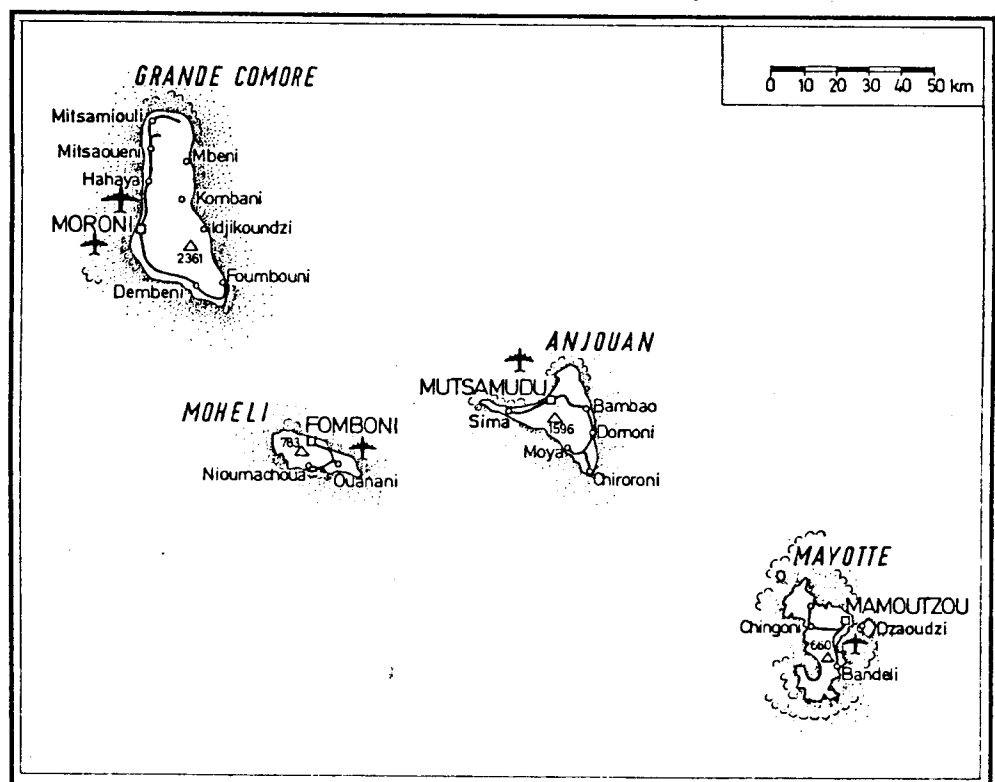


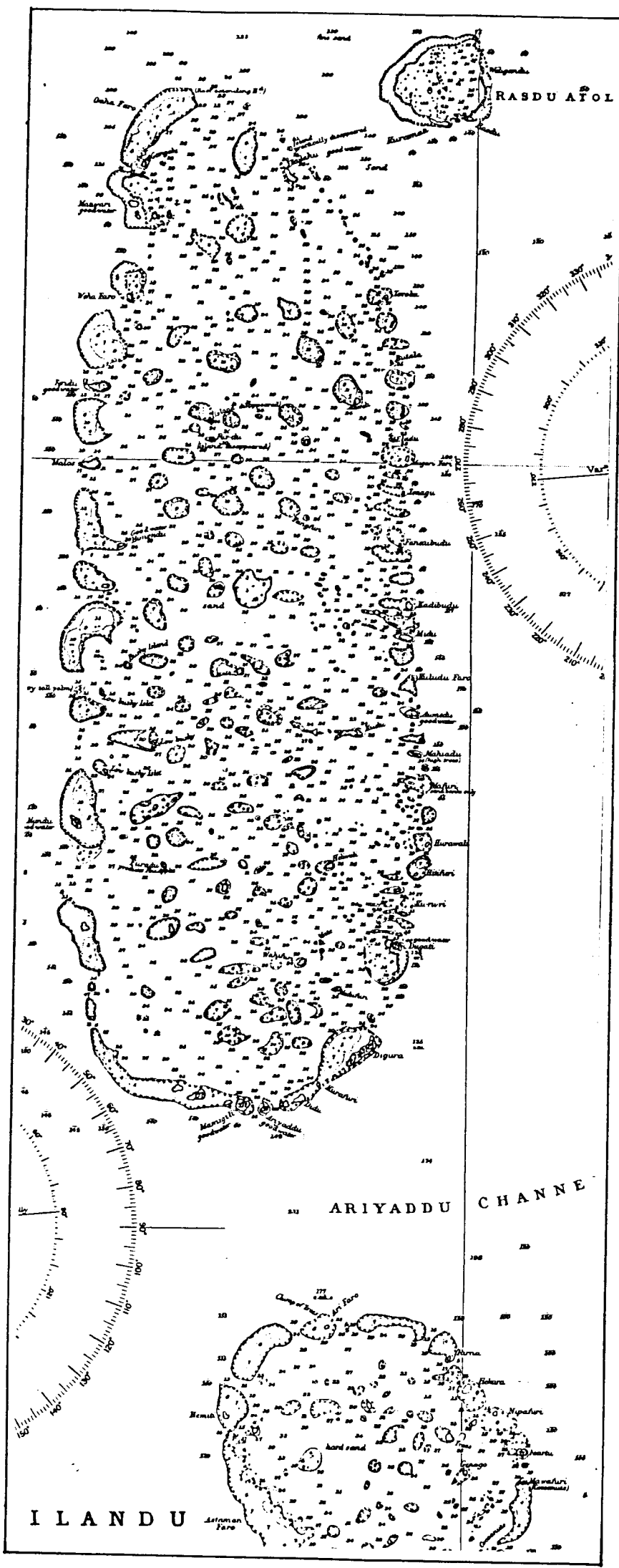
Map 4 THE CAPE VERDE ISLANDS





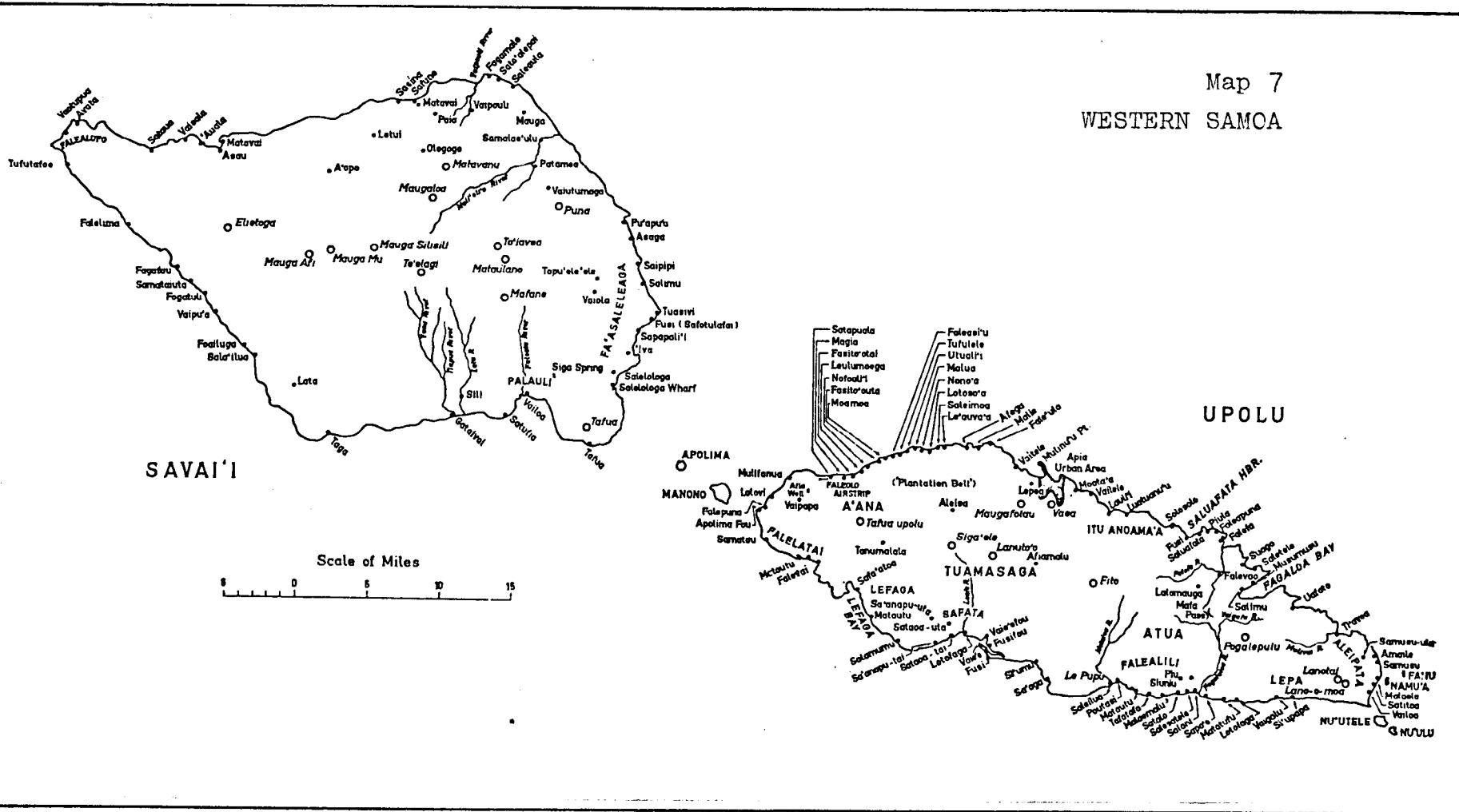
Map 5 THE COMORO ISLANDS





Map 6  
 THE MALDIVE ISLANDS  
 A Typical Section  
 of Navigation Chart  
 (showing Rasdu, Alifu  
 and Faafu Atolls.  
 Alifu Atoll lies WSW  
 of Male).

Map 7  
WESTERN SAMOA



ANNEX 18Terms of Reference for the StudyBackground and Justification

The Trade and Development Board, in its decision 247 (XXIV) of March 1982, requested the Secretary-General of UNCTAD, "in undertaking preparations for the sixth session of the Conference on Trade and Development in 1983, while focusing on a selective agenda, to pay due account to the problems of island developing countries, and in consultation with governments, in particular those of island developing countries and including international organisations with responsibilities in development co-operation and natural disasters situations, to ensure that documentation and material is available to the sixth session of the Conference that will allow the Conference to address effectively the problems of island developing countries."

UNCTAD V had decided, in its resolution III (V), para 4, that UNCTAD, in co-operation with regional and other competent institutions, should carry out in a co-ordinated manner and taking into account the work already done in this field, in-depth studies to analyse the common problems of island economies and the constraints inhibiting their economic growth and development, in particular the role of the economic and geographic factors in the problems of the island developing countries.

In para 2 (e) (1), the same resolution pointed out that islands are often subject to natural disasters (tropical storms, hurricanes, cyclones, floods, droughts, volcanic eruptions, earthquakes, tidal waves, etc). It called for efforts at the national, regional and global levels, bearing in mind the activities of the Office of the United Nations Disaster Relief Co-ordinator to improve methods of mitigating or preventing damage from

natural disasters. The scope for setting up or improving regional or inter-regional disaster insurance schemes or funds should be explored.

UNCTAD therefore plans to undertake, in collaboration with UNDRO, a study of the incidence of natural disasters in island developing countries (idcs) and the response to them.

#### Outline of the Study

The study will cover the following:

An examination of the influence of natural disasters on the economies of idcs liable to them, with particular reference to their effects on the balance of payments. This section should consider the influence of:

- a) the damage done by the natural disaster (eg loss of export crops).

It should, however, not restrict itself to the effect of individual disasters, but consider the long-term economic implications of proneness to particular types of disaster, which may be positive compared to similar regions free from the natural disaster in question (eg ample rains, which may be associated with location in a hurricane belt, or fertile soil with volcanoes).

- b) disaster preparedness. The impact on the balance of payments of measures of disaster preparedness, including long-term structural and social adjustments to disaster risks, should be examined.
- c) relief and reconstruction. The positive and negative aspects of these over the long run should both be examined.

#### Geographical coverage

The study will consist primarily of case studies of four least developed countries which are also idcs: Cape Verde, Comoros, Maldives and Western Samoa. Antigua has been added for Caribbean representation, and the study will draw the conclusions relevant to idcs in general.

Consultant

The Consultant may wish to visit Paris, London and Lisbon in order to collect long runs of disaster data for the island LDCs selected for particular scrutiny. Two visits to Geneva will be required for briefing and to finalise the text of the report.

As the study is intended for presentation to UNCTAD VI, it must be completed by the end of 1982. It should be restricted to 40 pages double-spaced typescript.

It is envisaged that it be undertaken by an economist with an interest in the long-term adjustment of societies to their natural and economic environment and familiar with the economic aspects of natural disasters.

Duration: 3 months.

ANNEX 19References

References are arranged under the following heads

1. Island Developing Countries and Natural Disasters.

2. Socio-economics:

Cost and measurement

Rehabilitation; reconstruction

Vulnerability; prevention; and preparedness

Insurance and funds.

3. Countries of special reference:

Antigua

Cape Verde Islands

Comoro Islands

Maldivé Islands

Western Samoa.

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