

Annex 9

RAINFALL AND HURRICANE IN SAMOA

1. As a mountainous pair of sizeable islands in the midst of an ocean, a/ Samoa receives a significant rainfall - a normal yearly total of 2,851.9 mm. Naturally there are intermittent years when rainfall is less than normal "as low even as 66% of normal". This abnormal low, is nevertheless double an annual rainfall of slightly less than average in Antigua. b/ Only one drought had been declared before 1974, that of 1925 reported as a result of "only 6.49 inches of rain during the period June to September 11 of that year". The reporter acknowledged that May had been an unusually wet month with 23.58 inches (599 mm) of rain! The drought of 1977 was localized in northern and north-western parts of Savai'i and Upolu, an expression of the regional vicissitudes of larger islands.

2. Rainfall fluctuations can nevertheless have a commercial impact of their own. Cocoa, a principal crop of Samoa, cannot survive long "drought", and coconuts do not produce well in wet seasons. The monthly distribution of rain throughout the year is as important to plantations as the annual total.

3. It is without doubt that many, if not all, of the 27 hurricanes, storms, or gales, recorded for Samoa for the years 1851-1975, have caused at least local damage. Some have caused widespread damage to either of the main islands of Savai'i and Upolu, and one or two have caused catastrophic destruction on a national scale. On the other hand it is hurricanes which are largely responsible for the comparative freedom from drought.

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

Reference:

- See annex 12.

a/ With a couple of small inhabited islands in between.

b/ NE. Antigua's average annual rainfall is four and a half times greater than that of Cape Verde (annex 4).

Annex 10

CONTEMPORARY OBSERVATIONS ON NINETEENTH CENTURY HURRICANES IN SAMOA

1. From his mission on Upolu, the Rev. M. Harbutt wrote on 20 May 1856, after the hurricane of 26 April:

"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:

"... 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 [i.e. warfare] having prevented their re-erection. We are suffering from the famine which I named as sure to follow the extensive destruction of the Bread fruits and other trees ... years must pass before the district will have another crop of bread fruits to gather - remarks which I have often heard in conversation and in public addresses respecting the fearful visitation ..."

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

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

(There are a number of references in the London Missionary Society Archives to plagues of caterpillars following hurricanes; see also annex 11).

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

"... bread fruit trees were turn 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".

4. After the "Great Hurricane" of 1889, Robert Louis Stevenson was of the opinion that the losses of ships and men of the German and United States navies was significant in putting an end to hostilities and in bringing about the Treaty of Berlin in 1899. The hurricane of 1889 caused great losses in Apia harbour, due in part to failure of vessels to put to sea in time through the tenseness of political situation. The Germans and Americans each lost two ships, and 155 lives between them. The British ship "Calliope" with 300 people on board, escaped to sea at the last minute without loss.

5. See annex 11 for a 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.

References (See bibliography):

London Missionary Society Archives: Navigator Islands and Samoa;
McKav. CGR (1937); Stevenson. R.L. (1912); Department of Statistics (1975).

Annex 11

INDIGENOUS AND EXOGENOUS RESPONSES TO HURRICANE IN
THE COOK ISLANDS IN THE NINETEENTH CENTURY

1. Writing from the Cook Islands, the Rev. Charles Pitman appears as a particularly astute and forthright observer and correspondent. An especially severe hurricane struck the Cook Islands around February 1841, and was followed by another hurricane the same year.
2. 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 (Rarotonga, 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, that 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".
3. The hurricane of 1846 was also very severe in the Cook Islands.
4. 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 ... This was given out to the Chiefs and Governors of the district, and they divided it among the households ... 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. ... This is a strange land. There can be no other like it."

5. But Pitman wrote, from Rarotonga 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 most felt is among the sick, as the sweet potato alone has not those nourishing qualities requisite to sustain their feeble frames ...

"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 apprize as soon as received".

References

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

Annex 12

EPIDEMICS AND POPULATION IN SAMOA

1. Epidemics of diseases newly introduced by European explorers and traders have been serious in the Pacific since the eighteenth century. Influenza first occurred in 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. Measles occurred as an epidemic in 1893; dysentery and measles occurred in 1911; and measles in 1915.
2. Inter-tribal warfare, beginning a few years before 1830, continued for several years. War occurred again in 1848, and again in 1869 for four years until 1873, yet again in 1877 and, indeed, on and off up to the end of the nineteenth century. The destruction of crops was a technique of war.
3. 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 1880s. Military and missionary estimates of population made during the nineteenth century were:

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

4. 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 epidemics although there is the occasional suggestion that it did.
5. There were epidemics of influenza in 1918 throughout the world, but in terms of the national proportion of attributable deaths, the Samoa influenza epidemic of 1918 was one of the most disastrous epidemics anywhere in the world during the first half of the twentieth century. About one-fifth of the national population died. Figures of "native" population reported by New Zealand are:

Year	Native population
1902	32 815
1906	34 962
1911	34 063
1917	37 223
1918 (September)	38 302 (before the epidemic)
1918 (December)	30 738 (after the epidemic)
1921	32 953

6. The epidemic reached Samoa by a ship from Auckland. The phenomenon of containment by islands can be noted here: neighbouring American Samoa escaped the epidemic completely.

7. There was a further unspecified epidemic in 1923 but rigorous attention to public health finally brought catastrophic epidemics to an end by the application of village sanitation, systems of notification of communicable diseases, food and drug inspections, purification of water supplies, examination and quarantine of incoming vessels, instruction in hygiene for schools, organization of women's health committees in villages, and extensive treatment of endemic diseases (hookworm, yaws and filariasis).

References (see bibliography):

New Zealand (1921); United Nations Department of Social Affairs (1948).

Annex 13

CROP INSURANCE IN MAURITIUS

1. An insurance scheme exists for sugar cane, the main crop of Mauritius, which accounts for over 70 per cent of total exports.
 2. The main causes of variations in the yield of sugar cane are:
 - (a) Climatic factors - cyclones, droughts, excessive rainfall *)
 - (b) Fires) risks beyond
 - (c) Diseases) the farmers' control
 - (d) Harmful insects)
- * The two insurable risks in 1974.

Fire insurance

3. 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:

4. 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.
5. 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 per cent 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 per cent of the value of sugar insured. The value of sugar insured was the average for the three preceding normal years (now the three preceding best years of twelve).
6. 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.
7. 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.

8. 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

9. 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 stabilized in years of shortfall, and savings are imposed during prosperous years. Insurance is compulsory.

10. 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 per cent 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 and 24 per cent of the insurable sugar value.

Reinsurance

11. The Board was in existence from 1946 until 1958 before reinsurance was first negotiated. Various excesses-of-loss covers were arranged between 1953 and 1963, 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:

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

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

13. In 1975 the Board recovered 126 million rupees after cyclone "Gervaise". Thus the importance of reinsurance covers is illustrated.

References (see bibliography):

Ballerose (1979); Sugar Insurance Fund Act (1974); Cyclone and Drought Insurance Board (1971); The Sugar Insurance Fund Board 1975-76 (1977).

Annex 14

THE SOUTH PACIFIC BUREAU FOR ECONOMIC CO-OPERATION (SOUTH PACIFIC FORUM):
DISASTER RELIEF FUND

1. In 1976 the economic arm of the South Pacific Forum, the South Pacific Bureau for Economic Co-operation (SPEC), requested from the Commonwealth Secretariat a project to establish guidelines for the management of a regional fund to provide insurance for natural disasters. The resulting report, accepted by the Forum in the same year, analysed natural disaster occurrence in the region of the (then) nine member countries, a/ 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\$ 5,000. 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.
2. During the first five years of the Fund, financial assistance was made for at least eight natural disasters in five countries. Allocations have been Fiji \$10,000, except in the case of Hurricane "Isaac" in Tonga (1982) when a total of \$F 25,000 was allocated, \$F 15,000 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.
3. 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.

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

Annex 15

CHRONOLOGY OF DAMAGING EVENTS IN FIVE SELECTED COUNTRIES

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

A. ANTIGUA AND BARBUDA (continued)			
Date	Event	Effect	Deaths
1780 10 October	Hurricane	Extremely violent: destroyed stone buildings and shifted canons	
1782	Fire	Destroyed most of St. John's	
1785 July	Earthquake	"Very violent" "disastrous"	
1789-1792	Drought	"Worst drought recorded in the Antilles"	
1792 1 August	Hurricane		
1792 10 September	Hurricane	"Very damaging ... crops destroyed"	
1792	Epidemic	"A malignant fever imported from Grenada"	
1795 18 August	Hurricane		
1804 4-6 September	Hurricane	Severe: 274 vessels perished (in all affected areas)	
1812 1 October	Hurricane		
1814	Drought	"Almost a state of famine"	
1814 August-September	Epidemic	"Dysentery among the negros"	
1816 August/September/ October	Epidemic	Yellow fever	
1818 22-25 September	Hurricane		

ANTIGUA AND BARBUDA (continued)			
Date	Event	Effects	Deaths
1828	Epidemic	"Dandy fever"	
1831 25-27 June	Hurricane		
1833 February	Earthquake	"Severe" "A smart shock"	
1833	Drought	"Severe"	
1833 14 August	Hurricane		
1835	Epidemic	Yellow fever	
1835 12 August	Hurricane		
1837	Drought	"Severe"	
1837 31 July	Hurricane		
1837 2-4 August	Hurricane		
1839 9 June	Hurricane		
1841	Fire	St John's destroyed	

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

ANTIGUA AND BARBUDA (continued)			
Date	Event	Effects	Deaths
1871-1874	Drought	Severe	
1893	Epidemic	"Flu": high infant mortality	
1894	Drought	"Excess"	
1898	Epidemic	Dysentery: Death rate increase	
1898	Drought	First six months of year "much distress, and even actual starvation, existed among labouring classes" (required poor-relief funds)	
1899	Hurricane	"Considerable violence" ... much damage to the huts of labouring classes (Island of Montserrat wholly devastated)	
1909-1912	Drought	"Considerable distress in country districts. Acute water famine for some days in St. John's"	
1920-1924	Drought	Severe and prolonged	
1924 28-29 August	Hurricane	Severe; "moderate" damage Relief expended: £1,356; "several thousand pounds of damage but brought relief in the form of welcome rains" (Ended the severe and prolonged drought 1920-1924) Imperial Government Grant in aid: £250 Also seriously affected Nevis, Montserrat, Tortola, St. Kitts; Lord Mayor of London Fund raised £4,000. Total relief including West Indian contribution - £23,000. "Wholly devoted to relief of peasants and labourers and reconstruction of their dwellings".	3

ANTIGUA AND BARBUDA (continued)			
Date	Event	Effects	Deaths
1928 5-7 October	Hurricane	Peasant houses: severe damage and destruction Telephone system damage Public Works (including ecclesiastical buildings)	
1929	Drought	"Severe"	
1929 12-13 September	Hurricane		
1945-1948	Drought	"Severe" St. John's water rationed to three gallons per day (per head?). Tank deliveries to villages. Pasture failed, many animals died. Money short, work scarce, building stopped for want of water. "Disastrous" effect on sugar crop.	
1950 18 August	Fire	Serious; centre of St. John's (90 per cent of buildings in timber). Four-storey hotel completely destroyed, and other commercial buildings	
1950 19 August	Fire	Federal secretariat destroyed	
1950 21 August	Hurricane	100 mph winds. Extensive road damage; telephone and electricity disorganized; livestock lost; severe destruction in rural areas. Total number of houses destroyed: 488. Total number of houses damaged: 636 (many rendered uninhabitable)	

ANTIGUA AND BARBUDA (continued)			
Date	Event	Effects	Deaths
1950 31 August- 1 September	Hurricane	<p>165 mph winds recorded in Antigua. Damage generally as for 21 August, but St. John's suffered more than rural areas. Considerable damage to government, private and commercial buildings</p> <p>Totals for both hurricanes of 1950 ("leaving out large houses which were either insured ... or whose owners could afford to repair them unaided")</p> <p>1,348 small houses completely destroyed 2,343 small houses damaged</p> <p>6,477 homeless people (+ Barbuda: 84 houses destroyed; 109 damaged; 320 homeless people)</p> <p>Total homeless: 6,797 (15 per cent of population)</p> <p>"prolonged"</p> <p>M 7.5. "moderate" damage</p>	3
1960-1969	Drought		
1974 July/August	Drought		
1974 8 October	Earthquake		

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

CAPE VERDE (continued)			
Date	Event	Effects	Deaths
1693	Volcanic eruption	(Fogo)	
1695	Volcanic eruption	(Fogo)	
1697	Volcanic eruption	(Fogo)	
1699	Volcanic eruption	(Fogo)	
1712	Volcanic eruption	(Fogo)	
1713	Volcanic eruption	(Fogo)	
1719	Famine		
1721-25	Volcanic eruption		
1746	Famine		
1747-50	Famine		
1754	Famine		
1761	Volcanic eruption		
1764	Famine		

CAPE VERDE (continued)			
Date	Event	Effects	Deaths
1769 (or 1774)	Volcanic eruption	(Fogo)	
1775	Locusts		
1774-75	Famine	Famine followed by epidemic; more than half the population of San Thiago died.	22 000
1785	Volcanic eruption	(Fogo) Earthquakes, explosions; lava flowed towards Fonte Pedra river and Anchuila e Relva Arable land destroyed	
1789-91	Famine		
1799 24 January - 25 February	Volcanic eruption	(Fogo)	
2-28 June			
August		Explosions and lava flows Arable land destroyed	
1810	Famine		
1813-14	Famine		
1816	Volcanic eruption	(Fogo)	
1825	Famine		
1831-33	Famine		12 000

CAPE VERDE (continued)			
Date	Event	Effects	Deaths
1845-46	Famine	Some inhabitants ate grass	
1847 9 April	Volcanic eruption	(Fogo) Moderate Strombolian activity with lava flows, most of which destroyed arable land and other property near the east coast. Casualties due to accompanying earthquake	
1847	Earthquake	(accompanied volcanic eruption) Casualties	
1850-51	Famine		
1855-56	Epidemic	Cholera (on Fogo; S. Antao; Fogo)	
1855-57	Famine		
1857 27 June	Volcanic eruption	(Fogo) Explosions	
November			
1863-65	Famine	"loss of all agriculture" "loss of all hope"	30 000 (40% of population)
1875-76	Famine		
1883-84	Famine		
1885-86	Famine		
1889-90	Famine		

CAPE VERDE (continued)			
Date	Event	Effects	Deaths
1892	Famine		
1896-97	Famine		
1902-04	Famine		15 000 (10% of popula- tion)
1909	Volcanic eruption	(Fogo)	
1920-22	Famine		17 000 (10.6% of the total popula- tion)
1927	Famine		
1930	Famine		
1931-35	Famine		
1940-43	Famine		24 463 (13.5% of popula- tion)
1946-48	Famine		20 813

CAPE VERDE (continued)			
Date	Event	Effects	Deaths
1951 12 June-August	Volcanic eruption	(Fogo) Explosions, lava flows Arable land and castor-oil plantations burnt Roadway broken Water main broken Water storage cisterns ruptured by earthquake 34 houses destroyed (no casualties)	
1951	Earthquake	(initiated volcanic eruption) Fractured water storage cisterns	
1961 5-6 September	Tropical cyclone	Agricultural damage: bananas, coconuts, maize Trees felled (Flash?) Flooding Dyke destroyed on Fogo (no description of dyke's purpose)	
1968-77	Drought	("eight years up to 1977": since transitional/independent Government) (UNDP files show international drought concern for 1975, 1977, 1979 and 1981)	
1972 October	Earthquake		
1979 December	Drought		
1982 August	Cyclone	Heavy damage to housing and fishing fleet	7

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

COMOROS (continued)			
Date	Event	Effects	Deaths
1867	Fire	Sugar factory: Debenev	
1872	Volcanic eruption	Karthala Grand Comoro NW Flank: Plateau de Diboini	
1876			
1880		SE flank: Massif du Badjini	
1883 March			
1884			
1889 (1885?) (1884?)	Volcanic eruption	Lava flows north side: no casualties	
1898 27-28 February	Tropical cyclone		
1898 22-23 April	Tropical cyclone		
1898	Cyclones	Mayotte Financial ruin of several sugar establishments, sugar production recontinued only in 1904; to a lesser degree and accompanied by diversification into other crops	
1898	Epidemic	losses to 23 colons (sugar plantations) Smallpox	

COMOROS (continued)			
Date	Event	Effects	Deaths
1904 25 February- 11 March	Volcanic eruption	Karthala Grand Comoro Three lava flows on the north side: one to the west two to the east Accompanying tremors and earthquakes Two deaths and cattle lost	
1904 14 December	Cyclone	Anjouane, Mayotte, and Moheli Total cost of damage to government, <u>colons</u> and <u>indigènes</u>	
1905 16 December	Cyclone	Anjouan; Moheli, and Grand Comoro Total cost of damage to government, <u>colons</u> and <u>indigènes</u> 150 injured	30
1904-1905	Food shortage	Followed cyclones of 1904 and 1905	490
1908 3 February	Storm	Anjouan	
1908 14 April	Cyclone	Anjouan, Moheli and Grand Comoro Damage not serious, no special financial advance required Cloves, coconuts, cocoa, cassava, maize, and sweet potatoes damaged Cyclone marked end of, and caused damage, after a dry season 50 tonnes of rice sent from Mayotte 300 tonnes of rice sent from Zanzibar Five ships ("boutres") lost with 54 lives Nine natives died	
1918 11-26 August	Volcanic eruption	Karthala Grand Comoro Cheminee nord Accompanied by earthquakes: 23 and 25 August felt in Grand Comoro and Moheli Ash column of 5 000 metres: Poboni, M'vouni and Moroni.	

COMOROS (continued)

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

COMOROS (continued)			
Date	Event	Effects	Deaths
1975	Food shortage	Caused by suspension of economic activity	
1975-76	Civil strife	Following food deficits	
1977 (January)	Repatriates	17 000 returnees from Madagascar	
1977	Volcanic eruption	Karthala	
5-10 April		Grand Comoro	
		SW flank	
		10 000 homeless	
1977	Food shortage		
1980	Cyclone		
November			
1981	Drought	Ngazidja Is	
1982	Drought	Grand Comoro Anjouan	
		Diminished crops Death to livestock	
1983	Cyclone (Elinah)	Severe damage to crops, both commercial and for national food supply. 30 000 persons received emergency assistance. Damage to infrastructure.	
January			

D. MALDIVES			
Date	Event	Effects	Deaths
1704	Epidemic	Smallpox	
1721	Fires	Disastrous series during 17 years previous	
1729/30	Earthquake	"Two destructive earthquakes occurred in the East; August 1729 and March 1730" (Also passing reference to three other earthquakes 1730)	
1759	Fire	All bazaars and many buildings destroyed in Male	
1773	Fire	All houses burnt down in Himiti Island (Milandre Atoll)	
1815	Earthquake	"Felt from Tiladummati Atoll to Fivaku on Miladummadulu Atoll . . . caused houses to fall"	
1818-19	Famine	". . . which reduced people even to eating grass"	
1819	Storm	"Great storm . . . twelve buildings fell in the Palace enclosure"	
1820	Tornado	14 islands of Tiladummati Atoll and 12 islands of Miladummadulu Atoll, plus 3 other islands devastated, many fishing boats wrecked, and a large number of people drowned	

MALDIVES (continued)			
Date	Event	Effects	Deaths
1887 3 February	Fire	Male; "... all merchant shops and some of the Maldivians' houses and other shops burnt down, also shops and houses belonging to the Government"	
1922 October-November	Epidemic	A type of influenza; "Maldivian gift fever" 300 deaths in Male "noble and plebeian alike"	
1965	Epidemic	Gastro-enteritis	
1966	Epidemic	Typhoid	
1968	Epidemic	Diarrhoea	
1978-79	Epidemic	Cholera 11,258 people affected 7.5% of population Over 7,200 cases reported on 50 islands	219 (in 1978)
1982 June	Epidemic	diarrhoea	

E. SAMOA			Deaths
Date	Event	Effects	
1690 (?) 1750) 1760) approx.	Volcanic eruption	Surrounded village of Aopo, and overwhelmed the coast from Sasina to Asau (Mauga Af'i)	
1830	Epidemic Influenza	First occurrence; returned almost every year for a long period	
1831 December	Hurricane	Upolu and Savai'i Earthquake at the same time (Savai'i) ?	
1836	Gale	"Some damage" at Apia	
1839	Epidemic	Influenza "over all the islands of the group"	
1840 December	Hurricane	"The preliminary symptoms are very similar to what they are in England, but the secondary effects are far worse"	
1842 15 December	Hurricane	Upolu and Tutuila	
1846 March	Cyclone	Apia and Sapapalii	
1847	Epidemic Influenza	3 ships aground in Apia Harbour	
1848 26-28 December	Cyclone	Especially severe	
1848-49	Epidemic	Influenza Whooping cough - "fatal among children and some adults" Savai'i	150

SAMOA (continued)			Deaths
Date	Event	Effects	
1850 April	Hurricane	Upolu Eastern part of the island "... a great scarcity of food, and diarrhoea and dysentery are very common among the people" "The oldest Samoan living never saw a storm anything like it before" "All the island (Upolu) having suffered more or less by it" All ships in harbour foundered. Upolu devastated as if by fire (Savai'i hardly suffered)	
1851	Epidemic	Mumps	
1854	Hurricane	Eight European vessels wrecked, and famine amongst the natives	
1856 26 April	Storm	"Desolating ... not a chapel is left in all Aleipata, and only here and there a small dwelling house ... escaped ... great rain ... in torrents"	
1863-73	Inter-tribal warfare		
1877	Inter-tribal warfare		
1883 March	Hurricane	Disastrous. Seven or eight ships in Apia harbour blown ashore and wrecked (earthquake tidal wave: at the same time - or sea surge?) ("possibility of tsunami can't be ruled out" - a slight quake and a strong hurricane, two big waves) small loss of life	

SAMOA (continued)			
Date	Event	Effects	Deaths
1889 16 March	Hurricane (60 km/hr winds)	"The Great Hurricane" "Hurricane and great losses in Apia harbour, due in part to failure of vessels to put to sea earlier through tenseness of political situation" 6 warships and 12 merchant ships destroyed with total loss of 247 crew Severe damage to Apia and district	
1893	Epidemic	Measles	
1902 30 October-- 22 November	Volcanic eruption	Mauga Mu Lava flow over an area of 150 sq.km.	
1905-11 4 August 1905- 10 September 1911	Volcanic eruption Tsunami	Matavanu Savai'i Matavanu Volcano. Started 4 August 1905. Lava flowed to the sea continuously until 10 September 1911 Nearly whole of Leaitolu district overwhelmed Considerable section of Saleaula destroyed Evacuation necessary (no figures given) Some people moved to their adjacent lands; others were established by the Government at Salamamu and fana South on Upolu Plantation and agricultural damage	
1917 Jun:	Earthquake R. 8.3	Tsunami and fires in Apia Considerable damage to buildings and contents - Apia Salunafata: landslides, trees uprooted Lotofaga: tidal wave flooded houses and plantations Sea wall demolished Tutuila: church shaken down	
1918	Epidemic	Influenza New Zealand Report: Population 1918 September 38,302 (before epidemic) Population 1918 December 30,738 (after epidemic)	Between 6,000 and 7,542

SAMOA (continued)			Deaths
Date	Event	Effects	
1918 September	Tsunami 0.2 metres	Much damage	
1923 March	Cyclone 50 km	Worst hurricane for 25 years, 48 hours' duration General damage to roads and public works and considerably reduced copra output	
1925 June-September	Drought	6.49" rain during the period (but May had been unusually wet with 23.58")	
1926 1 January	Intense storm	Winds exceeded 75 mph at Apia; 300 miles in diameter, moved at 15 mph Damage to vegetation increased by dryness during February Tug blown onto reef Coastal trading vessel beached Damage to plantations Copra production reduced by 2,608 tons (17 per cent of 1925/26 production)	3
1926 31 March	Intense storm 60 mph	Not so violent as January hurricane	
1927 3 July	Earthquake	Seismograph put out of action No other reports of damage	
1929 17-18 January	Cyclone wind gusts to 48 mph	Damage to plantations "Small" financial loss -- mainly to bananas	
1931 January	Cyclonic storm	Flooding in Apia	
1932 6 February	Storms	"As a result of cyclone over Tonga"	

SAMOA (continued)			Deaths
Date	Event	Effects	Deaths
1936 January	Hurricane	Aleipata Strong winds in Apia Considerable damage, all but strongest houses were demolished	
1939 January	Storm 65 mph	Apia - 15.95 inches rain in one day 52 inches rain in 48 hours (mountain rainfall stn)	
1939 December	Gale	Upolu devastated	
1941 March	Violent storm	Havoc in unprotected plantations of S Upolu	
1960 January and March	Storms	"Banana shipments suffered heavily ... neither imports nor Government revenue were unduly affected"	
1960 May	Tsunami 4.9 m max	Some damage at Apia	250
1964	Windstorm		
1966 January	Tropical storm 60 km (69 mph) (gusts of 82 km 94 mph)	WFP emergency food aid operations 2,135 tonnes food supplies plus £20,000 from Samoan Government and voluntary donations plus £26,000 from "other" mostly overseas government donations Copra Board estimated 40 per cent loss of production, timing uncertain	

SOMOA (continued)		
Date	Event	Effects
1968 February	Severe tropical storm 58 km 78 km gusts	<p>Apia "Confusion; breakdown of communication and lack of transport did not allow ... warnings to be disseminated until after many hours had elapsed" "Some determined effort must be made to improve communications and transport"</p> <p><u>Bananas</u> 70 per cent of all banana producing stems. Cessation of revenue from banana production to be considered. Corresponding drop in overseas earnings. "Rapid" recovery expected however. Planters in meantime unable to acquire loans or to provide adequate food supplies for themselves. Moratorium - loan repayments proposed.</p> <p><u>Cocoa</u> 25 per cent-35 per cent reduction below anticipated crop for 1968. 60 per cent of new cuttings destroyed - setback to cocoa project.</p> <p><u>Coconut</u> 1969 production expected to be as low or lower than 1967 following 1966 hurricane. Some agricultural building damage and some flooding. Buildings: agriculture and schools; school books; harbour equipment</p> <p>"Elmore" 475.7 mm rainfall in six days</p> <p>Food shortage</p>
1972 December	Tropical storm 46 km wind speeds	
1974	Drought	

Deaths

SONOA (continued)			
Date	Event	Effects	Deaths
1975 26 January	Hurricane "Val" windspeeds at Apia: 52 knots	Considerable amounts of rainfall Flooding in the Apia area caused by new springs Many springs formed along the northwest coast of Upolu	
1977 April- September	Drought	Northern and northwestern parts of Savai'i and Upolu islands Reduced agricultural production estimated at "several tens of thousands of tala" (Tala 0.787 = \$US 1.00 : 1977)	
1981 1 September	Tsunami	21 cm "slight damage on coast"	