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 1

Rainfall, 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.

<table>
<thead>
<tr>
<th>Rainfall of preceding year</th>
<th>Number of years</th>
<th>Tons of sugar: yearly average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 50 inches</td>
<td>1</td>
<td>4,442</td>
</tr>
<tr>
<td>30-40 inches</td>
<td>4</td>
<td>15,626</td>
</tr>
<tr>
<td>40-50 inches</td>
<td>7</td>
<td>19,041</td>
</tr>
<tr>
<td>50-60 inches</td>
<td>9</td>
<td>20,010</td>
</tr>
<tr>
<td>60-70 inches</td>
<td>1</td>
<td>27,713</td>
</tr>
<tr>
<td>Above 70 inches</td>
<td>3</td>
<td>28,657</td>
</tr>
</tbody>
</table>

av. 50.88 inches 25 av. 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:

<table>
<thead>
<tr>
<th>Year</th>
<th>1871</th>
<th>1872</th>
<th>1873</th>
<th>1874</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imports (£)</td>
<td>175,740</td>
<td>200,577</td>
<td>169,156</td>
<td>146,758</td>
</tr>
<tr>
<td>Exports (£)</td>
<td>247,630</td>
<td>153,190</td>
<td>170,977</td>
<td>106,705</td>
</tr>
</tbody>
</table>

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 millimetres.
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 rennovation 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 Eberneezer 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".

(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!
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

<table>
<thead>
<tr>
<th></th>
<th>1844</th>
<th>1845</th>
<th>Deficit</th>
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</thead>
<tbody>
<tr>
<td>Sugar:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hogsheads</td>
<td>15,357</td>
<td>11,809</td>
<td>3,548</td>
</tr>
<tr>
<td>Tierces</td>
<td>1,562</td>
<td>1,012</td>
<td>550</td>
</tr>
<tr>
<td>Barrels</td>
<td>4,512</td>
<td>2,745</td>
<td>1,767</td>
</tr>
<tr>
<td>Molasses:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puncheons</td>
<td>9,020</td>
<td>8,780</td>
<td>240</td>
</tr>
<tr>
<td>Hogsheads</td>
<td>127</td>
<td>-</td>
<td>127</td>
</tr>
<tr>
<td>Arrow-root</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxes</td>
<td>665</td>
<td>407</td>
<td>258</td>
</tr>
<tr>
<td>Barrels</td>
<td>104</td>
<td>-</td>
<td>104</td>
</tr>
</tbody>
</table>

(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 3½ 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

Cheesbrough, H (Rev) February 10, 1843, from St John's.
Keightly, J (Rev) February 18, 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)
Hobson (1964)
ANNEX 4

The 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 infrastructural 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

<table>
<thead>
<tr>
<th>Building</th>
<th>1843</th>
<th>Rec</th>
<th>1974</th>
<th>Rec</th>
<th>Rep</th>
<th>1843</th>
<th>1974</th>
<th>Cost @ 1974 value (£1=EC$ 4.8) (x 7½) ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cathedral</td>
<td>£35,000</td>
<td>Rec</td>
<td>£1,000,000</td>
<td>Rec</td>
<td>Rep</td>
<td>£262,500</td>
<td>£108,333</td>
<td></td>
</tr>
<tr>
<td>Ebernezer Chapel</td>
<td>£3,000</td>
<td>Rec</td>
<td>£50,000</td>
<td>Rep</td>
<td>£22,500</td>
<td>£10,416</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missions; St John's Total</td>
<td>£2,500</td>
<td>Rep</td>
<td>£18,750</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Missions; Island Total</td>
<td>£4,100</td>
<td></td>
<td>£30,750</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parliament</td>
<td>£20-50,000</td>
<td></td>
<td>£14,000,000</td>
<td></td>
<td></td>
<td>£150,000- 2,916,666</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total cost 375,000

(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

Tomblin and Aspinall (1975)
Economic Commission for Latin America (1974)
Colonial Reports (1845-1847)
Annex 3.
ANNEX 5

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

From 1774 to 1948 (175 years) there were seven periods of severe famine(1) 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

(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 percent of total population in 1582 declining to 9.5% in 1844. Slaves were subject to forced transhipment and migration 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 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 traditionally in emigration. Cape Verdians have 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(1)) 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.

(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 interrup-
tion 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 question-
ing 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 com-
plaint, and the collective misfortunes which he has to endure leave him a
natural bounty of unlimited patience".

References

Tables of event dates only
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Terry, L (1959)

Tables of event dates, text (and other tables and figures)
Amaral, I do (1964)
Bebiano, J B (1933)
Bolletim Official (1863)
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Bull Soc Geog (Paris) (1833)
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Carreira, A (1972)
Carreira, A (1977b)
Gourou, P (1958)
Guichonet (1972)
Ribeiro, O (1954)
Santos, A L dos (1971)
Santos, A L dos (1972)
UNDRO Files (1974)
CAPE VERDE ISLANDS

Indices of Natality and Death

Source: Carreira (1977)

<table>
<thead>
<tr>
<th>Period</th>
<th>Births</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-1909</td>
<td>49,107</td>
<td>49,811</td>
</tr>
<tr>
<td>1910-1919</td>
<td>62,826</td>
<td>43,659</td>
</tr>
<tr>
<td>1920-1929</td>
<td>26,960</td>
<td>42,127</td>
</tr>
<tr>
<td>1930-1939</td>
<td>73,723</td>
<td>43,824</td>
</tr>
<tr>
<td>1940-1949 (two great famines)</td>
<td>62,224</td>
<td>90,354</td>
</tr>
<tr>
<td>1950-1959</td>
<td>79,679</td>
<td>27,400</td>
</tr>
<tr>
<td>1960-1969</td>
<td>100,578</td>
<td>31,407</td>
</tr>
<tr>
<td></td>
<td>455,007</td>
<td>328,592</td>
</tr>
</tbody>
</table>

Population census 1900: 174,424
Population census 1970: 272,000
Difference in relation to 1900 124,576
CAPE VERDE ISLANDS

Numbers of Animals 1960-71

Source: Carreira (1977)

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>Animal Census</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1960-63</td>
</tr>
<tr>
<td>Horses</td>
<td>2401</td>
</tr>
<tr>
<td>Mules</td>
<td>1331</td>
</tr>
<tr>
<td>Donkeys</td>
<td>13749</td>
</tr>
<tr>
<td>Bullocks</td>
<td>18988</td>
</tr>
<tr>
<td>Sheep</td>
<td>1008</td>
</tr>
<tr>
<td>Goats</td>
<td>55705</td>
</tr>
<tr>
<td>Pigs</td>
<td>46568</td>
</tr>
<tr>
<td>TOTAL</td>
<td>139750</td>
</tr>
</tbody>
</table>

Figure 9

CAPE VERDE ISLANDS

Forc

Numbers of animals 1930-1950

Source: Ribeiro (1954)

Cabras: goats  Porcos: pigs  Vacas: cows
**Cape Verde Islands: Agricultural Exports**

### Table 12

#### Sugar

<table>
<thead>
<tr>
<th>Periods</th>
<th>Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1839-1864</td>
<td>158</td>
</tr>
<tr>
<td>1872-1888</td>
<td>116</td>
</tr>
<tr>
<td>1892-1900</td>
<td>92</td>
</tr>
<tr>
<td>1901-1910</td>
<td>3</td>
</tr>
<tr>
<td>1911-1929</td>
<td>3</td>
</tr>
</tbody>
</table>

Exports ended in 1929

#### Castor Oil Plant

<table>
<thead>
<tr>
<th>Periods</th>
<th>Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1899-1904</td>
<td>17</td>
</tr>
<tr>
<td>1909-1918</td>
<td>29</td>
</tr>
<tr>
<td>1913-1928</td>
<td>77</td>
</tr>
<tr>
<td>1929-1938</td>
<td>75</td>
</tr>
<tr>
<td>1939-1948</td>
<td>149</td>
</tr>
<tr>
<td>1949-1958</td>
<td>146</td>
</tr>
<tr>
<td>1959-1970</td>
<td>75</td>
</tr>
</tbody>
</table>

Exports ended in 1970

#### Coffee

<table>
<thead>
<tr>
<th>Periods</th>
<th>Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1892-1901</td>
<td>349</td>
</tr>
<tr>
<td>1902-1911</td>
<td>314</td>
</tr>
<tr>
<td>1912-1920</td>
<td>303</td>
</tr>
<tr>
<td>1921-1932</td>
<td>69</td>
</tr>
<tr>
<td>1933-1942</td>
<td>63</td>
</tr>
<tr>
<td>1943-1953</td>
<td>63</td>
</tr>
<tr>
<td>1954-1962</td>
<td>105</td>
</tr>
<tr>
<td>1963-1970</td>
<td>30</td>
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</table>

Exports ended in 1970

#### Salt

<table>
<thead>
<tr>
<th>Periods</th>
<th>Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901-1909</td>
<td>4294</td>
</tr>
<tr>
<td>1911-1917</td>
<td>4590</td>
</tr>
<tr>
<td>1920-1929</td>
<td>10468</td>
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<td>1930-1939</td>
<td>18111</td>
</tr>
<tr>
<td>1940-1949</td>
<td>12097</td>
</tr>
<tr>
<td>1950-1959</td>
<td>21282</td>
</tr>
<tr>
<td>1960-1969</td>
<td>30097</td>
</tr>
<tr>
<td>1970-1973</td>
<td>35771</td>
</tr>
</tbody>
</table>

(continuing)

#### Purgueira

<table>
<thead>
<tr>
<th>Periods</th>
<th>Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1873-1883</td>
<td>4813</td>
</tr>
<tr>
<td>1884-1893</td>
<td>4229</td>
</tr>
<tr>
<td>1892-1910</td>
<td>4750</td>
</tr>
<tr>
<td>1911-1918</td>
<td>4080</td>
</tr>
<tr>
<td>1924-1930</td>
<td>2334</td>
</tr>
<tr>
<td>1931-1940</td>
<td>1737</td>
</tr>
<tr>
<td>1941-1950</td>
<td>1795</td>
</tr>
<tr>
<td>1951-1960</td>
<td>1927</td>
</tr>
<tr>
<td>1961-1970</td>
<td>461</td>
</tr>
</tbody>
</table>

Exports ended in 1970

#### Coral

<table>
<thead>
<tr>
<th>Periods</th>
<th>kg</th>
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</thead>
<tbody>
<tr>
<td>1843-1874</td>
<td>593</td>
</tr>
<tr>
<td>1875-1884</td>
<td>1900</td>
</tr>
<tr>
<td>1885-1904</td>
<td>600</td>
</tr>
<tr>
<td>1895-1903</td>
<td>590</td>
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</table>

Exports ended in 1903

Source: Carreira (1977)
<table>
<thead>
<tr>
<th>Year</th>
<th>IMPORTS (contos)</th>
<th>EXPORTS (contos)</th>
<th>Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food goods</td>
<td>% in relation to total</td>
<td>Total</td>
</tr>
<tr>
<td>1963</td>
<td>52 188</td>
<td>30.7</td>
<td>170 242</td>
</tr>
<tr>
<td>1964</td>
<td>62 767</td>
<td>31.3</td>
<td>200 718</td>
</tr>
<tr>
<td>1965</td>
<td>75 007</td>
<td>32.9</td>
<td>228 283</td>
</tr>
<tr>
<td>1966</td>
<td>69 293</td>
<td>28.4</td>
<td>244 203</td>
</tr>
<tr>
<td>1967</td>
<td>69 237</td>
<td>26.8</td>
<td>259 790</td>
</tr>
<tr>
<td>1968</td>
<td>77 306</td>
<td>27.4</td>
<td>281 926</td>
</tr>
<tr>
<td>1969</td>
<td>168 471</td>
<td>40.2</td>
<td>418 801</td>
</tr>
<tr>
<td>1970</td>
<td>145 240</td>
<td>30.9</td>
<td>469 418</td>
</tr>
<tr>
<td>1971</td>
<td>222 537</td>
<td>38.8</td>
<td>573 464</td>
</tr>
<tr>
<td>1972</td>
<td>246 110</td>
<td>37.5</td>
<td>656 876</td>
</tr>
<tr>
<td>1973</td>
<td>241 350</td>
<td>29.0</td>
<td>833 052</td>
</tr>
</tbody>
</table>

Source: Carreira (1977)
Figure 6 CAPE VERDE ISLANDS
Demographic Evolution: 1496-1900

150 (000) Population

Year
- 1770
- 1790
- 1810
- 1830
- 1850
- 1870
- 1890
- 1900
Figure 7 CAPE VERDE ISLANDS
Population and Emigration 1900-1972

- Population (000)
- Emigration

- 280
- 270
- 260
- 250
- 240
- 230
- 220
- 210
- 200
- 190
- 180
- 170
- 160
- 150
- 140
- 130
- 120
- 110
- 100
- 90
- 80
- 70
- 60
- 50
- 40
- 30
- 20
- 10

- 1900
- 1910
- 1920
- 1930
- 1940
- 1950
- 1960
- 1970
Figure 8
CAPE VERDE ISLANDS
Annual Rainfall (Praia) 1875-1960
Source: Amaral (1964)
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.

References:
Bebiano, J B: 1932.
Boletim Official: 1883.
Chelmicki, J C C: 1841.
Freidlander, I: 1941.
von Padang
Ribeiro, 0: 1954.
Map 9
CAPE VERDE ISLANDS
Fogo
Population distribution (one dot represents 50 inhabitants).

Map 10
CAPE VERDE ISLANDS
Fogo
Eruption of 1951
Lava flows
Source: Ribeiro (1954)
ANNEX 7

The 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 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 transshipped 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 transshipment.

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 transhipment 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.

References:

DUNCAN, T B (1972)

LERENO
ANNEX 8

The 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 (1) 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.

(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 smallpox 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:

Kayotte: 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:
<table>
<thead>
<tr>
<th></th>
<th>Administration</th>
<th>Colon</th>
<th>Indigènes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MAYOTTE</strong></td>
<td></td>
<td></td>
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<tr>
<td>Administration</td>
<td>106,000</td>
<td>760,000</td>
<td>-</td>
<td>866,000</td>
</tr>
<tr>
<td>Assessor's</td>
<td>60,000</td>
<td>260,000</td>
<td>80,000</td>
<td>400,000</td>
</tr>
<tr>
<td>estimates (Fr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ANJOUAN</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>28,300</td>
<td>471,000</td>
<td>60,000</td>
<td>559,000</td>
</tr>
<tr>
<td>Assessor's</td>
<td>28,000</td>
<td>295,000</td>
<td>60,000</td>
<td>375,000</td>
</tr>
<tr>
<td>estimates (Fr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MOHELI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessor's</td>
<td>-</td>
<td>85,000</td>
<td>20,000</td>
<td>105,000</td>
</tr>
<tr>
<td>estimates (Fr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total:**

<table>
<thead>
<tr>
<th>Administration</th>
<th>1,530,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessor's estimates (Fr)</td>
<td>880,000</td>
</tr>
</tbody>
</table>

**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;
<table>
<thead>
<tr>
<th>Value per plant (Fr)</th>
<th>Value per product (Fr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanilla: 0.50</td>
<td>15.20 and 20.00 (kilo)</td>
</tr>
<tr>
<td>Coconut: 1.70</td>
<td></td>
</tr>
<tr>
<td>Cocoa: 2.00</td>
<td></td>
</tr>
<tr>
<td>Coffee: 0.50</td>
<td></td>
</tr>
<tr>
<td>Sugar:</td>
<td>300.00 - 350.00 (tonne)</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Buildings etc</th>
<th>Vanilla destroyed</th>
<th>less cost of harvesting</th>
<th>various</th>
<th>Total</th>
<th>Colons' own assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANJOUAN</td>
<td>230,200</td>
<td>233,600</td>
<td>206,500</td>
<td>64,700</td>
<td>735,000</td>
</tr>
<tr>
<td>MOHELI</td>
<td>29,840</td>
<td>79,755</td>
<td>40,250</td>
<td>20,335</td>
<td>170,200</td>
</tr>
</tbody>
</table>

**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.
Anjouan Moheli

Administration assessment (Fr): 20,612 5,000
Mission assessment (Fr) 19,000 3,500

Losses to indigènes

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 indigènes n'ont pas cherché a speculer sur le secours qui pourrait leur être alloué par le metropole, ils se sont bornés a indiquer avec sincérité 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):

<table>
<thead>
<tr>
<th>Island</th>
<th>Administration</th>
<th>Colon</th>
<th>Indigènes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anjouan</td>
<td>19,000</td>
<td>744,000</td>
<td>178,000</td>
<td>941,000</td>
</tr>
<tr>
<td>Moheli</td>
<td>3,500</td>
<td>172,000</td>
<td>48,500</td>
<td>224,000</td>
</tr>
<tr>
<td>G. Comoro</td>
<td></td>
<td>8,000</td>
<td>8,000</td>
<td>8,000</td>
</tr>
<tr>
<td>Mayotte</td>
<td>22,500</td>
<td>916,000</td>
<td>234,500</td>
<td>1,173,000</td>
</tr>
</tbody>
</table>

The assessors report acknowledged that losses were most seriously felt by indigènes, employees on plantations, small colonists, 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:

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

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

Fourec and Manicacci (1970/1975?)
ANNEX 9

Volcanic 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 circumferential 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. 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
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, 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.
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 Hahaia.
Source: Battistini (1967)
**Map 13**

**Grande Comore**

_Carte dressée d’après un levé sans vapeur exécuté en 1892 par M. le Capitaine de frégate Ravel, commandant le Bourgogne._

Les détails de l’itinéraire ont été susseptis aux instructions de M. le Capitaine d’Infanterie de marine Dubois (1892).

Reproduites comme au texte suivant:

Les points adoptés sont les moyennes des déterminations de M. Niez, sous-inspecteur hydrogr.

et de M. Dumez envarco de muscaras...

Les positions sont reportées au sol de pavillon

de Bâle à Mars, à Zanzibar (Négép), pour lequel on

a adopté 28° 15’ E

**Centres of the Eruption**

25 February 1904

Notations:

A and B: Centres of the eruption

(25 February 1904)

---: Direction of Java flows

C : Earthquake at Badjini

D : Earthquake at Mutamiondi

Source: Archives National.
Natural disasters in the Maldives: Information and reality

The disaster history of the Maldives comes from only three sources. H.C.P. Bell was a Colonial administrator and archeologist in Ceylon who visited the Maldives in 1920 and 1922; the Colombo Secretariat published (restricted) in 1910 a collection of papers relating to the Maldives Islands covering the periods 1897-1902 and 1904-10; and Laval was a French explorer who was shipwrecked in the Maldives 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 Maldives are within 2°S and 7.2°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, 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 "Maldive 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 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 Maldive 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 Maldive 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 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)
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 the above-mentioned subject.

Before giving you what little advice 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:

Mr James Lewis
UNDRD/UNCTAD Consultant
Consultancy Services for Disaster Mitigation
101 High Street
Marshfield
Avon SN14 8Lt
ENGLAND.
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 cooperation 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 Maldives Islands by Clarence Malony (published by Orient Longman, New Delhi)
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.
ANNEX 11

The Hurricanes of 1966 and 1968 in Western Samoa

1 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 12

Rainfall 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. 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/1 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 vorticities 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

(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 visita-
tion. . . ."

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 cater-
pillars 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
dysentry 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 13

Indigenous, 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 8½ 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 feable 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. Biscuit 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".

References
London Missionary Society Archives; the Cook Islands. (1832, 1841, 1846, 1847).
Epidemic 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:

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1839</td>
<td>47,000</td>
</tr>
<tr>
<td>1845</td>
<td>40,000</td>
</tr>
<tr>
<td>1849</td>
<td>32,000</td>
</tr>
<tr>
<td>1854</td>
<td>29,237</td>
</tr>
<tr>
<td>1881</td>
<td>28,000</td>
</tr>
<tr>
<td>1886</td>
<td>29,000</td>
</tr>
</tbody>
</table>

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; dysentry in 1907, a year in which there was no population growth; dysentry 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.

<table>
<thead>
<tr>
<th>Census years</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1906</td>
<td>37,320</td>
</tr>
<tr>
<td>1911</td>
<td>38,064</td>
</tr>
<tr>
<td>1921</td>
<td>37,157</td>
</tr>
<tr>
<td>1926</td>
<td>40,229</td>
</tr>
</tbody>
</table>

Figures of "native" population reported by New Zealand are

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

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 filiariasis).

References

New Zealand (1921)

UN Department of Social Affairs (1948)
Crop Insurance in Mauritius

An Insurance scheme for sugar cane, the main crop of Mauritius, sugar being 70 per cent of total exports.

Main causes of variations in the yield of sugar cane are:

a) Climatic factors - cyclones, droughts, excessive rainfall
b) Fires
c) Diseases
d) Harmful insects

* The two insurable risks at 1974.

Fire insurance

The Sugar Insurance Fund Board established mainly for climatic risks, takes on a small amount of fire insurance which is compulsory. The remainder of fire insurance is undertaken with commercial insurance companies.

Cyclone, Drought and Excessive Rainfall Insurance

Insurance against cyclone damage was envisaged in 1907, and again in 1943. After considerable cyclone losses in 1945, assistance was requested of the British Government, which was granted on condition that the Mauritius Government set up a crop insurance scheme. The "Cyclone and Drought Insurance Board of Mauritius" was established in October 1946 and the first premiums paid covered the 1947 crop.

The fund was a self-help institution in which all planters and sugar-cane millers participated. Those insured against cyclone and drought were compensated at 75-80% of the value of the shortfall of sugar production after
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:

<table>
<thead>
<tr>
<th>Year</th>
<th>Premiums received</th>
<th>Losses paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1958/9</td>
<td>3,753</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>2,524</td>
<td>34,120</td>
</tr>
<tr>
<td>1961</td>
<td>3,126</td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>3,059</td>
<td>2,711</td>
</tr>
<tr>
<td>1963</td>
<td>3,518</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td>5,838</td>
<td>20,450</td>
</tr>
<tr>
<td>1965</td>
<td>No reinsurance effected</td>
<td></td>
</tr>
<tr>
<td>1966</td>
<td>2,953</td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>4,158</td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>3,092</td>
<td></td>
</tr>
</tbody>
</table>

|       | 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)


Cyclone and Drought Insurance Board (1971)

The Sugar Insurance Fund Board 1975-76 (1977)
ANNEX 16

The 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 (1), 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 (2), 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.

(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 (2531 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 Malagasy, 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 1600 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
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 1962.

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 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).
ANNEX 18

Terms of Reference for the Study

Background 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 cooperation 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 19

References

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
   - Maldives Islands
   - Western Samoa.

1. ISLAND DEVELOPING COUNTRIES AND NATURAL DISASTERS


Lewis, J. "Disaster cost and GNP; Numbers of homeless and populations; and country size: Some Tabulated and Graphic Comparisons". Unpublished. 1981.


O'Keefe, P; Conway, C. "Natural Hazards in the Windward Islands". Occasional Paper No 14, Disaster Research Unit, University of Bradford. 1977.


Simkin, T; Siebert, L; McClelland, L; Bridge, D; Newhall, C; Latter, J H. "Volcanoes of the World". Smithsonian Institution, Washington DC. 1981.


UNCTAD. Specific Action related to the particular needs and problems of island developing countries: issues for consideration. Item 16(b) main policy issues. TD/242. May 1979. Manila.


2. SOCIO-ECONOMICS

Cost and Measurement


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