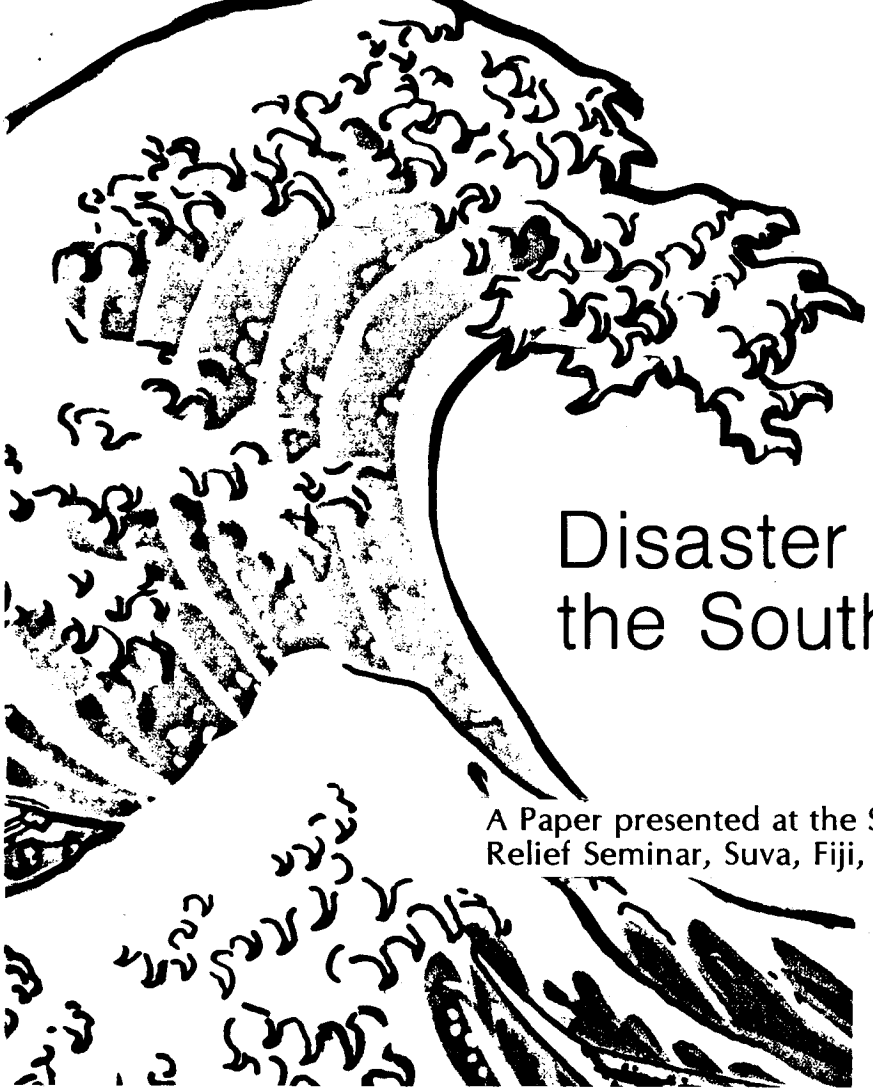

Disaster preparedness in the South Pacific

A Paper presented at the South Pacific Disaster Preparedness and Relief Seminar, Suva, Fiji, in September, 1976.

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EARTHQUAKES

The earthquake which occured in November 1970 at Madang in what was then Northern New Guinea, was recorded at a magnitude of 7.1 on the Richter Scale, and effects of it were felt over an area of 10,000 square kilometres. Its damage was assessed at the time at almost $A1,750,000. Taking account of inflation that sum would now be $A2½ million. Many landslides caused damage to buildings, services and crops and a submarine cable was broken; 15 people lost their lives.

On September 14, 1953, Suva and South-East Viti Levu of Fiji experienced an earthquake which was followed by a tsunami. The earthquake was felt over an area of 340 square miles and registered 6.75 on the Richter Scale. There was much damage to property and 60 miles of trans-Pacific submarine cable were carried away by a giant slide of the ocean floor. Suva wharf, badly damaged by hurricane in 1952 was severely damaged for a second time; the accompanying tsunami, 50 feet high at the reef and generally six feet high thereafter, created a 15-foot wave at Kadavu, killed two people and wrecked many boats.

In June 1917, an earthquake on Upolu, Western Samoa, registered 8.3 on the Richter Scale and caused considerable damage to buildings in Apia, causing fires, creating landslides and initiating a tsunami which demolished a sea wall at Lotofaga and flooded houses and plantations.

TSUNAMIS

A tsunami initiated by a Chilean earthquake in 1960 created sea waves of between one and two metres in height along the coast of Bouganiville, New Britain and mainland coastlines of Papua New Guinea.

Another tsunami to affect San Christobal had a recorded wave height of between four and 20 metres and destroyed 18 villages killing 50 people.

A tsunami in 1930 in the Ninigo Island group of Papua New Guinea caused waves up to ten metres high, wrecked villages and killed 11 people.

In 1895, a wave two metres high struck Buna Bay in what was then East Papua and killed 26 people.

But what is said to have been the most disastrous tsunami yet known in Papua New Guinea resulted from the volcanic explosion of Ritter Island in 1888 and has been compared to the overwhelming tsunami which followed the Krakatoa (Indonesia) eruption of 1883, one of the world's worst disaster events: waves up to 12 metres high resulted.

In the Cook Islands, a tsunami in 1926 swept right over the island of Palmerston.

ACTIVE VOLCANOES

In the Solomon Islands in 1971, the volcanic island of Tinakula erupted and lava poured down from the peak for two months; the population of 160 had to be evacuated.

The population of Manam Island had to be evacuated in 1958 for eight months while flows of hot lava solidified to depths of 50 feet, and 12-inch deposits of ash ruined subsistence gardens.

Probably one of the most catastrophic volcanic eruptions of recent times occurred in Papua New Guinea for six months in 1951 when Mount Lamington sent an avalanche of hot lava sweeping down its slopes with 'hurricane force velocities.' Ninety square miles were devastated and secondary 'micro' disasters were caused by the flooding of lava-blocked rivers, mud flows and disrupted roadways and river crossings. Five thousand people had to be evacuated and another 4000 people died.

In 1937, an eruption of Mount Matupi adjacent to Rabual of New Britain caused the evacuation of Rabaul which was then the capital city and seat of the government of New Guinea.

In 1945, the island of Niuafo'ou in Tonga was severely damaged by volcanic eruption and considerable damage was done to property and crops. Nearly all of government headquarters on the island was destroyed including a wireless station, copra sheds, lighters and £20,000 worth of copra awaiting shipment. The entire population of 1300 was evacuated to the island of Eua in the South (but by 1971 half of them had returned).

Niuafo'ou was previously volcanically active in 1929 when one town and a third of the cultivated land on the island were completely destroyed.

In Western Samoa, Mount Matavanu on Savai'i erupted intermittently for six years between 1905 and 1911 damaging plantations and crops and causing evacuation of many villages.

Earthquake, volcanic eruption and tsunami belong to a group of seimically generated or tectonic disturbances which result in disaster. A second and equally significant group are those disasters caused by atmospheric disturbance.

HURRICANES

One of the earliest records of serious effects of hurricane comes from the Cook Islands where a coasting schooner was picked up and carried inland over coconut palms at Rarotonga in 1846.

In 1883, it is recorded that a hurricane at Apia, Western Samoa, carried seven ships on to the shore and that a 'slight' earthquake occurred at the same time.

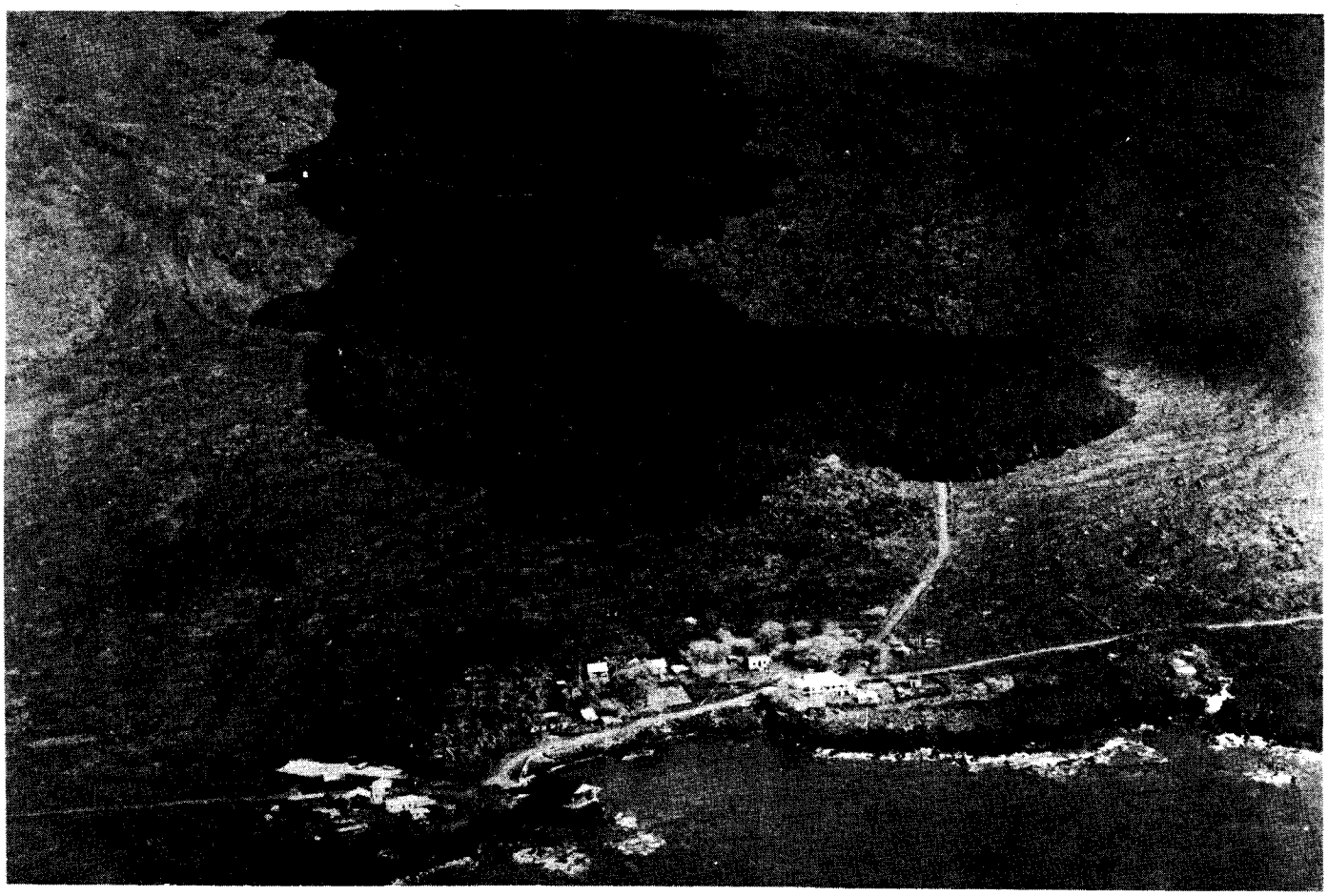
One of the most severe hurricanes in Fiji occurred in 1929 and caused serious damage on Vanua Levu, Rotuma, Mokogai and Gau. Several trading vessels were lost, 12 people died, crops suffered and there is a contemporary estimate of £60,000 worth of structural damage at Labasa (that would be F$132,000 at today's prices).

Mount Lamington in Papua New Guinea erupted on 21 January, 1951, throwing a gas column 40,000 feet above the crater.

In 1931, Labasa was again severely damaged by hurricane which also destroyed Lautoka and 200 lives were lost in subsequent flooding.

More recently in 1960 on Niue, a hurricane demolished 750 of the 850 houses on the island, which again suffered severe hurricane damage in 1968.

In 1961, Tonga suffered extensive damage on the islands of Vava'u and Ha'apai where subsistence and export crops suffered severely, housing was damaged, two people



On April 18, 1926, the fishing village of Hoopuoa Landing, Hawaii, was wiped out when the lava stream from Mauna Loa engulfed it. This remarkable aerial shot shows the flow, 50 feet high and 1500 feet wide, approaching the village.

died and 8,000 others required emergency shelter.

Two tropical storms struck Western Samoa in 1966 and 1968 causing severe damage to crops and long term reductions to agricultural exports.

Winds of 100 mph occurred in a hurricane which severely damaged port facilities at Honiara, Solomon Islands in 1967 and a number of villages were also destroyed.

In 1971, the Solomon Islands were again struck by hurricane 'Ursula' at Santa Anna and all houses on that island were destroyed leaving one person dead, and 2,500 homeless.

But it was in October 1972 (earlier than the usual hurricane 'season') that one hurricane formation, hurricane 'Bebe', affected at least four countries. The island of Funafuti, the principal island of Tuvalu, was the first to be almost completely destroyed by 'Bebe'. With winds reaching 180 mph, 95 per cent of all houses (all but two) on the island were destroyed, and 700 people were made homeless; all generating and radio equipment was destroyed, five people were killed, four fishing vessels were wrecked and a large section of the coral reef was lifted and carried on-shore. On the islands of Fiji, 'Bebe' was the worst hurricane for 20 years. Over 4000 bures and 2500 houses were totally or partially destroyed with another 1100 bures and houses slightly damaged and 120,000 people made homeless (a fifth of the country's population) and in need of emergency feeding for six months. Eighteen people were killed. Airports were closed and out of action, bridges collapsed, roads were broken, telecommunications were disrupted and water pipelines fractured. 'Bebe' went on to cause lesser damage in the islands of Tonga and on Niue.

Before there had been anywhere near enough time to recover from hurricane 'Bebe', Fiji suffered hurricane 'Juliette' in April 1973, destroying almost 14,000 bures and houses and having a disastrous effect on the lives of 160,000 people (35 per cent of the country's population). 'Juliette' went on to Tonga and caused severe damage to crops, housing, schools and churches on seven islands and in 17 villages.

In December of the same year (1973), hurricane 'Lottie' struck Kadavu and the Southen Lau group of Fijian islands and destroyed 1400 homes and 40 schools. Fifteen thousand people had to be rationed and

10,000 of them experienced their second hurricane in eight months. Two inter-island ships were lost and 74 people were drowned.

The Lau group of islands were again struck by hurricane 'Val' in January 1975 destroying 75 per cent of homes, severely damaging 25 schools, and causing 22,000 people to be rationed for six months. Ten thousand people suffered their **third** serious hurricanes in less than two years.

DROUGHT

Drought has been by comparison a gentler and slower disaster event but capable of comparable disruption and deprivation. In the Gilbert Islands 1916-1917 had a serious period of drought during which exports of copra were severely reduced.

Another period of drought is recorded (amongst others) for 1934 when 'food producing trees practically ceased to produce and an outbreak of beri-beri and the lack of fresh food killed a number of natives.'

It is interesting to note that a period of drought during 1973 and 1974 ended a season of particularly high coconut production affected by the high rainfall of 1972-1973 — no doubt drastically increased by hurricane 'Bebe.' The ending of one disaster for some was brought about by another disaster for others.

I have recently attempted to assess the total losses from all disasters over the ten-year period of 1966-1975 for the ten member countries of the South Pacific Bureau for Economic Co-operation (Lewis, 1976). By adjusting a summation of recorded losses over this period to allow for inflation, a total of $A37.5 million resulted. That is approximately ten dollars for each man, woman and child now in those ten countries and represents an annual average loss per country of $A0.375 million, which is 1.15 per cent of the average GNP at market prices for 1973. To these assessments of primary loss must be added assessments for secondary losses caused in particular by evacuation and migration resulting from or exacerbated by natural disasters.

The overall resulting interruption, debilitation and postponement of plans for development are another important area of secondary loss that has yet to be examined in detail. Another factor is the increase in the amount of development since earlier disaster occurances and the present, and the corresponding increase in disaster losses that would accrue now in similar events due to increased development. As development increases so does vulnerability to losses from disaster.

These were some of the results of disaster occurrences in the South Pacific. As this paper was being prepared an earthquake with a magnitude of 7.1 occurred in Irian, Jaya, the neighbour of Papua New Guinea, killing 443 people and leaving 3,000 people unaccounted for. Two other earthquakes occurred in Indonesia in the same months and another in July 1976, an earthquake ocurred between New Hebrides, New Caledonia and Fiji on August 2 and an earthquake in the Celebese Sea on August 16 sent a 15-ft. tsunami into the South coast of Mindanao Island of the Philippines killing at least 2,000 people and leaving as many homeless. Japan experienced its worst typhoon in 15 years in September. Such events are thus not events of a distant past but are with us all the time. We can sadly be sure of them and other disaster events occurring in the future.

The brief descriptions I have given have been retrospective. They are a summary of some of the effects of some past events. How are we to anticipate disaster events of the future that we know will occur and how are we to mitigate their effects. What is disaster? and what, therefore, is preparedness?

The first part of my question may seem facile. We of the South Pacific know what disasters are already. But I am going to suggest that it is insufficient to think of disasters entirely in terms of the natural phenomena which initiates them. What we have tended to take for granted in our attitudes to disaster is that they affect us — they affect **people.** Without people there cannot be a **disaster.** There can certainly be the manifestation of extreme natural phenomena, but an earthquake under the sea or the volcanic eruptions of an uninhabited island does not cause a disaster (assuming there to be no tsunami which is experienced elsewhere!)

A hurricane in Suva in 1958 caused this damage to coconut trees planted in sandy soil.

This is not a mere academic observation because it follows that if people are a necessary constituent for disaster then the condition and situation of those people, their socio-economic environment that is, is as significant, when we come to assess disaster potential, as is the natural phenomenon itself (Baird *et al,* 1975). Extreme natural phenomena are the **disaster agent. Disaster occurs where the agent meets a vulnerable human settlement** (Baird *et al,* 1975).

Attention to disaster occurrence by the world press and television and by monitoring systems encourages all of us, as outsiders to situations being experienced by others, to consider disasters as single events of one **kind** or another. The potential victim, on the other hand, the insider in his vulnerable settlement, finds himself in a continual state of risk from disasters of all and **whatever kind** all of the time. His loss and deprivation is assured at each occurrence but the degree of that loss relates to his condition and situation rather more I would suggest than to the type of the natural event. In any case he is affected in much the same way, in terms of his deprivation, whatever 'type' of disaster has occurred. In human terms as well as socio-economic values, 'disaster' is common from whatever the cause.

Natural events which lead to disaster are therefore an extreme manifestation of a day-to-day situation. *Vulnerability to disaster is the degree by which a community is at risk to extreme natural phenomena which it has not the capacity to absorb* (Westgate 1976). It is day-to-day therefore because:

1. The state of hazard condition is continuous.
2. Disaster potential is conditioned by the socio-economic condition of settlements which is subject to adjustment continually.

Furthermore, the taking of precautions against disaster occurs before the disaster occurrence, but more realistically because there will usually have been previous disasters, precautions take place between disasters. Therefore, and thirdly, precautions have to be continuous and day-to-day as:

3. Precaution is the manifestation of awareness of the continual hazard state.

Precaution for disaster is therefore an aspect of planning and is part of what has been called predisaster planning or just simply precautionary planning.

Precautionary planning is the policy of implementation over time which sets as its objective the mitigation of the effects of disaster by a comprehensive co-ordination of indigenous resources and infrastructure (Westgate, 1976). As an applied science precautionary planning has been developed to answer the need for a precautionary strategy against the results of disaster events, the probability of which is known. It takes as its base the premise that a government has a responsibility to do all in its power to protect life and property of its people, to safeguard their health and welfare and to provide public services essential to the national well-being and commensurate with the nation's capacity (Lewis, 1975).

It is important to emphasise here that just as the disaster potential is conditioned by the socio-economic condition of a settlement, so is the capacity for taking precautions. The relationship of disaster impact and disaster precautions with the development process is now therefore clearly apparent and there are now two approaches, simultaneous and not alternative approaches, to precautionary planning. One is to attend to the needs of settlements as they exist now. The other is to take steps to reduce the vulnerability of future settlements or the vulnerability of development that has not already taken place. To undertake either one without attention to the other would be an inadequate response.

This is important because if the socio-economic condition is to be changed then the development process must be aware of disaster potential and its own capacity to reduce or exacerbate that potential. Development has within its power the capacity to reduce vulnerability in the long term (Baird *et al,* 1975). This capacity to reduce vulnerability in the long term is a principal part of what has been called 'disaster prevention'.

Disaster prevention may be described as measures designed to prevent natural phenomena from causing or resulting in disaster.

Although it is a term I use daily, I find it difficult to accept until clarified by an analogy to preventive medicine. It seems to me to be presumptious in the extreme, even in the terms of which I have described the disaster process, to assume the capacity to totally prevent disaster. Mitigation is to me a more appropriate explanation of this important part of precautionary planning.

Disaster preparedness may be described as action designed to minimise loss of life and damage, and to organise and facilitate timely and effective rescue, relief and rehabilitation in cases of disaster which cannot be avoided.

Disaster prevention and disaster preparedness, relief and rehabilitation go closely together to form the comprehensive concept of precautionary planning. Activities under these headings can be related to the time phases of a disaster occurrence. These phases are:

Prevention, Warning (where any is possible), Strike, Emergency, Relief, Rehabilitation and Reconstruction.

These phases are of variable and indeterminate time and diffuse in operation and they will vary according to location and to disaster.

In relating the activities of precautions to these time phases, it is clear that some can be carried out in preparation for a disaster that **will** occur in the near future, while others, those for relief and rehabilitation, cannot be carried out **until** the disaster has occurred and actual conditions are known.

Precautions to be taken before disaster occurrence can be related to two principal areas. First, land use and building construction which have been called **physical** precautions. Secondly, those precautions relating to the preparation of warnings, the promulgation of warnings and associated advice to achieve a desired and most effective response, attention to particularly vulnerable communities or individuals and the provision of emergency shelter, feeding and first aid. These have been called **social** precautions (Lewis, 1975b), and include the preparation of information for administrators, the public and for schools. This second group are aspects of disaster preparedness.

So prevention and preparedness are the taking of precautions beforehand, which can be classified as:

Physical precautions
Social precautions
Contingency planning.

Relief is the execution of activities, pre-identified within the precautionary planning process, to restore bodily needs to disaster victims. These bodily needs are:

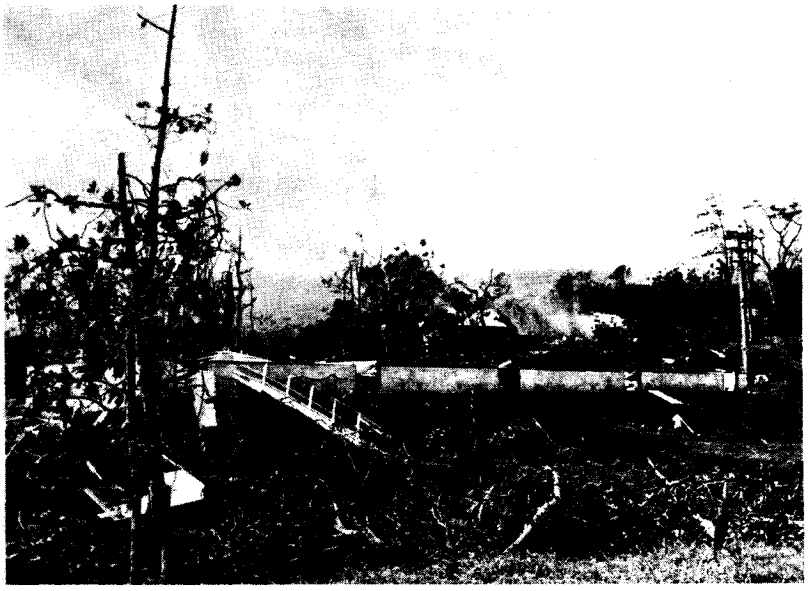
Treatment of wounds
Potable water
Edible food

Simple shelter
Warmth
Sanitation

The first three examples of first aid, water and food are immediate bodily needs and are required in order to stop further loss of life. They belong to the **Emergency** period. The latter three examples of emergency shelter, warmth and sanitation are the commencement of a process to restore temporary facilities without which serious secondary loss would occur. These belong to the phase of **Rehabilitation.**

A particularly significant aspect of contingency planning is the identification and assessment of indigenous resources (Lewis, 1975a). In any location there will be resources of supplies and materials for normal use by governments and the private sector which, when scheduled and precoordinated with information on ownership, accessibility and payment will be a most important and immediately effective local relief source. It is unlikely that all would be lost in the disaster occurrence, there will be useful areas adjacent to the area most severely hit, which is why this principle becomes particularly valuable in a regional or sub-regional grouping of islands or island groups.

The activities of the **reconstruction** period, which follows those of relief and rehabilitation, are devoted to the permanent



This is typical of the wreakage among Samoan houses when a hurricane struck on 29-30 January, 1966.

provision of housing and the restoration of life-support systems, and supporting services of water, power, sewage disposal, transport and communication. This is a necessarily much larger period and is the phase during which precautions for subsequent disaster can and must be incorporated.

The activities which relate to each of these phases of operation can be further analysed and identified and related to roles for personnel in government and non-government organisations. Thus an administrative structure, initiated and co-ordinated by government, consisting mostly of existing roles and responsibilities, can emerge as a programme precautionary planning to be applied and executed in whole or in part. The whole programme must be first identified so that sectoral or mono-disciplinary activity can proceed within and as part of the whole without resulting in counter-productivity or incom-

patibility. What is important to emphasise is that the programme emerges from within at national, provincial and local levels and because it is based on an analysis of physical and administrative resources it is immediately commensurate with what is available.

Further and critically important consideration of indigenous resources leads me to mention the most valuable resource of all: the skills, innovation and resourcefulness of people. If this powerful resource is not to be overwhelmed and lost it seems to me to be of paramount importance for the adaptability of relief aid. which can be expected sooner or later to be considered as a matter of policy as part of the preplanning process. We hear a lot nowadays of how aid programmes have increased, rather than decreased, dependency. The same is true of relief aid, and the dangers of unplanned relief-aid are even more real. In a sense it is consideration of indigenous resource in reverse, not in terms of capacity to provide, but in its capacity to absorb outside supplies.

The countries of the South Pacific can demonstrate a considerable awareness and a considerable degree of preparedness directly related to devastating disaster experiences — some of which I have described. Most significant has been the estabishment of a Regional Disaster Fund by the ten-country member South Pacific Bureau for Economic Co-operation (SPEC) based in Suva. The fund was commenced by a donation from the republic of Nauru and is contributed to annually and equally by member governments and additionally by neighbouring or interested governments and organisations. It will be used as oil for the machinery of regional, sub-regional and national indigenous relief; it is itself an aspect of precautionary planning and a catalyst for many other aspects. It is the first fund of its kind to have become established and is a striking example of initiative with enormous potential from within the region.

The working guidelines for the fund are contained in a Pilot Study Report (Lewis 1976) which has recently received acceptance by the SPEC Committee. The applied science of precautionary planning for natural disaster is still in its infancy. It can be no more than five years old. We are all still feeling our way in spite of the attentions being paid to the problems of disaster throughout the world. World attention there now certainly is, and interest and activity here in the problems caused by disaster in the countries of the South Pacific is a significant part of that world attention. World attention is a reciprocal process between regions, and between nations, and between organisations of the world. The countries and organisations represented in the South Pacific I see as essential partners of this process.

REFERENCES

BAIRD, A., O'KEEFE, P., WESTGATE, K., WISNER, B. (1975). *Towards an Explanation and Reduction of Disaster Proneness.* Occasional Paper No. 11, Disaster Research Unit, University of Bradford.

LEWIS, J. (1975a). *Proposals for a Working Method of Indigenous Resource Co-ordination as Part of a Predisaster Plan.* Occasional Paper No. 3, Disaster Research Unit, University of Bradford.

LEWIS, J. (1975b). *A Study in Predisaster Planning.* Occasional Paper No. 10, League of Red Cross Societies / Disaster Research Unit, University of Bradford.

LEWIS J. (1976). *A Report of a Pilot Study to Establish Guidelines for the Management of a Regional Fund to Provide Insurance for Natural Disaster.* Commonwealth Secretariat/South Pacific Bureau for Economic Co-operation/Disaster Research Unit, University of Bradford.

WESTGATE, K.N. O'KEEFE, P. (1976). *Some Definitions of Disaster.* Occasional Paper No. 4, Disaster Research Unit, University of Bradford. □

NEW COCOA FERMENTRY IN FIJI WILL BE CHEAPER, QUICKER THANKS TO LOCAL MATERIALS

A new cocoa fermentry being built at Logani, in the Bau district will mean a quicker and cheaper turnover of dried cocoa beans for the farmers in the area. The Ministry of Agriculture in collaboration with the District Administration and Rural Development is building the drier to streamline cocoa bean processing in the Central Division.

Mr. Ray Paris, a V.S.O. attached to the Commissioner Central Division, is supervising construction of the project financed by a $1,500 grant under New Zealand aid.

Commenting on the project, Mr. Paris said: "On approval of funds, we selected a site and made arrangements for work to begin. We are using voluntary labour from cocoa farmers. Timber will be the main structural component; about 75 per cent will be local unsawn timber from nearby areas and about $250 worth of sawn timber. The use of local material will help cut down costs immensely. Final cost is estimated at $1,100."

The capacity of the drier will be about five tons which will be more than adequate for the maximum demand at the height of the cocoa season anticipated in the area. It will be simple and will have a timber oven fire.