

ANNEXES

Annex 1

RAINFALL, DROUGHT AND SUGAR PRODUCTION IN ANTIGUA

1. During the period of colonial administration in Antigua, by far the most important crop was sugar cane. Before 1898 cane disease was the dominant influence on production. It is difficult to distinguish the effects of disease from those of drought. Successful experiments with resistant cane brought disease under control by 1898. Thereafter the relationship between rainfall and sugar production was clearer, though still masked in small degree by changes in agricultural methods, variations in acreage, new varieties of cane, and factory efficiency.

2. 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.

Rainfall of preceding year	No. of years	Tons of sugar: yearly average
Below 30 inches <u>a/</u>	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
Av. 50.88 inches	25	av. 19,761

a/ One inch = 25.4 millimetres.

3. The average rainfall for the 76 years from 1874 to 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 16 years of severely low rainfall, there were a further 17 years with rainfall below average. Over the same 76 years (1874-1949) there are, however, only 14 years where drought has been significant 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.

4. Drought in 1863-1865 had an obvious impact on a mortality which at the time was normally around 48 per 1,000 population: 5,222 deaths were recorded for the period - 14.4 per cent of the population.

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Annex 1

7. 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".

8. The beneficial effect of a hurricane in bringing rainfall and ending a serious three-year 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, almost ten inches above that of the preceding year.

References

Colonial Reports, Antigua: (1845-1933 and 1947-1954); Watts, F (1906);
and Auchincloss (1956) (See bibliography).

Annex 2

THE ANTIGUA AND BARBUDA EARTHQUAKE OF 1843

The earthquake

1. Earth tremors had been a common occurrence during the eighteenth (and possibly the early nineteenth) century. But "At 20 minutes before 11 o'clock on Wednesday morning, 6 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".

Damage and effects

2. A number of stores built since the fire of 1841, private dwelling houses ("that is those built of stone or brick"), "almost every kitchen and oven on the island" and cisterns were among the structures destroyed or very severely damaged.

3. St. John's Cathedral was badly damaged and declared "unfit for public service" and several parish churches, chapels or mission houses were destroyed or badly damaged, except one "not much, being a wooden structure". a/ All the stone buildings on Barbuda (except one school-house) were destroyed.

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

Public revenue and expenditure

5. The first Colonial Report available after the year of the earthquake, that for 1845, was pleased to record an excess of government revenue over "a very liberal expenditure". 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 dutiable goods, and particularly the productions of the United States; although the declared value of imports generally was less in 1845 than the preceding year".

6. The effects of the earthquake on the economy persisted for a few more years. 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".

a/ St. John's had been destroyed by fire in 1841, and it seems that much rebuilding 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.

7. "Expenses from earthquake" still appeared in government accounts in 1847/48. 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.

Public loan

8. 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 Her Majesty's 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 1/4 per centum, have rendered this obligation a comparatively light and easily manageable one". (Governor MacKintosh).

9. These concessions had been hard fought for (rending between the lines of Colonial Reports) and the burden 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". Advances had been made by the Antiguan administration from the public loan to borrowers, who were to repay by instalments to coincide with Antigua's yearly repayments to Her Majesty's Treasury in London.

10. The earthquake loan had disappeared from Colonial Reports only by 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 (See bibliography):

Cheesbrough, H (Rev) 10 February 1843, from St. John's; Keightly, J. (Rev) 18 February 1843, from St. John's; Archives of the Wesleyan Methodist Missionary Society.

Colonial Reports, Antigua (1845, 1846, 1847 etc.: earliest available report is 1845).

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

Annex 3

THE ANTIGUA AND BARBUDA EARTHQUAKE OF 1974

1. 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 is attributed to the early hour of the event. Few people were about and places of work, centres of congregation and commerce, and public buildings were unoccupied.
2. The list of government buildings damaged in 1974 is very similar to that of those damaged in 1843, the reasons being much the same - all were of unreinforced masonry or inadequately constructed reinforced concrete frame buildings. Half of the total accommodation being utilized for government operations was rendered unusable. The Anglican cathedral, rebuilt after the 1843 earthquake, sustained significant damage.
3. 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 persistent drought hazard (annex 1).
4. The principal industrial damage was to the oil refinery, rupturing tanks and pipelines, and resulting in up to one-third of the workforce of the island's largest employer being laid off. An immediate scarcity of bread resulted from the destruction and damage caused to bakeries. ^{a/} Lobster reefs were damaged by the earthquake. Housing losses were sustained mainly in the rural areas, involving mostly buildings of traditional construction inhabited by the lowest income earners, where insurance cover was non-existent or inadequate and family income too low to effect repairs without assistance.
5. On the other hand, in the 132 years since 1843 the Anglican and Catholic cathedrals, parish churches, and chapels had become eligible for reconstruction assistance as places of historical and cultural interest. In a country heavily dependent on tourism, these items are as important as hotels. The hotels, incidentally, were less seriously damaged.

Economic consequences of the earthquake

6. The figure below shows the performance of exports and imports during the decade. The earthquake having occurred on 8 October 1974, its effects are likely to be reflected mainly in 1975. Exports in real terms indeed reached their lowest point of the decade in that year. On the other hand, lobster exports, which had fallen in 1974, recovered substantially in 1975. Import volume was lower in 1975 than 1974, but in any case the trend was downwards throughout the decade. Imports of building materials rose markedly in 1975, but they made up only a small share of total imports.
7. The table below shows GDP in constant prices for the period 1973-1979. Total GDP fell from 1974 to 1976, and recovered almost to the 1974 level by 1978. The bulk of this decline is due to "manufacturing" (line 3), i.e. to the closure of the oil refinery and of the sugar mills. Reports give no indication that these closures were due to the earthquake: more structural economic factors seem to have been responsible. Construction, which was also in decline between 1973 and 1978, did grow in 1976 (not 1975), and by less than 2 per cent.

^{a/} Also damaged in 1843: see annex 2 above.

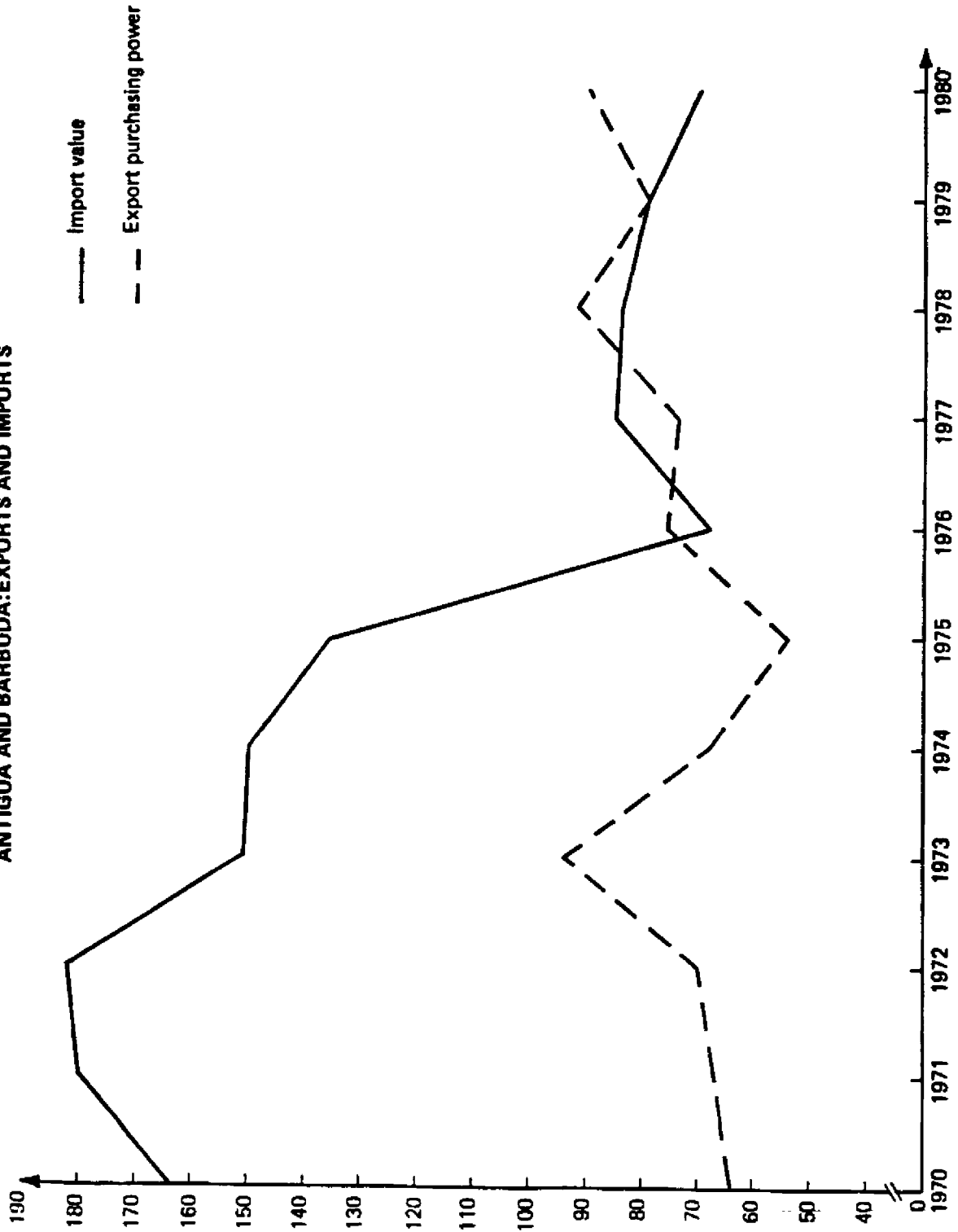
Table 3.1.
Gross domestic product by kind of activity, in current prices

Antigua and Barbuda

	1973	1974	1975	1976	1977	1978	1979
	(Thousand of East Caribbean dollars)						
	At constant prices of 1975						
1. Agriculture, hunting, forestry and fishing	10 969	10 302	9 618	10 785	10 895	11 879	11 389
2. Mining and quarrying	846	944	746	1 028	952	1 051	1 238
3. Manufacturing	11 839	11 629	11 056	4 911	6 095	7 841	10 356
4. Electricity, gas and water ...	798	1 377	1 368	1 343	1 500	1 919	2 206
5. Construction	10 899	9 716	8 958	9 128	8 904	8 519	9 415
6. Wholesale and retail trade, restaurants and hotels	26 007	27 460	26 497	23 879	26 462	29 627	33 535
7. Transport, storage and communication	21 895	21 450	20 068	16 920	19 325	22 275	24 813
8. Finance, insurance, real estate and business services .	24 805	23 819	23 974	24 024	23 997	24 481	24 746
9. Community, social and personal services	20 876	25 139	21 969	22 262	24 874	24 790	24 985
Subtotal	128 834	131 836	124 254	114 280	123 004	132 382	142 683
Loss imputed bank service charge	5 554	4 190	3 698	4 482	5 209	5 265	5 706
Gross Domestic Product	123 280	127 646	120 556	109 798	117 795	127 417	136 977

Source: Yearbook of National Accounts Statistics, 1980, United Nations publication, Sales No.E.82.XVII.6

Figure 3.1
ANTIGUA AND BARBUDA: EXPORTS AND IMPORTS



Source : UNCTAD secretariat (1975 prices).

Annex 4

FAMINE IN THE CAPE VERDE ISLANDS: EFFECTS, RESPONSES AND CAUSES

1. "Drought, hunger and death have dominated Cape Verde for almost two centuries. Since independence, the efforts of the Government, significant aid and international assistance have limited the effects of the present drought cycle. Soil and water conservation works and reforestation are increasingly being intensified in the hopes of a change". a/

2. From 1774 to 1948 (175 years) there were seven periods of severe famine. b/ 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

3. 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 (figure I in part II above and annex 15 below). In this context, volcanic eruption of Fogo has not been regarded as the cause of serious disasters (annex 5). Famine has occasionally been exacerbated by the coincidence of more than one of these hazards.

4. Refer to figure 1 in part II above and annex 15 below for a more 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 only in respect of certain individual islands. c/

5. Famines have become less deadly since the 1940s. 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".

Rainfall

6. Annual rainfall is very erratic. Famines are closely related to low rainfall. This is already apparent from figure 4.2 below. It would be even more evident if the other food shortages (also called "famines" in annex 15) were also taken into account, apart from one or two anomalies. In 1927 in particular a food shortage coincided with high rainfall. d/

a/ Mémoire du Cap-Vert (1981).

b/ Corroborated by several references: see final page of this annex.

c/ In a famine of 1609-11, slaves were "freed" when their owners could no longer feed them.

d/ See also paragraphs 11 and 12 on the 1940-1943 famine below.

Mortality and natality

7. The population of Cape Verde has suffered periods of sudden decline. (Figures 4.1 and 4.3 below). These have coincided approximately with famines, although the extent of approximation suggests that other factors may also have been operating. Population declines were due to emigration as well as to deaths, but as has been shown above, deaths were sometimes on a staggering scale. Mortality in the famine of 1942 reached 207 per 1,000 population or 1 person in 5. In 1940 mortality was 173 per 1,000 population.

8. Annual birth rates have normally fluctuated between 2.5 and 3.5 per cent but have been 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 realistic view might be that could hazard demonstrably be reduced, the psychological need for a high birth rate might be ameliorated.

Emigration

9. Figure 4.4 below combines population and emigration figures. There is an obvious correlation. Emigration followed famine fairly consistently up to around 1950. Figures for deaths given above are contained in the fall of population which obviously takes account also of migration, the greater figure. It is striking that after the 1960s, in the absence of severe famine, rapid increase of population has been paralleled by an equally significant increase in migration. Cape Verdians have traditionally migrated to New York and Massachusetts, the Azores, Madeira, West Africa, Sao Tome and Principe, Angola, Mozambique, and Chile, Uruguay and Brazil, and to the Antilles (including Antigua), as well as to Portugal.

Animal population

10. Animals are unable to emigrate from islands, and become the first victims as other supplies of food for the human population diminish. Figure 4.3 below clearly shows the decline of animal population in relation to periods of famine.

The famine of 1940-43

11. The famine of 1940-43 was particularly catastrophic, with mortality reaching one in five of the population. However, while rainfall was low, it was not outstandingly so (see figure 4.2). Indeed 1943 was not a bad year for rain, and the animal population on Fogo (for which information is available) was already increasing again (see figure 4.3). On the other hand there was relatively little emigration (figure 4.4). It seems therefore that the disruptions of World War II must have aggravated the famine by blocking the safety valve of emigration and undoubtedly hindering other responses to food shortage.

12. Here is a peculiar example of one catastrophe compounding another: in this case a man-made catastrophe abroad exacerbating a natural disaster at home.

Causes and consequences of famine

13. Insufficient and irregular rainfall may be the primary and obvious cause of famine. Crops also fail through lack of attention due to shortage of labour in the early stages of famine, shortages of water caused by drought, excessive sun, and later shortages of seed. In the longer term, 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 torrential rain of exposed and progressively under-vegetated and unenriched land. The over-all process is one of inexorable decline. Indeed, desertification has now become the subject of long-term preoccupation.

Recent events

14. There has been no serious famine for several years now in spite, in particular, of the long and serious drought of the 1970s, which resulted inter alia in the total failure of the maize crop in 1972. (See following table.)

Production of main crops: Cape Verde
(tonnes)

	1969	1970	1971	1972	1973	1978	1979
Maize	3 339	924	910	-	714	1 000	9 000
Beans	979	341	270	1 150	144	1 400	2 500
Sweet potatoes	3 898	2 344	1 459	1 212	1 055	10 000	12 500
Manioc	3 018	2 119	1 667	235	526	6 000	6 000

Source: République du Cap-Vert (1982).

15. Production in the last ten years has not exceeded 40 per cent of output in the 1960s, especially output from unirrigated areas which have not reached 20 per cent. Livestock production has also suffered from the consequences of spreading desertification. The slaughter of pigs does not exceed 35 per cent of the 1963 volume and the slaughter of goats and cattle have been reduced by 50 and 30 per cent respectively. Agricultural production is thus shrinking and in 1978 covered only 3 per cent of food requirements. e/

e/ Mémoire du Cap-Vert (1981).

16. The gap has been filled by imports sufficiently to avoid actual famine, although malnutrition remains a permanent condition among the population.

17. During the 1920s and 1930s Capé 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. By 1978 they had reached 66 thousand tons.

18. One can assert that it is international assistance which has made it possible up to now to avoid a catastrophic situation with respect to nutrition. f/

19. Emigrants' remittances also play a major role in meeting the import bill. The item "net services and private transfer payments", which can be taken as consisting mainly of these remittances have been seven times larger than visible exports over the period 1976-1981. Remittances rose noticeably after independence (July 1975) and since then have on average covered over 45 per cent of Cape Verde's import bill.

Indigenous survival

20. 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 colonized 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".

f/ Ibid.

Figure 4.1
CAPE VERDE ISLANDS
DEMOGRAPHIC EVOLUTION: 1750-1900

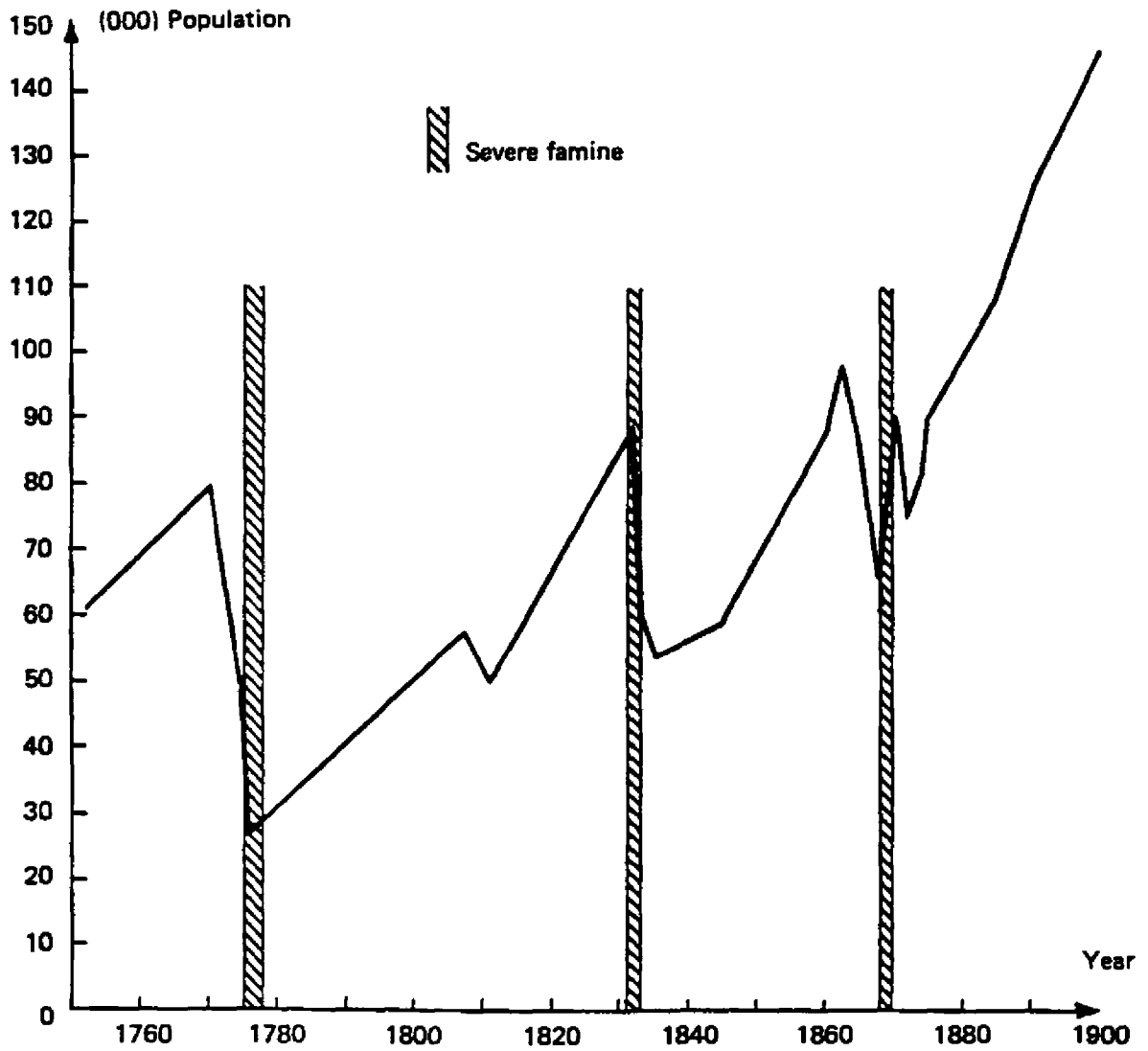


Figure 4.2
CAPE VERDE ISLANDS
ANNUAL RAINFALL (PRAIA) 1875-1980

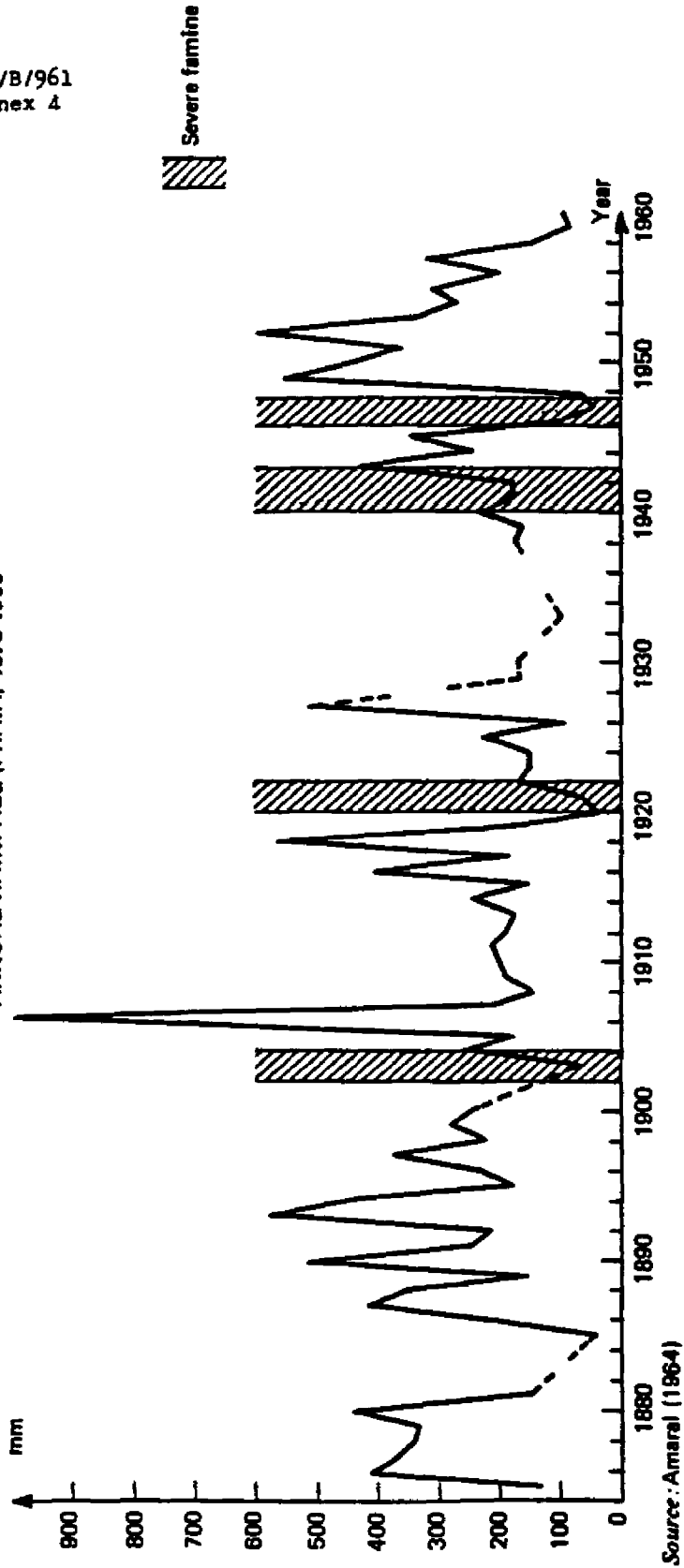


Figure 4.3
CAPE VERDE ISLANDS
NUMBERS OF ANIMALS 1930-1950

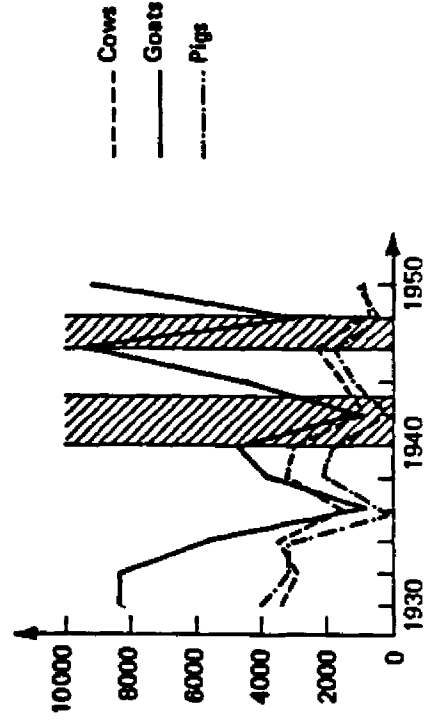
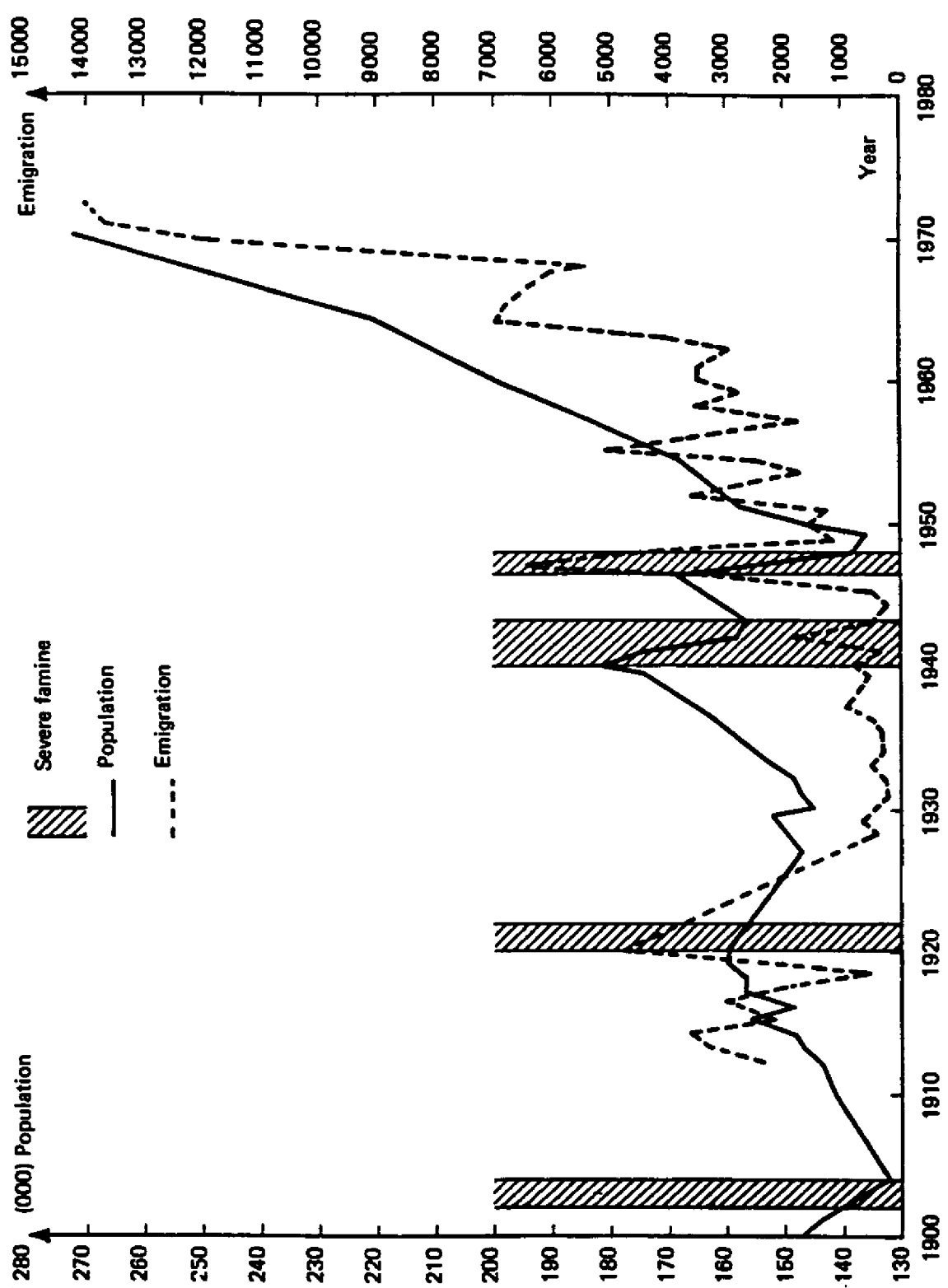


Figure 4.4
CAPE VERDE ISLANDS
POPULATION AND EMIGRATION: 1900-1972



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Annex 4

References (See bibliography)

Tables of event dates only

Chelmicki, J.C.C. (1841); Friedlander, I. (1875); Terry, L. (1959).

Tables of event dates, text (and other tables and figures)

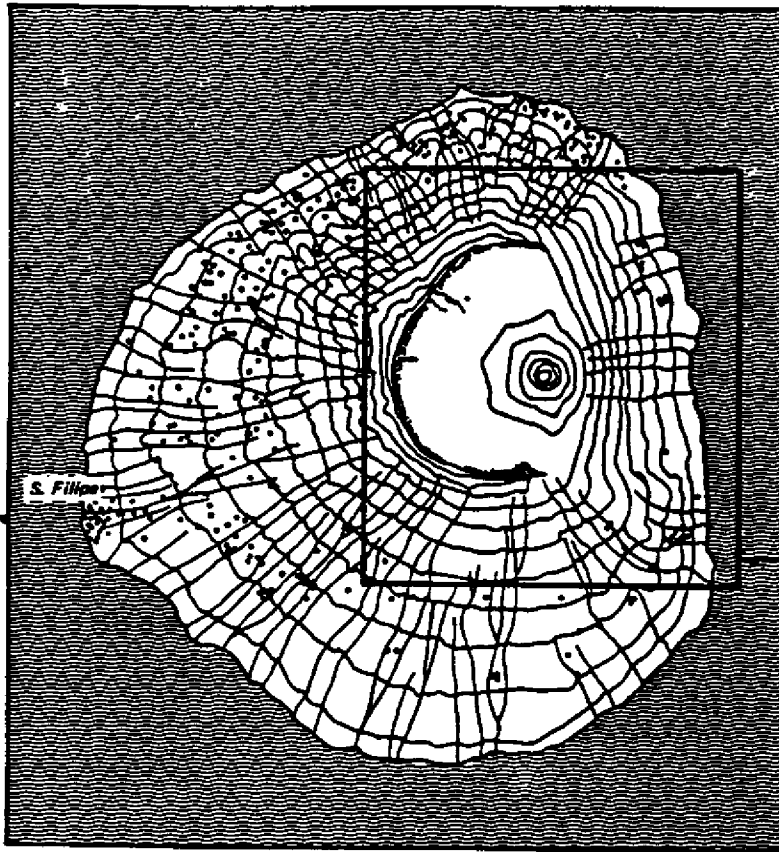
Amaral, I. do (1964); Bebiano, J.B. (1933); Bolletim Official (1863);
Brito, A. de P. (1890); Bull Soc. Geog. (Paris) (1833); Carreira, A. (1966);
Carreira, A. (1969); Carreira, A. (1972); Carreira, A. (1977b); Gourou, P. (1958);
Guichonet (1972); Mémoire du Cap-Vert (1981); République du Cap-Vert (1982);
Ribeiro, O. (1954); Santos, A.L. dos (1971); Santos, A.L. dos (1972);
UNDRO Files (1974).

Annex 5

THE ERUPTIONS OF FOGO, CAPE VERDE

1. Fogo is one of the nine islands of the Cape Verde Archipelago and the only one which is volcanically active. With an area of 476 square kilometres, a circumference of 81 kilometres and a height of 2,822 metres, the island is three times the size of Vesuvius though of a similar form. A caldera (rim height 2,700 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 population there (map 5.1 and 2).
2. There have been recorded 25 eruptions of various kinds since 1500, the latest being in 1951 (figure 1 above and annex 15). 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 (annex 15). There were casualties caused by the earthquake which accompanied the eruption of 1847.
3. The eruption of 1951 (map 5.2) burned 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 at 1.5 million escudos.
4. The year 1951 happened to be one of rain and of good harvests, and though the eruption must have meant some crop losses 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".
5. Given the comparative frequency of eruption, and the severe frequency of famine and food shortage often of several years at a time (annex 4) 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 cholera epidemic (on Fogo and two other islands) a/ and famine of 1855-56.
6. 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.

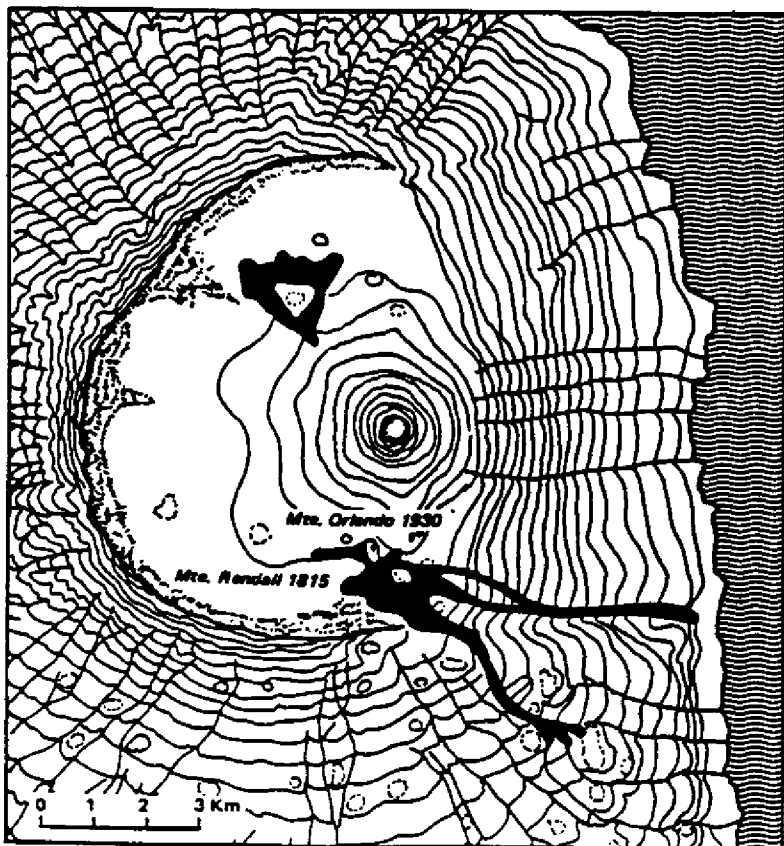
a/ The cholera epidemic, which affected only three islands, is an example of the containment of hazards by the confines of the islands.



Map 5.1
CAPE VERDE ISLANDS

FOGO
Population distribution
(one dot represents 50 inhabitants)

Approximative area of map 5.2



Map 5.2
CAPE VERDE ISLANDS

FOGO
Eruption of 1951
Lava flows

Source: Ribeiro (1954)

and only one of these was tipped in 1951. It was the main from this spring serving San Felipe that was broken by the earthquake of 1951. There are both private and public freshwater cisterns which are the most certain source of water. Water is sold and used solely for drinking purposes, being conserved "as one would wine". None is used for irrigation.

7. This one island of the Cape Verdean archipelago demonstrates the impact in a small land area of one hazard upon another. It is not that different kinds of catastrophe occur at the same time, each adding to the gravity of the other; it is rather that the underlying conditions created by one type of disaster can aggravate the effects of another.

References (see bibliography):

Bebiano, J.B.: 1932; Bol. tin Oficial: 1883; Chelmicki, J.C.C.: 1841;
Friedlander, I.: 1941; Gourou, P.: 1958; Van Padang; Ribeiro, O.: 1954.

Annex 6

THE COMOROS: TROPICAL CYCLONES AND FINANCIAL ASSISTANCE

1. There are 10 storms and cyclones recorded for the Comoro Islands from 1864 to 1933 (118 years). Though their frequency is not great, their effect has been the more serious as a result of their grouping (see figure 1 in part II above) and of their timing. Of the nine, two occurred in 1898, two more in 1904/1905, 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.

2. The sugar industry in the Comoros was in recession at the turn of the 19th/20th centuries and the cyclones were the "last straw" for an industry already in severe decline. Exports of sugar ceased from 1898 until 1904 and reappeared then only in meagre quantities. There was at the same time considerable diversification of export crops. Citronella, was introduced in 1904, ylang-ylang ^{a/} in 1905, lemon grass in 1903, and sisal in 1904 and 1911, as well as basil, cinnamon, pepper, nutmeg, and bitter orange - all in place of formerly predominant sugar cane.

3. One source suggests that the hurricanes of 1898 were wholly responsible for the demise of the sugar industry, but if this had been so, it is unlikely that plants 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 the vanilla industry recovered and increased.

The cyclones of 1898

4. The cyclone of 28 February 1898 destroyed a large number of buildings. The second cyclone of 22/23 April hit a population struggling to rehabilitate after the first. There was also a smallpox epidemic in 1898.

5. Amounts of financial assistance by the Metropolitan Power 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 the smallpox epidemic 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.

The cyclones of 14 December 1904 and 16 December 1905

6. 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. An "approximate evaluation" of damage to government buildings, roads, bridges and jetties 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 at 9 per cent. The 1905 cyclone caused 30 deaths and 150 injured. The islands of Anjouan and Moheli were the most seriously affected.

^{a/} Ylang-ylang is an oil used in perfume manufacture.

7. Food shortage followed the cyclones; on Grand Comore there was no rain from January to November 1905. After the cyclones, people gathered fruit and bought food from Indian and Arab traders; 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 (e.g. Hombo on Anjouan). One hundred and thirty thousand 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.

Financial assistance after the cyclones of 1904 and 1905

8. 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 subsidize every request for assistance, some of which must, it was said, be met from current budgets.

9. The 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. An assessment mission (perhaps from Madagascar) was made from 25 December to 9 January 1906, and its report submitted on 23 January 1906. The assessors cut the estimates of losses made by the administration most severely in respect of the colons; but estimates of losses by the indigènes were accepted without reduction. Indeed, the assessors added estimates of losses by the indigènes of Mayotte, which had not even been included by the administration.

"The natives have not sought to speculate on the assistance which might be granted to them by the metropolitan power, they have limited themselves to indicating with sincerity the amount of their losses."
(Original: French).

Assistance for indigènes was to be administered by village chiefs, who were supervised (contrôlés) by the Police.

10. There was probably more satisfaction in Paris than in the Comoro Islands with the amount of help forthcoming. A "crédit extraordinaire" of Fr.360,000 was made for both cyclones, of 1904 and 1905. Sixty-thousand francs were to be spent on the repair of government buildings, and Fr.300,000 were to be allocated to colons and indigènes according to need. The period for repayment of the financial obligations incurred by the credit of 1898 was to be extended.

References (See bibliography)

Archives Nationales, Section outre-mer: (MAD:c.251; d.566) (MAD:c.393; d.1064);
Fourec and Manicacci (1970/1975).

Annex 7

VOLCANIC ERUPTION, LAVA FLOWS, AND THEIR SOCIO-ECONOMIC EFFECTS ON GRAND COMORO

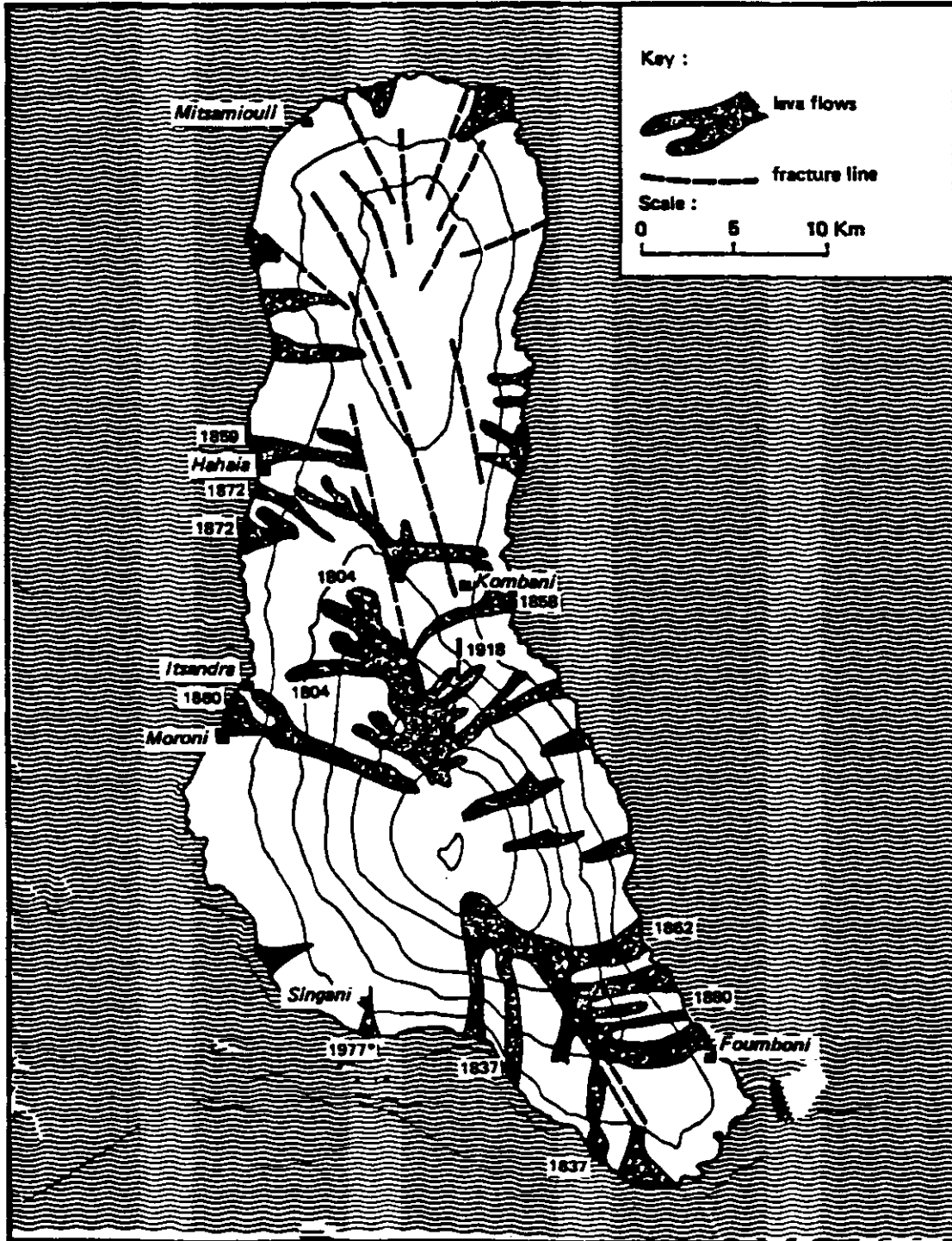
1. As Figure 1 in part II above and Annex 15 below indicate, there have been frequent eruptions of the Kartala on the island of Grand Comoro. Between 1823 and 1977 (148 years) there were 27 recorded eruptions, most of which have involved lava flows, some with discharge of ash and/or explosions. By no means all eruptions have 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. 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 (Map 7.1 a/). Most agricultural activity is located along the coast or up to 1,000 metres, forming an essentially circumferential band of settlement, food growing, and economic activity.
2. Damage is restricted to narrow corridors where the lava flows cross this coastal band, and they are likely to be well defined and locally known or predictable.
3. The eruption of 1904 occurred on 25 February and caused three flows of lava. They were accompanied by earthquakes and tremors in the night of 25/26 February; several houses were destroyed, two people killed and some cattle lost. The eruption continued until 11 March. The previous lava flow, said to have occurred in 1889 had been very slow, allowing inhabitants time for evacuation.
4. Volcanic eruption and consequential lava flows are perhaps spectacular and dramatic but they 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 whole. It is a point of concern however that, nationally and on Grand Comoro, the proportion of cultivable 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 cultivable land, local knowledge concerning areas vulnerable to lava should not be ignored.
5. 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 10,000 homeless, it was of far greater social and economic proportions than ever before recorded. The south west flank of the Kartala is an area largely unaffected by eruptions in the past (Map 7.1) which may partially account for the high losses.
6. The strain on Comorian resources was aggravated by the arrival of 17,000 returnees from Madagascar in January 1977, a sudden 6 per cent increase in the population of the country. These people also needed to be housed and fed immediately, pending their insertion into the national economy.

References (See bibliography):

Archives Nationales; Section outre-mer: (MAD.o.406 d.1086); Battistini, R. (1967); Simkin et al (1981); United Nations (1977); UNDR0 Files.

a/ Though at first sight the map of lava flows shows an impressive proportion of Grand Comoro having been affected, this has not been simultaneous, but in different places at different times.

Map 7.1
RECENT LAVA FLOWS ON GRAND COMORO



After Battistini (1967)
* Approximate location

Annex 8

DISASTERS IN THE MALDIVES

1. The Maldives 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 Laccadive Islands. The Maldives consist of some 220 inhabited islands in 19 atolls extending over 1,000 kilometres. Experiences of many kinds will vary from atoll to atoll, if not island to island. Fires, earthquakes, storms and tornadoes, if they have been described at all, are specific to certain islands and atolls. Epidemics are the only event ever reported to have been of national significance.

2. Francois Pyrard de Laval, a Frenchman who was shipwrecked in the Maldivian Islands and lived there in consequence for five years at the end of the 16th century stated that epidemics of something like smallpox, from which many people died, occurred every 10 years.

3. H.C.P. Bell, a British colonial administrator and archeologist, visited the Maldives in 1920 and 1922. His visit in 1922 coincided with an outbreak of what was described as "Maldivian gift" 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 mentions several fires and storms, the earthquakes of 1729/30, wars with the Laccadivians, and the famine of 1818/19.

4. Historic records of disasters are coincident with travellers' visits, and their writings. Had there been more historians, perhaps there would be more recorded disasters, but this must not be assumed. From the few historical sources available to this study it is clear that environmental health hazards have been the predominant source of disaster. The most common disasters which the Maldives have faced in recent years have been epidemics. Fire has been a constant risk in markets and bazaars. Famine is rarely mentioned. Earthquakes have occasionally damaged masonry buildings. Storms, which might be thought to be frequent on small islands surrounded by sea, were either not damaging or regarded so much a normal occurrence as to have escaped record by a nation of skilled sailors.

5. International allegations in 1977 of serious food shortage, and accompanying health hazards, were refuted by the Government. The cholera epidemic of 1978/79 appears to have been more serious, affecting about 5 per cent of the population and causing 200 deaths. But neither was this a new phenomenon to Maldivians.

References (See bibliography):

Laval, F.P. de (1601); The Colombo Secretariat (1910); Bell, H.C.P. (1921); Bell, H.C.P. (1940).