

Part II

THE ECONOMIC AND SOCIAL EFFECTS OF NATURAL DISASTERS
IN ISLAND DEVELOPING COUNTRIES 2/

A. Island developing countries and natural disasters: general remarks

1. Highest proportional impact

50. In recent years satellite pictures have made it possible for the world to watch while a vast tropical cyclone completely covers one small island country after another. But in a world predisposed towards large size, small countries and small populations have no chance of suffering disasters to compete in total magnitude with what can happen in continental countries. Yet the often overwhelming proportional impact of disasters in small countries is reason for special concern. 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 the frequency of recurrence is impressive.

51. The economic and social cost of natural disasters falls most heavily on small 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. Thus the smaller developing countries are the most vulnerable of all to the economic and social effects of disasters. On the other hand, in the case of archipelagic countries disasters can be greatly contained (epidemic and volcanic eruption) or divided (tropical cyclone; earthquake), protecting the national entity from the over-all severity.

52. Tropical cyclones have been the type of disaster most responsible for high proportional losses among island countries. Hurricane "Bebe" in 1972 left over one fifth of Fiji's population homeless. Hurricane "David" in 1979 destroyed 80 per cent of Dominica's housing stock. About 20 per cent of housing in Tonga was destroyed or severely damaged by Hurricane "Isaac" in March 1982, together with all the breadfruit and 90 per cent of the banana crop, as well as substantial losses to other crops. 3/

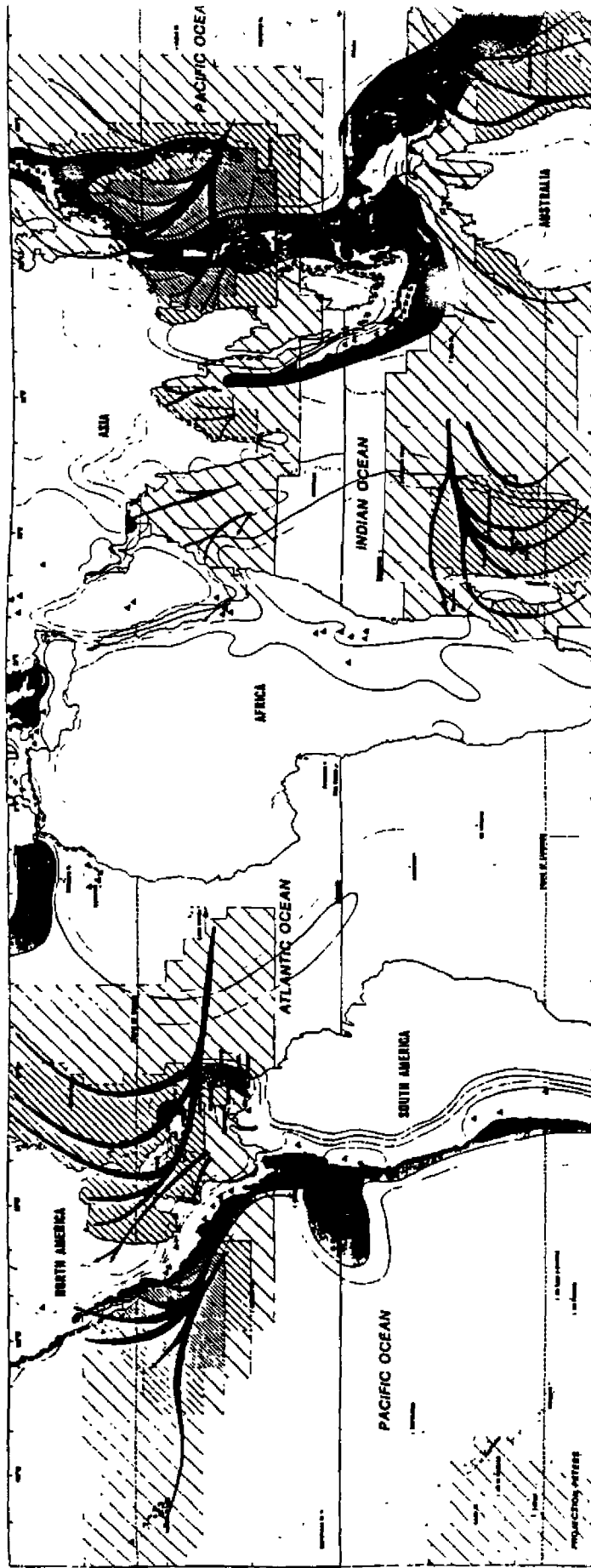
53. Sixteen thousand people in St. Vincent, 15 per cent of the population, were temporarily evacuated in 1979 during the eruption of Mt. Soufrière; in Guadeloupe 72,000 people, one fifth of the population, were evacuated when another Soufrière erupted in 1976. Indeed, the entire population of Tristan da Cunha was evacuated for similar reasons in 1961, and in 1946 2,500 people, 7 per cent of Tonga's population, the total population of the volcanic island of Niua'fo'u were evacuated. Only one quarter of them have since returned.

2/ Part II of this study, including the annexes, was prepared by the UNCTAD secretariat, but it is largely based on work by James Lewis, a consultant engaged for this purpose by UNDR0.

3/ See "assistance to Tonga", report of the Secretary-General (A/37/583), November 1982.

CARTE MONDIALE DES RISQUES NATURELS EN MILIEU OCEANIQUE TROPICAL

WORLD MAP OF NATURAL HAZARDS IN THE TROPICAL OCEAN



RISQUES NATURELS

Échelle: 1:10 000 000
 1 cm = 100 km
 1 inch = 1000 miles

PROJETÉ PAR LE SERVICE NATIONAL DES CARTES GÉOLOGIQUES ET GÉOLOGiques
 U.S. GEOLOGICAL SURVEY
 WASHINGTON, D.C. 20508
 1974

FRÉQUENCE MOYENNE ANNUELLE DES VENTS CYCLONAIQUES ACCOMPAGNÉS DE ORAGES OU DE SÉISMES (PLUS DE 83 km/h)

moins de 1 fois par an
 1 à 2 fois par an
 3 à 5 fois par an
 6 à 10 fois par an
 11 à 20 fois par an
 21 à 30 fois par an
 31 à 40 fois par an
 41 à 50 fois par an
 51 à 60 fois par an
 61 à 70 fois par an
 71 à 80 fois par an
 81 à 90 fois par an
 91 à 100 fois par an

PROXIMITÉ MOYENNE ANNUELLE DES VENTS CYCLONAIQUES ACCOMPAGNÉS DE ORAGES OU DE SÉISMES (PLUS DE 83 km/h)

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54. The extremely high vulnerability of some of the smallest countries is illustrated by Niue, where 83 per cent of the population was made homeless by a cyclone in 1960; Dominica, where 73 per cent of the population was made homeless by a cyclone in 1979; and St. Lucia, where the damage inflicted by a cyclone in 1980 amounted to 99 per cent of GNP.

55. An examination was made of 112 reported earthquakes, tropical cyclones, and floods between 1977 and 1981, with random information from some disasters in earlier years. 4/ Percentages of populations made homeless can be estimated for 54 of the cases examined; estimates of damage and loss as a share of GNP can be estimated for 38 of them. The share made homeless is over 5 per cent in 11 cases, of which 8 were island developing countries. Damage as a share of GNP was over 5 per cent in nine cases, of which seven were island developing countries.

2. Island vulnerability

56. The tectonic, volcanic, and other geomorphic processes which created islands in the first place continue to change island structure and formation in ways which can on occasion bring disaster for island inhabitants. Earthquakes have raised or lowered islands, and caused lagoons to drain and dry. Volcanoes have shaped and re-shaped islands, and tropical cyclones have built or shifted massive sections of island. 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.

57. So successful are adjustments to hazard that average life expectancy at birth in island countries is significantly higher than in continental countries at the same levels of income. 5/ Life expectancy is low in the Comoros (46 years) and the Maldives (47 years), 6/ but the explanation in these cases is to be sought in poor environmental health and nutrition in general, rather than in the incidence of natural disasters. Availability of 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 effects. Attempts to generalize about disasters and about islands are misleading, as variations in magnitude, force, locality, season and population introduce unique combinations. This kind of diversity is frequent in island analysis of any kind. Vulnerability and dependence on relief from outside are, however, increasing in some small islands where there is less capacity and flexibility for adapting to changing social and economic expectations and activities. The fragile ecological balance required for food production in the hazardous environments of small islands is increasingly threatened not only by sudden changes in natural systems, but also by the inexorable change in socio-economic systems.

4/ Information on disaster cost and homelessness was taken from "Courier" (EEC/ACP) and "UNDRO News". Both sources use extracts from nationally prepared estimates.

5/ Dommen (1980) (see bibliography at the end of this study).

6/ See "Basic data on the least developed countries" (TD/B/AC.21/10).

58. Islands remain highly vulnerable to diseases introduced from outside and the proportional impact on small countries can be extremely great. The influenza epidemic of 1913 in Samoa (then Western Samoa) was one of the most disastrous epidemics anywhere in the world during the first half of the twentieth century. On the other hand, and as an example of the protective value of island isolation, neighbouring American Samoa was untouched by the epidemic (see annex 12). However, the conveyance and re-emergence of some diseases is continuing as one negative by-product of air travel, and thus of tourism, in attractive island countries.

59. Variable nutrition levels, affected by intermittent or frequent food shortages and conditions of environmental health, may have permitted disease and epidemics of high proportional impact and frequency. Though there are certain national similarities and national experiences and conditions which make possible some comparisons between island countries, there are important 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 (see annex 11). The type, quantity and season of food production may vary considerably within as well as among islands. Islands with high altitudes catch rainfall, but they also suffer from 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 can be 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 but had little effect on their capitals.

60. 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 underlie it - and which disaster in turn affects.

61. Exposure to disaster brings exposure to disaster relief in its aftermath (see annex 11). Sudden bounty causes some to interpret disasters as a timely windfall to compensate for inadequacies in development assistance (see annex 6), and others to see the long-term costs of disaster relief, if only because it obscures social and economic factors contributing to disaster, as a factor making for increased dependency and vulnerability. Disasters themselves are part of the over-all processes of inevitable change.

62. Each country has its own unique combination of topography, history, resources, and experience of hazard. Although there are some subnational variations, in islands most factors come together and inescapably and discernibly bear upon one another in ways that are not so obvious in larger countries that have 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.

B. Economic and social effects in five island developing countries

63. Five island countries were selected for special attention in this study. They are: Antigua and Barbuda, Cape Verde, the Comoros (with Mayotte), the Maldives, and Samoa. The four last named are also least developed countries.

Map 2
LOCATION OF THE FIVE ISLAND COUNTRIES

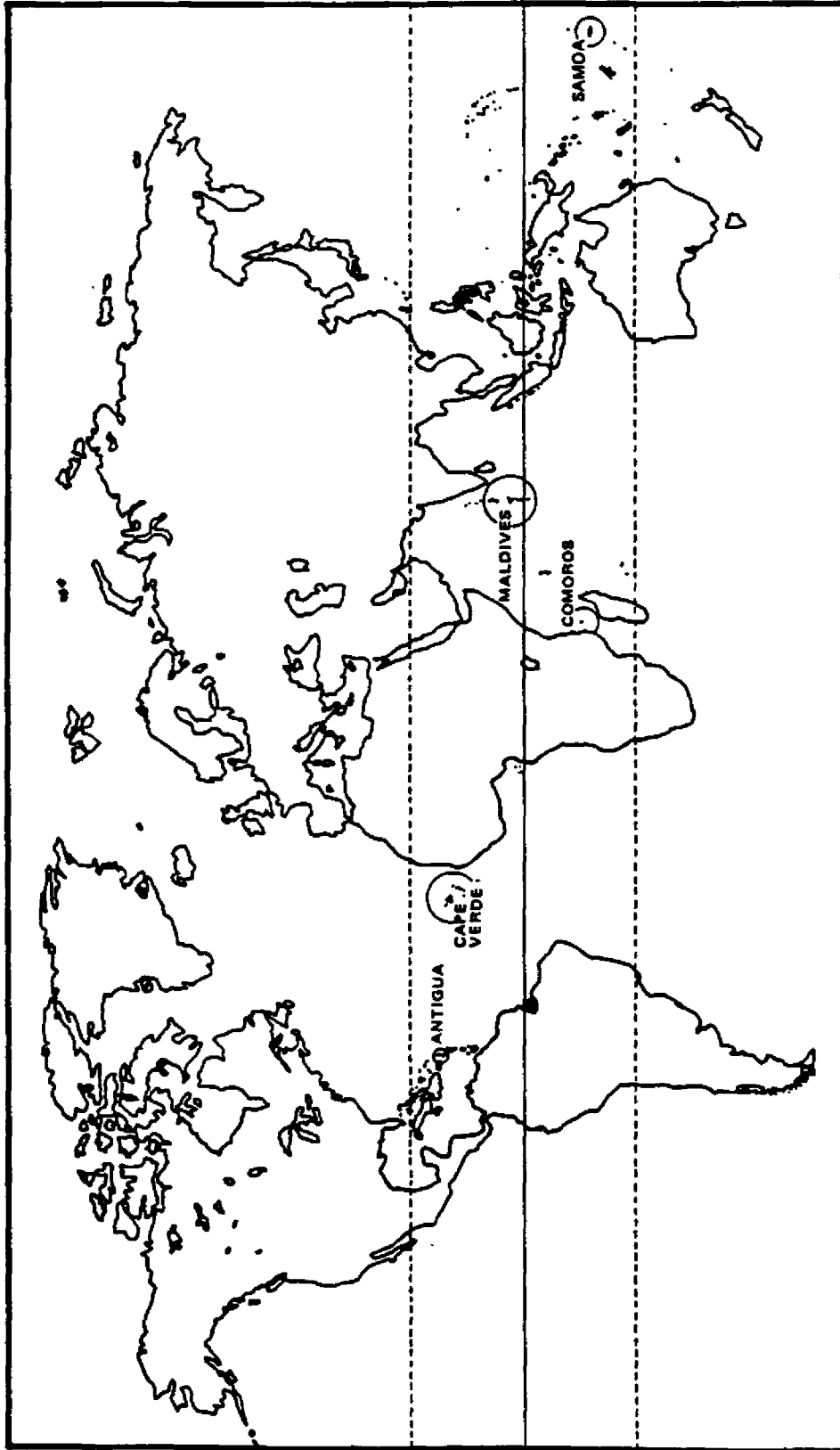


Table 1
Data on the five selected island countries

	Antigua and Barbuda	Cape Verde	Comoros	Maldives	Samoa
Population ('000) (1981)	77	329	369	159	158
No. of inhabited islands	2	10	4	220	4
Distance from nearest continent ^{a/} (km)	900	700	350	800	3 000
Land area (sq. km)	442	4 033	2 171	298	2 935
Population density (1981) (inhab./sq./km)	174	82	170	534	54
Maximum overall length (km) ^{b/}	115	323	275	1 000	165
Dispersion (metres/person) ^{c/}	1.49	0.98	0.75	6.29	1.04
Annual rate of population growth (1970-1981)	0.9	1.9	2.9	3.1	1.0
GNP (1980) (\$ millions)	100	100	100	40	119 ^{e/}
GNP per capita (\$) (1980)	1 270	300	300	260	770 ^{e/}
Urban population (%) ^{d/}	31	20	32	21	21
Labour force (% in agriculture) (1980)	..	56	64	77	75 ^{f/}
Demographic indicators ^{d/}					
Expectation of life at birth (years)	62	60	46	47	63
Crude death rate (per thousand)	6.8	8.2	18.2	11.8	2.8
Infant mortality rate " "	24.5	104.9	51.7	118.3	8.8
Crude birth rate " "	19.8	25.7	47.3	40.5	20.1
Year of independence	1981	1975	1975	1965	1962
<u>Languages</u>					
A = Arabic C = Creole E = English) official	E	P	F	L	E
F = French L = Local P = Portuguese) major	E	PC	L	L	L
<u>Ethnic composition</u> A = African					
E = European P = Pacific Islander	A	E;A	A;S	S	P
S = Asian					
<u>Religion</u>					
C = Christianity; I = Islam	C	C	I	I	C
Geological formation	Volcanic Sedi- mentary	Volc.	Volc. Atolls		Volc.

Sources: TD/279 (Part II), Caldwell, J.C. et.al. (1980)(see bibliography).

a/ Distance from island country capital to nearest continental capital or important town.

b/ Distance between the extreme points of the country.

c/ Difference between the extreme points of the country divided by its population.

d/ Most recent estimates.

e/ 1979.

f/ In subsistence agriculture.

64. Map 2 shows the location of the five countries and table 1 gives some basic socio-economic comparisons. Annexes 1 to 10 and 12 examine a series of disasters in these islands.

65. A first observation is the wide variety among the countries examined. Generalizations about island countries seem to start and end with their being islands. Even disaster experience is varied. 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 cyclones. Furthermore conditions created by one event can affect vulnerability to the next event. Fire and epidemic are particularly relevant in this respect (cf. annexes 2 and 12).

66. In addition to these most obviously "natural" disasters are those caused by warfare, political unrest, inflows of refugees or returnees. War has not been treated in any detail in this study. Nevertheless, its impact as a factor aggravating natural disasters is on occasion apparent, whether it be war overseas (annex 4) or war in the disaster-stricken country itself (annex 10). The volcanic eruption of 1977 on Grande Comore (annex 7) coincided with the problem of resettling some 20,000 Comorian returnees from Madagascar.

1. Temporal and spatial analyses

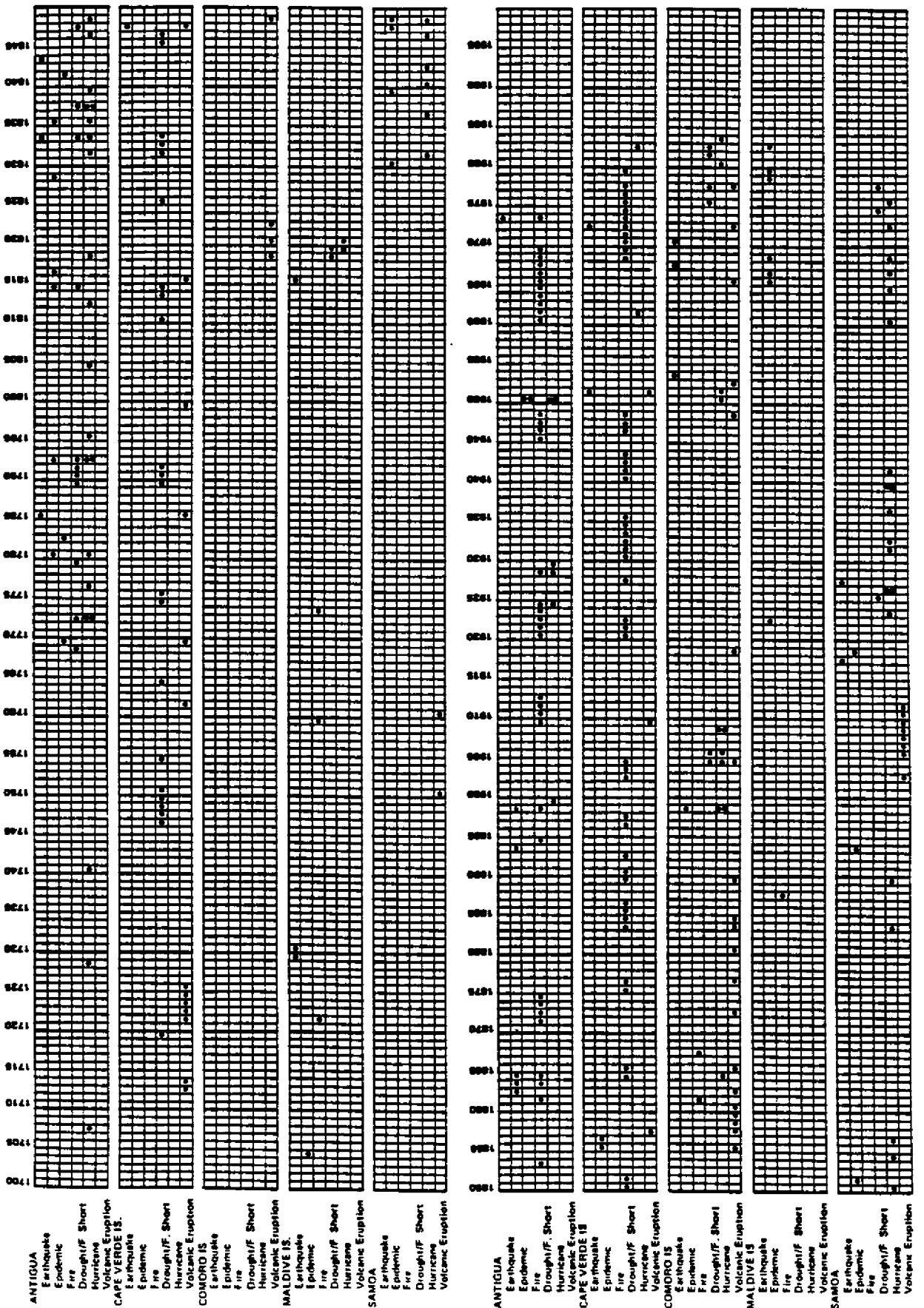
67. Two chronologies of disaster events are included as figure 1 and annex 15. Figure 1 presents a graphic chronology of damaging events in all five countries studied, from about 1700 to 1982. Records for the Comoros commence in 1828; and for Samoa in 1750 (or for practical purposes 1830). In annex 15 an annotated chronology gives the series of damaging events in sequence, with brief notes on the damage and losses sustained. Table 2 presents a crude indicator of liability to disaster.

Table 2
Frequency of disaster

Country (1)	Number of years		Frequency
	in which disaster occurred (2)	for which information available (3)	(3) ÷ (2) (4)
Antigua and Barbuda	86	319	3.7
Cape Verde	89	522	5.9
Comoros	45	156	3.5
Maldives	15	279	18.6
Samoa	48	233	4.9

The lowest factor reflects highest incidence of damaging events for the years for which data are available, but the information may well be incomplete (see annex 8 in particular).

Figure 1
GRAPHIC CHRONOLOGY OF DAMAGING EVENTS



68. Frequency and timing may be as significant as the strength of impact of a disaster, its damaging and disruptive effects 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 Comoros, their pairing and timing made them particularly damaging (annex 6). Had the occurrence of earthquakes in Antigua and Barbuda 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.

69. Drought is a relative concept. Though in Antigua and Barbuda drought caused suffering and some deaths, the real concern was the effect on sugar production (annex 1). Had it not been for the colonial administration's concern for exports, drought might not have been recorded at all. "Drought" in Antigua and Barbuda is not comparable with drought in Cape Verde. Rainfall figures for the two countries show why recurrent catastrophic famine occurred in Cape Verde and simply depressed sugar exports in Antigua and Barbuda; and why Antigua and Barbuda was to receive Cape Verdean migrants and not vice-versa. In the 75 years between 1875 and 1949 the lowest rainfall for Antigua and Barbuda was 647 mm for 1930. Only one annual maximum in Cape Verde exceeded that level - 1,000 mm in 1906, which was a rare peak. The next highest was 580 mm in 1893. The average annual rainfall for Praia for the 63 years recorded (during the 75) was 248 mm; the average for Antigua and Barbuda for the same period was 1,092 mm.

70. That epidemics and other events are related is a widely held fear. Oddly enough, the case studies reported here provide little evidence of such a relationship. In Antigua and Barbuda the epidemic of 1792 followed four years of drought and food shortage, and in 1862-63 epidemic was concurrent with food shortage years. However, since the epidemics of 1847, 1849 and 1851 in Samoa that followed the hurricanes of 1846, 1848 and 1850 were of influenza, whooping cough and mumps, they could hardly be directly imputed to the hurricanes. (On the other hand, diarrhoea and dysentery also followed the hurricane of 1850 (see annex 10)).

2. Fluctuations in national production

71. In the absence of specific accounts for the 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. In the Comoros, for instance, economic magnitudes are subject to wide fluctuations in any event. GDP per head declined by 1.3 per cent in 1977, ^{1/} but this may well have been due to the growth in population of 6 per cent (the returnees) over and above the normal growth rather than to the volcanic eruption. Given these two events, it seems surprising that import volume fell by 4.8 per cent in 1977, but it rose by over 20 per cent in both 1976 and 1978. In short, no immediate effects of the events of 1977 can be clearly discerned in the statistics of the national economy. In the Maldives, normally accepted economic fluctuations in previous years (e.g. fishing) were no less than those continuing through 1978. Whatever the economic impact of the cholera epidemic in 1978, it was wholly subsumed and disguised by other economic factors and is not separately discernible. And yet the epidemic caused 219 deaths and suffering for hundreds more.

^{1/} Basic data on the least developed countries, note by the UNCTAD secretariat (TD/B/AC.21/10), 2 September 1982.

72. The epidemic in 1979 was not an unusual event. It continued a long tradition of epidemics in the Maldives, 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 9). To change the tradition of epidemics 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, economic indicators may reveal positive changes, but they may also reveal costs or, for that matter, continue to reveal nothing. The 1974 earthquake in Antigua and Barbuda was a sudden, rare, and therefore precisely definable event. Yet there is no clear evidence that it had any significant impact on the national economy. Those variations which may have been attributable (in whole or in part) to the earthquake are not particularly significant (annex 3).

73. 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 no disaster, and (b) positive as well as negative effects between sectors in disaster years. Disaster relief accounts for less than one third (average) of the total estimated disaster cost.

74. Economic circumstances can even conceal social reality. One effect of the Antigua earthquake of 1843 was a marked increase in government revenue from receipts of customs taxes on imported reconstruction materials in 1844 and 1845 (annex 2). Remittances from Cape Verdeans overseas, migrants from famine, contribute largely to the balance of payments.

75. Disasters are not isolated events; they are part of a process of continuing change in social, economic and natural environments, to which they contribute. One disaster will affect the underlying conditions for the next; the damaging effects of earthquake on crucial water conservation systems on Fogo (annex 5), and the seriousness of the eruption of 1977 on Grand Corozo (annex 7) in the political and social context in which it occurred can be taken as examples.

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

3. Adaptation and change

77. In the knowledge that there were certain benefits to be gained by the habitation of hazardous locations, populations have invariably formed adaptive systems in responses to hazard. They included the utilization of wild tubers, roots (annex 11), 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 for the purpose of survival. Traditional house forms and construction systems were one sector of this wide variety of adaptive systems. 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 taking effect, there has been adaptation to a wide range of other influences and pressures which have not always been compatible with one another. Some changes, self-motivated or superimposed, may have removed options for adaptation once available.