Country Report for UNCED

Tokelau

National Reports to the United Nations Conference on Environment and Development (UNCED) were prepared under the direction of the National Task Forces in 12 Pacific island countries with the financial and technical assistance of the Asian Development Bank and United Nations Development Programme. This assistance was coordinated by Gerald Miles through the South Pacific Regional Environment Programme (SPREP). For Tokelau, this report was drafted by Foua Taloa, David Collins and Stella Humphries, and endorsed by their government for presentation to the United Nations.

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PREFACE

The United Nations has called for a Conference on Environment and Development (UNCED) to be held in Brazil in 1992. At UNCED the global problems of environmental degradation and non-sustainable use of resources will be examined with a view to developing a policy framework and action plans for addressing these problems. In preparation for UNCED each member country has been asked to prepare a National Report analysing the key environmental issues arising from past development activities and identifying the constraints and opportunities for sustainable use of resources in the future. This National Report forms part of Tokelau's preparation for UNCED.

Financial assistance for the preparation of this report was provided by the United Nations Development Programme (UNDP) through the South Pacific Regional Environment Programme (SPREP). The report was written by Dr. Stella Humphries (C.S.I.R.O., Division of Wildlife and Ecology, Australia) and David Collins with assistance from Dr. David James. A task force comprised of representatives from various administrative departments of the Office of Tokelau Affairs and representatives of the Councils of Elders, the local governing authorities on each atoll, provided the information which forms the basis of this report.

Preparation of the report was co-ordinated through the Department of Agriculture and Fisheries. The contents of the report and the recommendations contained within have the full support of the Office of Tokelau Affairs and the Councils of Elders.

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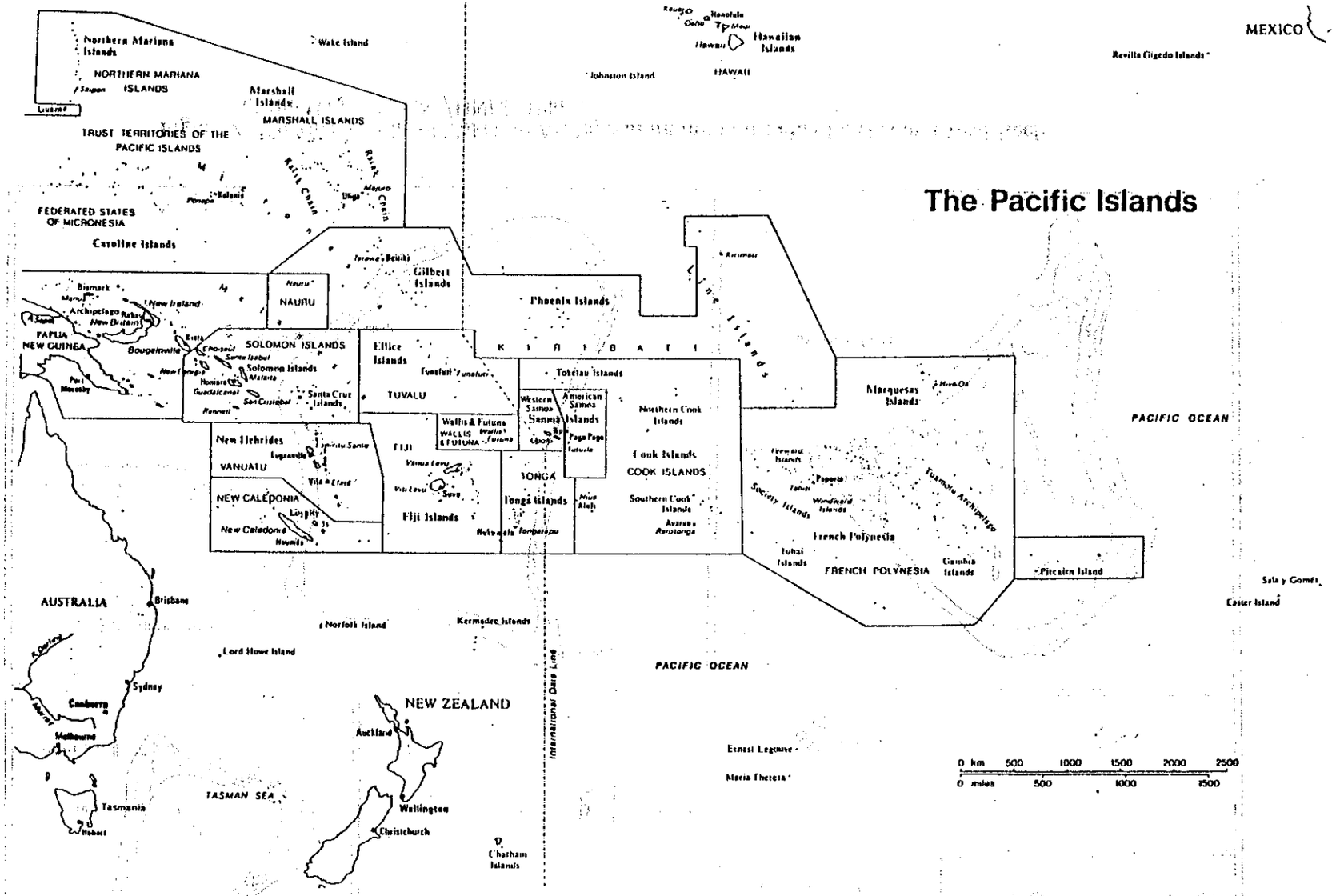

Figure 1 The South Pacific Islands showing the regional location of Tokelau. (From: The Economist Intelligence Unit Country Profile: Pacific Islands 1988-89).

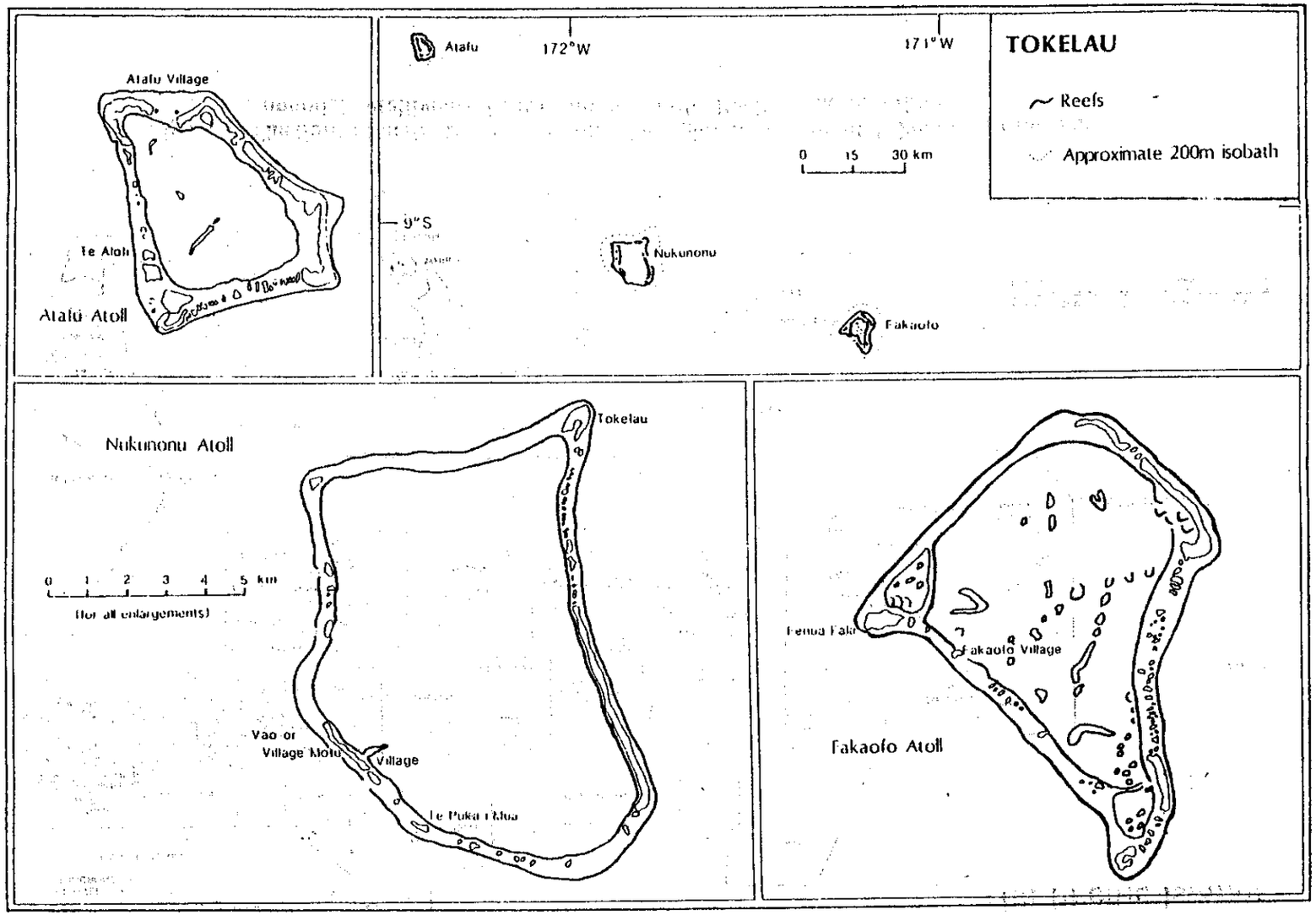

Figure 2 The three atolls of Tokelau: Atafu, Nukunonu and Fakaofo. (From: Coral Reefs of the World IUCN /UNEP 1988).

1.0 EXECUTIVE SUMMARY

Description

Tokelau is a small, isolated, non-self-governing territory under the administration of New Zealand since 1925. It consists of three low-lying atolls just south of the equator (9°S 173°W), a land area of 12 sq km fragmented into 127 islets and a total lagoon area of 187 sq km. The maximum elevation is 5m above sea-level. Rainfall is heavy but irregular averaging about 280cm per year. Major storms have occurred in 1846, 1914, 1966, 1987 and 1990 with the latter (Cyclone Ofa) the worst in living memory. The land is vulnerable to wave over-wash during storms which contaminates the soil and freshwater lenses with salt. Increases in frequency and severity of storms have evoked fear of climate change which could make the islands uninhabitable.

The total population has stabilised at about 1700 and is concentrated on one or two islands in each atoll. Emigration to New Zealand provides the major outlet preventing over-population. About 4,500 Tokelauans live abroad.

The basis of Tokelau's legislative, administrative and financial system is the Tokelau Act 1948 and amendments enacted by the New Zealand Government. Most of the powers of the Administrator who is based in Wellington, New Zealand, have been delegated to the Official Secretary based in the Office of Tokelau Affairs in Apia, Western Samoa. The local governing authority on each atoll is the Council of Elders. The central governing authority of Tokelau is the General Fono which has representation from the three local councils and different social groups. The General Fono endorses and recommends laws and policy measures but it has no legal status. Administrative responsibilities and specialist services are carried out by the Tokelau Public Service who are funded by New Zealand.

The only communication lines are a monthly supply ship and telecommunications with Apia; there are no air links.

Natural resource endowment

Cultivation on the porous and infertile soils is limited to subsistence crops apart from copra production which provides the only cash crop. The indigenous terrestrial ecosystem is mostly disturbed with low species diversity and no known endemics.

Marine resources are rich and varied and the sea is the mainstay of the Tokelau lifestyle. Fishing is spread across lagoon, reef and ocean systems. A small scale commercial tuna fishery is under development. The coral and lagoon ecosystems have been surveyed for selected species for their commercial viability but a complete ecosystem profile is not available.

There is no surface water; rainwater is adequate for domestic and stock consumption requirements. The role of the freshwater lenses in agriculture and maintenance of the terrestrial and reef ecosystems is indeterminate.

Energy sources for domestic use are predominantly petrochemical based with the import demand increasing. There is scope for greater use of renewable energy sources.

Patterns of economic growth

Tokelau is in transition from a traditional subsistence lifestyle typical of Polynesia to a western, monetary economy with the balance shifting increasingly toward the latter.

Market forces have infiltrated relatively recently. Employment opportunities first came with aid projects in the 1950's however it was with the introduction of the Public Service Scheme by the New Zealand Government in 1976 that monetisation accelerated and Tokelau began to move rapidly into a more westernised economy.

In 1990 budgetary assistance and aid totalled NZ$4.1m or NZ$2426 per capita. Remittances were in the order of NZ$0.2m annually or about NZ$120 per capita. In 1990 local revenue from sale of handicrafts, import duties, stamps, souvenir coins to about NZ$380 per capita. Considering the bulk of local revenue is indirectly aid-derived via the levies and duties, income derived from domestic production based on resources contributes only a fraction of total government revenue and disposable income.

Tokelau is now locked into dependency on budgetary assistance, aid and remittances to maintain current lifestyles. With the limited resource-base the generation of sufficient investment revenue to fulfill present aspirations of the people is improbable.

The most promising income generating opportunities are in greater commercialisation of the offshore fishery and possibly aquaculture, but revenue from this and the other small enterprises such as the manufacture of handicrafts, can only ever provide supplementary income. There is potential for limited tourism development, but there is no policy to encourage tourism in Tokelau.

Social effects of development

With paid jobs, remittances and access to western education came individual accumulation of wealth and differentiation of rights. Access to western technology and consumables enabled individual harvesting of food and community activities diminished.

Traditional knowledge is becoming increasingly obsolete. A new social structure is emerging as a result of western education and the opportunities for economic independence of individuals. The transition is breaking down traditional values, social cohesiveness and authority structures which also contributes to a level of confusion in government decision-making processes.

Availability of imported goods has increased health risks. A high incidence of coronary and respiratory diseases, diabetes and hypertension are attributed to changes in diet towards processed, low quality foods, reduced exercise and smoking. Consumption of sugar rose by 800% since 1961 to 1kg per person per week; consumption of flour rose by 500%. Tobacco increased by 1780% in the same period; over 4000kg of tobacco was imported in 1991 financial year.

Environmental effects of development

Western technology is substantially modifying resource use patterns. The lagoon fishery, in particular, is threatened. Artisanal fishing included practices inherently protecting the resource from over-exploitation but motor boats and nets now promote indiscriminate harvesting. Pressure is concentrated on easy to catch species by contrast to a broad range of species. Customary sanctions are obsolete in the new situation and environmental protection laws and regulations have not been instituted or are poorly enforced. Fishing effort is largely unregulated and stocks are not monitored.

The rapid introduction of western products is having environmental effects for which Tokelau is totally unprepared. Solid waste disposal is becoming a problem with the increasing use of non- or slowly degradable consumables. There is no provision for disposal of toxic waste. Household waste, including a wide range of domestic chemicals used, is discharged directly into the porous soil and lagoon. There is almost a total lack of knowledge at the village level of the environmental hazards of these lifestyle changes consequently controls or management measures are not being instituted.

In response to threats of climate change Tokelauans have begun the construction of sea-walls and concrete houses. Removal of beach sand and coral rubble for construction is causing siltation of the lagoon and shore erosion. Due to an acute shortage of fill for the sea-wall, there is some harvesting of live coral.

Environmental management capability

Environmental awareness is still in its early stages and the institutional organisation and processes reflects this. Formal structures and procedures for environmental assessment and

management are not in place. Handling of environmental issue has fallen to the Department of Agriculture and Fisheries which neither has adequate numbers of skilled personnel nor the power to address cross-sectoral issues.

There is a shortage of information and expertise to identify environmental problems and to ask for appropriate development assistance. The situation is exacerbated by the fact that most powers of decision-making rest with the traditional local authorities who are not in a strong position to appreciate contemporary management needs. Conventional development projects are funded over those with relevance to the environment. For the most part these have not been subjected to comprehensive environmental impact assessment and environmental issues are currently outstanding. Current effort and funding are concentrated on infrastructure development, communications and transport - priorities also influenced by the isolation and recent cyclone damage.

Environmental awareness and information is lacking at the village level and the information flow from the Office of Tokelau Affairs in Apia is hampered by the long distances. The delineation of authority between the traditional (local) and administrative organisations is still evolving. In practice it is overlapping and unclear which detrimentally affects budget allocation, development of legislation and law enforcement.

The institutional problems, the too few skilled personnel and the limited environmental awareness results in a level of planning and management that is inadequate to deal with the scope of current and impending environmental problems.

Long-term implications of current development trends

The economic-environmental mechanism that has evolved is largely the result of the continuing displacement of traditional customs, values and lifestyle by a monetised Western-style economy. This process is being driven by aid programs and the payment of monetary wages to public servants, providing a cash flow that is spilling over to expenditure on imports and to budgetary deficits.

This situation has potentially self-reinforcing feedbacks on the natural resources and environment of Tokelau. There is the possibility that an attempt will be made to boost cash flows (or to replace any decreases in aid) by expanding exports based on natural resources thereby more rapidly depleting the resources.

The expansion of western imports, supported by aid and wages and salary payments will continue to place increasing stresses on the environment and natural resource base by providing technological means of exploitation and accelerating the rates of accumulation/discharge of waste and pollutants.

The increasing role of the monetary economy is thus a risk economically, environmentally and culturally.

Demographic and greenhouse issues

Other long-term management issues for Tokelau relate to demographic factors and potential hazards resulting from the greenhouse effect. The New Zealand Government estimated in 1926 that the total population of Tokelau should not exceed 1250 persons. The level has already been exceeded and there are no population growth policies or family planning programmes in place.

The carrying capacity of the islands needs to be revised in the light of current stresses, mitigation options and knowledge of ecological limits by specifying a number of critical economic, environmental and resource parameters.

The threat of the greenhouse effect is that the islands of Tokelau may become uninhabitable. Wholesale emigration may be the only solution. Part of the long-term planning is to consider issues of maintenance of a cultural identity whilst assimilating into Western-style economies such as New Zealand.

Options for the future

The residents of Tokelau are faced with difficult decisions with respect to the long-term and the short and medium term future. The priority is formulating social goals relating to the desired level of traditional versus market-based lifestyles, population growth and where the population should reside in the event of forced emigration due to climate change.

For the short and medium term Tokelau should focus on cultural and environmental sustainability issues including demographic factors. Broad-based community involvement in the discussion of these issues and the setting of social goals is an essential pre-requisite to successful implementation of ensuing policies and strategies.

There must be a commitment to tackle resource and environmental management problems on a co-ordinated and integrated basis. In addition to a set of social goals and community understanding of issues, this requires strengthening institutional capacity and allocating appropriate funding levels for environmental programmes.

Administrative structures and procedures need to be set in place to fulfill environmental responsibilities. Environmental officers with cross-sectoral jurisdiction are essential to identify environmental problems, conduct planning processes,

carry out environmental assessments, provide advice on aid and development projects and compile and research information relevant to the environment. The officers could facilitate community education programs and the use of scientific and consulting skills for key resource or environmental management problems.

The profound influence of aid places on donors a heavy complementary responsibility to provide assistance in a form which enhances rather than detracts from the social and environmental welfare of Tokelau.

Assistance should be provided to Tokelau to help its people better understand the interdependence between development and environment. Knowledge of the options for development planning and resource management are needed. It is essential for Tokelau to receive advice on environmental changes that are expected from the greenhouse effect as knowledge and forecasting capacities improve. It is essential for the people to gain a better understanding of the sustainable yields that are achievable from their natural resources base and the environmental tolerances of waste management practices. Responsibility for appropriate design of development projects and technologies also rests with donor organisations. Donors must ensure that their projects are appropriate to local needs and capacities and are adequately assessed for environmental effects. Provision should be made for continuous monitoring of the implementation of the project with adjustments made as necessary.

Expert advice should be supported by extension work and counterpart training.

Opportunities

Tokelauans have a rare opportunity to act on the basis of the warning signals because the social changes are still not entrenched and environmental degradation has not become irreversible. The challenge is to emerge a collective vision of the future which retains the best of the traditional life and incorporates the best of the new. An informed community is essential so choices at the individual and collective level are made with full appreciation of the consequences. Tokelau's small population, its isolation and traditional social structures provide a rare opportunity with regard to dissemination of information and the control of unwanted influences.

There is wide support for traditional values and many Tokelauans know of the dangers of ad hoc development. The onus is on these individuals to catalyse the process toward an alternative direction.

Major conclusions

A number of major conclusions arose from the national assessment.

1. The paramount long-term threat is that of climate change for which the fundamental solution is not within the control of Tokelau. Only adaptive solutions are possible: protective constructs and emigration.

2. Development has been *ad hoc* without due consideration given by donor organisations to social and environmental implications of budgetary assistance and aid projects.

3. The ongoing trend toward a monetary economy based on aid and remittances is socially destabilising, an economic risk and environmentally deleterious.

4. The current knowledge base and institutional capabilities are not at a level needed to deal with the present and impending environmental problems.

5. Tokelauans still have the option of modifying the direction of change if there is the political will, budgetary assistance funds are committed to integrated environmental management, external technical support is provided, and aid donors assume complementary responsibilities.

Key issues

The following social and organisational needs are a fundamental prerequisite for setting the course of development towards sustainability and for maximising the opportunities for Tokelau.

1. Development of explicit social goals with reference to the balance between traditional and market-based lifestyles and economy.

2. Increasing technical knowledge and community understanding about environmental issues.

3. Strengthening institutional capability for environmental and resource management.

A range of specific projects and programmes relating to sustainable development are identified in Section 6.0; specific issues urgently requiring attention in the short-term are listed below:

* Undertake an assessment of the environmental effects of the construction activities for the sea-wall and housing scheme giving consideration to alternative designs and technologies.

* Establish integrated liquid, solid and toxic waste management strategies with expert advice on environmentally suitable household chemicals and products; recycling opportunities; waste management options; opportunities for land-application of sewage; opportunities for minimising waste production.

* Develop a Lagoon and Reef Conservation Strategy incorporating the establishment of: an ecosystem profile; protection areas; regulation of fishing; monitoring of fishing effort and stocks; monitoring of effects of land-based pollution sources.

* Investigate the localised pattern of fish poisoning.

PROBLEM I'M FACING TODAY:
THE INTRODUCTION OF OUTBOARD MOTORS

It never enters the minds of the general public of Tokelau when someone says, "next week my son in New Zealand is shipping me a small aluminium boat with a 25hp Johnson outboard motor" what is in store.

Literally what this man says marks the beginning of an evolution of change to the way of life the people have been used to for generations past. Now every family owns one or two of these aluminium boats with either one or two outboard motors. Modern technology is quickly being adopted by the people as they experience getting to other places and islets quickly and with very little effort. The age of technology has finally reached Tokelau, it is a wonderful experience but it also brings about many problems.

Traditional knowledge is passed down from fathers to their children, generation to generation. Such knowledge about fishing, weather, cloud movements, wind direction, period of times moon, stars, time of the day, time of the night plus much basic knowledge that a young man, growing up in Tokelau, must possess in becoming a grown man ready to assume his manhood duties.

The presence of the (outboard) motor has now given our young people the idea that, since they can move around faster, they can make several mistakes and still make up for the lack of traditional knowledge.

One other very basic problem we also face today is our family ties. Every young man with an outboard motor can leave the family without asking the father of the family for permission.

A few examples of the problem I have are:

1. very few young people learn the weather patterns;
2. know about fish migration on their own reef;
3. respect nature;
4. lost respect for traditions and culture and the environment and how to manage natural resources; and
5. young people accept that a new technology will replace traditional cultural values.

2.0 COUNTRY DESCRIPTION

2.1 Location and description

Tokelau (160-170^0 W and 6-11^0 S) is a tiny, isolated South Pacific country of 12sq km of land fragmented into 127 islets; the lagoon area is 187sq km. It comprises three atolls, Fakaofo, Nukunonu and Atafu set on a 200km northwest-southeast axis 480 km north of its nearest neighbour, Western Samoa. Fakaofo the southernmost atoll is 92km from Nukunonu, the central one, and 156km from Atafu, the northernmost.

The atolls are typical coral atolls, each with many islets or 'motu' surrounding a lagoon. The highest point is only 5m above sea level.

Tokelau lies just outside of the South Pacific equatorial dry zone and rainfall is variable with an annual mean of about 280cm; the average mean annual temperature is 28^0 C. Severe storms, not common until recently, occurred in 1846, 1914, 1966, 1987 (Tusi) and 1990 (Ofa). The latter were experienced as the worst in living memory.

The population of about 1700 is totally isolated apart from a monthly supply ship service from Western Samoa and a telecommunications link with the Office of Tokelau Affairs in Apia. There has not been any inter-atoll link except via the supply ship but the New Zealand Government is funding the construction of an inter-atoll vessel due for delivery in late 1991. The people of Nukunonu and Atafu live in single villages while at Fakaofo a second motu has been populated. There are no airstrips and no safe anchorages outside the reefs. There are no deep water passages into the lagoon and access to the islets is by water.

2.2 Government

Tokelau is a non-self-governing territory under the administration of New Zealand since 1925. Tokelauans were granted New Zealand citizenship in 1948. Most of the powers of the Administrator who is based in Wellington are delegated to the Official Secretary of the Office of Tokelau Affairs in Apia, Western Samoa.

The basis of Tokelau's legislative, administrative and financial system is the Tokelau Act 1948 and amendments enacted by the New Zealand Government. Each local Council has the ability under the Villages Incorporation Regulations 1986 to formulate its own village rules.

The New Zealand Government is committed to assisting Tokelau towards a greater degree of self-government and economic self-sufficiency.

The Central Governing Authority in Tokelau is the General 'Fono' comprised of representatives of the three Councils of Elders (one from each atoll) and from women's, youth and 'aumaga' (able-bodied men) groups. The Council of Elders is the local governing authority on each atoll and is comprised of heads of families and males over 60 years of age. The Fono meets every six months on alternate atolls to discuss and decide on the internal affairs of the territory.

The Tokelau Public Service (TPS) was instituted by the New Zealand Government in 1976 and is based in the Office of Tokelau Affairs in Apia, Western Samoa. The General Fono determine the priorities and needs of Tokelau. The TPS has the responsibility to administer the approved plans and programmes, provide specialised services[1] and advise the Fono and local councils on technical issues. Seven directors are responsible for managing the operations of Administration, Health, Finance, Education, Public Works, Agriculture and Fisheries and Economic Affairs and Information.

The Fono and the local councils are based on the traditional family and village systems of Tokelau and the TPS is an additional social structure rooted in western culture. The respective role and interface between the two organisations is still in evolution.

1 Specialist services include such things as health care, teaching, agricultural and fisheries assistance, clerical and technical assistance.

3.0. DEVELOPMENT TRENDS AND ENVIRONMENTAL IMPACTS

3.1 Natural resource endowment

3.1.1 Land resources

Tokelau consists of three coral atolls. A total of one hundred and twenty-seven islets or 'motu' encircle the three lagoons. The 'motu' vary in size from 90m to 6km in length and a few meters to 200m in width. The highest point above sea level is 5m. The largest atoll is Nukunonu with 4.7 sq km on 24 motu, followed by Fakaofo with 4sq km on 61 motu; the smallest is Atafu with 3.5km on 42 motu. There are no deep water passes into the relatively calm waters of the lagoons.

Outside the villages and a few isolated spots, there is no soil apart from highly porous coral sand and rubble mixed with a thin layer of humus. The principal vegetation cover consists of dense groves of coconut palms (*Cocos*). In some motus with less disturbance or in areas where the coconut plantations have been neglected for a long time, littoral forest predominates. The most common species are *Hernandia nymphaeifolia, Cordia subcordata, Guettarda speciosa* and *Pisonia grandis*. On the margins of these forests is open scrubby vegetation consisting mainly of *Scaevola taccada, Tournefortia* and *Pemphis acidula*. The dominant understory plant is usually the bird's nest fern, *Asplenium nidus*.

There is very little potential for increased soil fertility and the poor soils of the atolls have precluded agricultural development beyond a subsistence economy. The coconut palm provides the only export crop of copra. Since 1983 agro-chemicals have been banned in recognition of the deleterious effects to lagoon ecosystems. However, rat poison is used to control coconut rats.

Food crop production is confined to supply of domestic needs only. The food crops are breadfruit, swamp taro ('pulaka'), pandanus, bananas and coconuts. There are three methods of domestic crop production: the homegarden, pit and tree crop. The pit system utilises available organic matter and groundwater and tree crops are grown on all the islands. Composing is widely used in home gardens. There are a range of initiatives in place to diversify agriculture although poor soil fertility, harsh conditions and periodic storm damage mitigate against this.

Pigs and poultry are raised, primarily for ceremonial and social functions.

Currently, domestic production falls short of demand and imports are required to make up the balance. In Western Samoa Tokelau

runs a taro plantation on 200ha[2] of freehold land to supplement domestic requirements.

The effect of the 1990 Cyclone Ofa was devastating to agriculture. Waves totally covered the islands and washed away any topsoil. Structural damage and residual salt inhibited coconut and other crop production for more than a year.

3.1.2 Marine resources

Tokelau's greatest natural asset is its marine resources. Lagoon, reef and deep sea resources are rich and varied and fishing is the mainstay of the Tokelau diet.

Fisheries comprise an inshore lagoon and reef fishery and an offshore pelagic and deep water fishery. The lagoon fishery is mainly for domestic consumption although there is a small-scale commercial component consisting of few individuals wishing to supplement their income and some send fish to relations in Western Samoa. Fish forms the major component of the diet with the lagoon and reef fishery accounting for 55% of all animal protein consumed (Gillet and Toloa 1988). Trochus transplants have been successful but harvesting has not begun. The potential for cultivating turtles, clams and pearl oysters is being explored.

Main species in the lagoon and reef fisheries are great trevally, bigeye scad, goatfish, garfish parrotfish and surgeonfish. In the offshore fishery tuna and tuna like species are mainly caught and account for 19% of animal food taken for human consumption in Fakaofo (Gillet and Toloa 1987 red book). The deep water fishery comprises mainly of snappers, shark, groupers and emperors.

In most cases individuals will fish at their discretion with supplies they have at their disposal. In these situations fishing is undertaken primarily in the lagoon and reef areas. Community fishing has decreased since the advent of motor boats but is still organised periodically by the village elders. Activities are usually confined to the catch of tuna and tuna like species. There is increasing levels of commercial fishing using alias and fish aggregating devices.

Information on the state of fish stocks is limited an there is no regular monitoring program except for tuna and trochus. However, there is concern among Tokelauans that because of the changes in fishing effort as a result of western technology, pressure is now on easy to catch lagoon and reef fish stocks. Anecdotal evidence suggests that size of fish caught is declining.

Likewise, information on offshore stocks are unknown but it is believed that there is considerable scope for the further commercialisation of this fishery.

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2 17% of the total land area of Tokelau.

3.1.3 Water resources

No streams are present on atolls and all water for local use is derived from roof catchments and dug wells.

The groundwater resources consist of a thin layer of freshwater 'floating' on the saline water below. Such freshwater lenses form beneath each islet beyond a minimal size. The lateral extent, thickness and hydraulic characteristic of the lens varies locally. The factors governing lens volume are rainfall, tides, seepage, evapotranspiration and abstraction rates. The groundwater supplies are extremely vulnerable to any changes in sea-level or storm frequency. The dependency of tree crops on groundwater is indeterminate.

Groundwater is used mainly for construction with rainwater adequately fulfilling domestic needs. A number of events compounded to change attitudes and usage of groundwater. Cyclone Ofa in 1990 caused sea-water to mix with the freshwater and the supply became too brackish for domestic use. Further, with the succession of two cyclones within 3 years and the threat of sea-level rise housing design changed to incorporate concrete tanks as part of the foundations. On the inhabited islands there is increasing likelihood of contamination of the lens by sewage and sullage with the introduction of flush toilets and use of household chemicals.

3.1.4 Biodiversity

A recent conservation review of Tokelau (Anon. 1989) lists 67 vascular plant species including 16 naturalised weeds and thirteen introduced cultivars. An earlier study by Wodzicki (1973) reports that the vegetation has very low diversity with 48 indigenous species and 12 introduced cultivars. These species are widespread throughout the Pacific and none are thought to be endemic or have restricted world-wide distribution. However, there is indication that a number of plant species associated with traditional crafts such as *Cordia subcordata* and some species of Pandanus are declining and that the loss of genetic stock of Tokelau is a serious possibility (Lear 1989).

Because of the limited land resources available to the people of Tokelau, there are no motu with totally undisturbed vegetation. *Cocos nucifera* is the dominant tree species on most islets with an understorey of native trees, shrubs and groundcover species. There has not been any survey since Cyclone Ofa to assess the damage to the indigenous communities. The composition of native species shows some variation from motu to motu and this can most probably be attributed to differences in past management (Lear 1989). The policy of clearing all trees and groundcover for coconut replanting was identified by Lear (1989) as needing modification to conserve remnant ecosystems.

A total of 150 species of insects in 83 families are recorded most being widely distributed South Pacific species including several agricultural pests. Coconut crabs have traditionally been a main protein source on the islands but now the size and numbers are decreasing due to breakdown in the traditional systems of harvesting.

The avifauna is relatively rich with at least 26 species of which 15 are sea-birds, 8 shore birds and 3 land birds. Of these 7 sea-birds and one land bird breed in Tokelau. The population of these eight species are at present in decline because they are hunted for food and their eggs are collected (Wodzicki and Laird 1970). Birds particularly sought for food are noddies, terns and pigeons.

There has not been a comprehensive inventory of marine species (except for those with commercial potential; See Section 3.1.2) or an environmental profile for the marine system compiled.

3.1.5 Energy

Electricity generation is by way of diesel plants located on each of the atolls. Kerosene is still widely used for lighting; imports have increased ten-fold in 30 years from 6,000L in 1961 to 61,000L in 1991. Solar panels have been installed for telecommunications but potential application of solar power in other areas has not been examined. The capacity of these plants is not sufficient to meet current demands. To overcome this, sections of the village are closed down periodically.

Petrol and diesel imports in 1990-1991 totalled 130,400L and 80,000L respectively. Fuel imports will increase on current consumption patterns if more motor boats are imported and as the inter-atoll vessel becomes operational.

Cooking is still for the most part done in traditional ovens which use coconut husks and shells for burning.

Greater use of renewable energy sources are particularly appropriate for Tokelau given its remoteness and limited economic base. Creative options to better suit local needs should be explored.

3.2 Patterns of economic growth

Economic growth as measured by increases in the gross domestic product is not applicable in Tokelau, either as an indicator of development or the productive capacity of the economy. For the former, greater weighing should be given to cultural and social objectives in the determination of development goals and for the

latter, the micro size of the economy (small population, small land area and small economy; Shand 1980) limits the opportunities for capital investment. There are major land based resource limitations with little available land which can be brought into production. Further it is unlikely that increased productivity could be achieved from resources currently employed to the extent that investment revenues could be generated to sustain 'economic growth'. A more realistic objective, and one espoused by both the Public Administration Office of Tokelau and the New Zealand government, is greater economic self sufficiency.

The traditional 'economy' of Tokelau involves land rights, labour related to agriculture and fishing, livestock production and fish harvesting for which there are only rudimentary internal markets (exchange). Production and harvesting of food is communal with redistribution of the products equally shared. Fishing played a central social role. Traditional knowledge relating to fishing was vested in the elders (men over the age of 60) and this functioned to give them status and authority within the community. Complex customs and rituals contributed to social cohesiveness and maintaining social structures.

The majority of the land is owned by family groups known as the 'kaiga' and a small amount is leased to the Tokelau Administration for hospitals, schools and other public buildings. Certain areas of each atoll are designated as communal land and worked by communal labour. Traditionally the use of the kaiga lands was controlled to avoid over-exploitation but these controls are less strictly enforced today. There was communal fishing and cultivation of the kaiga lands and equal sharing of the harvest. The governing ideology was redistribution and equal shares for all. Copra provided the only cash crop and the income generated was distributed among all those who had rights to the land from which it was produced.

Employment opportunities opened up in the 1950's with aid projects such as the building of schools and hospitals. In 1966, a destructive severe storm led to the establishment by the New Zealand Government of the Tokelau Islands Resettlement scheme which increased emigration and consequently the inflow of cash and foreign goods. In 1976 the New Zealand Government instituted a Public Service which now provides employment opportunities for about 10% of the population. A community levy of up to 10% is imposed on Tokelauan-based public servants. Casual employment positions are regularly rotated among the population to spread the opportunity for earning an income.

Income is also earned by individuals from the sale of handicrafts and produce to the Government which then facilitates their onward sale.

Over the past two decades the role of financial assistance has increased. In 1989/90 budgetary assistance totalled NZ$4.1m or NZ$2426 per capita. The budgetary assistance is managed by the

Office of Tokelau Affairs in Apia. The Office also generates revenues which totalled NZ$0.64m in 1989/90 (NZ$380 per capita). Much of this revenue represents transfer payments within the Tokelau community through the collection of duties on selected imported commodities and the provision of public services along with externally generated income from EEZ access fees and stamp and coin sales. Remittances were in the order of NZ$0.2m over 1989/90 or about NZ$120 per capita and direct aid, provided mainly by the UNDP totalled nearly NZ$0.6m over the same period.

Figure 3 gives a historical perspective of exports, imports, government expenditure and revenue for Tokelau over the last four decades. It is likely that there has been a growing separation between domestic production and consumption, as shown by the trends in imports and exports. Imports have steeply diverged from commodity exports, but the extent to which imports have replaced domestically produced commodities is largely unknown. Living standards have been driven up by budgetary assistance and remittances.

On each atoll there is a cooperative store which acts as a distribution point for imported products. Profits are returned to each village and used at the discretion of the village elders. Sales across the three atolls totalled NZ$1.2m over 1989/90. As there are few if any investment opportunities in Tokelau, individuals have a high propensity to consume rather than save with their disposable incomes being derived from permanent and casual salaried and wage position held with the Tokelauan Public Service (NZ$1.7m in 1989/90). The remaining government revenue was allocated across a wide range of projects in the areas of health, education public works, transport and communication, administrative support, land and building maintenance, publicity and economic development and agriculture and fisheries.

As incomes are used for consumption rather than investment there has not been an increased demand for land and sea resources in Tokelau but environmental problems have emerged through the inefficient use, to some degree, of those resource which are used. Little incentives exist to maintain sustainable production systems. The importation of consumables also leads to waste disposal and health problems which are becoming increasingly evident. If economic self sufficiency is achieved through exploitation of local resources then obviously the demand for these resources will increase, and if resource use is not sustainable then, apart from the potential environmental problems which could emerge, economic self sufficiency itself would not be sustainable.

To maintain the current level of services provided in Tokelau, continuation of budgetary assistance would be vital. With the limited resource-base the generation of sufficient investment revenue to fulfil present aspirations of the people, with currently available technologies, is improbable. The land and sea resources are sufficient to guarantee the basic needs of the

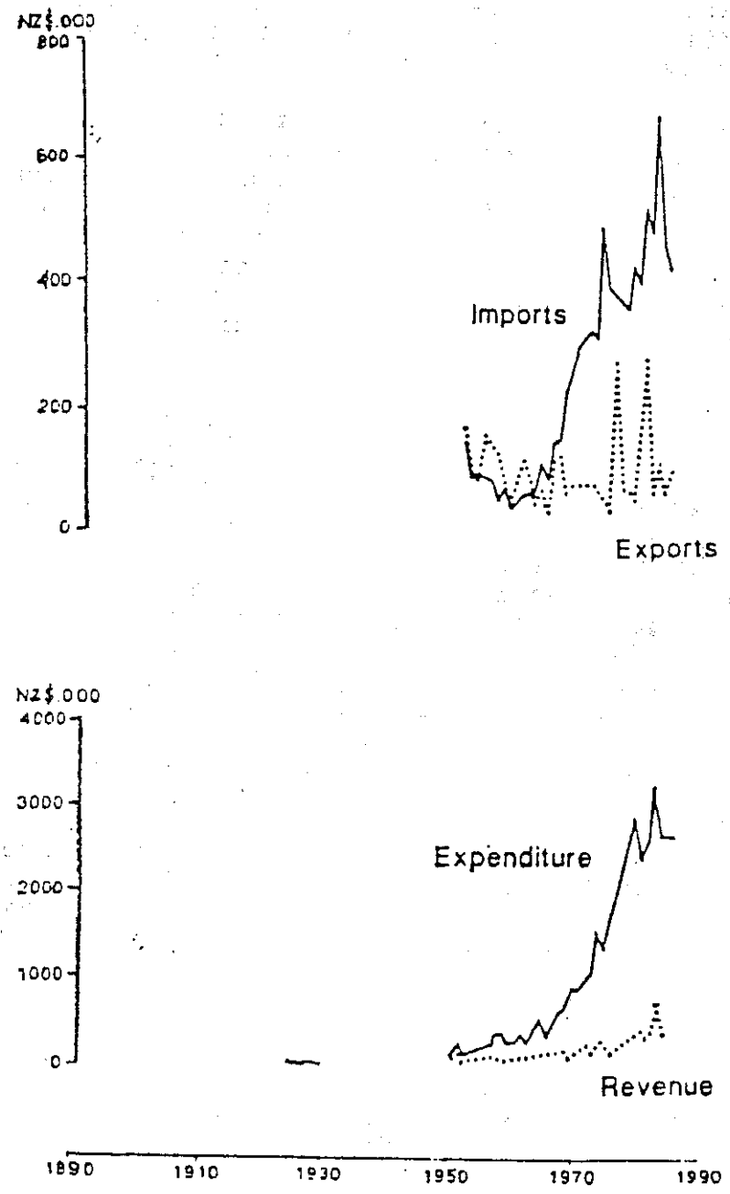

Figure 3 Exports and imports; Government expenditure and revenue for Tokelau. (Redrawn from Bertram and Watters 1985).

population providing net growth remains at zero but they are not sufficient to sustain economic self-sufficiency at current living standards. The land based resource limitations are due to the harsh conditions and limited land available for production. At present income is earned from the sale of copra, handicrafts, stamps and coins. Income generated from export tax on copra has declined with the decline in the world prices and is vulnerable to cyclone damage. Potential for tourism is also limited by the isolation, sparse communication links and size. The availability of cash incomes from aid and remittances are a disincentive to increasing local production. Additional cash made available to the village households is more likely to be allocated to increased consumption.

The most promising income generating opportunities in Tokelau are in greater commercialisation of the offshore fishery and possibly aquaculture, but revenue from this and the other small enterprises such as the manufacture of handicrafts, can only ever provide supplementary income. Value adding in the offshore fishery is being pursued with the development of a small scale tuna jerky enterprise. Aquaculture potential with clams, and pearl shell oysters is under consideration. Tourism has some albeit limited potential but is not encouraged by Tokelau. There exist external income generating opportunities from Western Samoan based plantations. There is also scope to derive more revenue from the EEZ but patrol capabilities have to be established.

The main driving forces in shaping the Tokelau economy and society is budgetary assistance, migration, aid and remittances. In less than four decades Tokelau has changed from being a society living an 'existence' lifestyle wholly supported by the local resources to a 'development' lifestyle which is heavily and increasingly supported by external aid and job opportunities. Such an economy is only sustainable provided aid support and emigration opportunities continue, but it is essential that investment of budgetary assistance and aid monies be made in such a way that the welfare of Tokelauans is maximised.

3.3 Demographic trends

The estimate of the population changes between 1840 and 1986 is shown in Fig. 4. At the last census in 1986 there were 1690 people inhabiting the three atolls.

Until the New Zealand Government assumed control of Tokelau in 1925, there had been considerable emigration to Swain's Island and Samoa.

In addition, episodic events including dysentery and the Peruvian slave trade reduced the populations at various times (Hooper and Huntsman 1973). The New Zealand Government, aware of limited

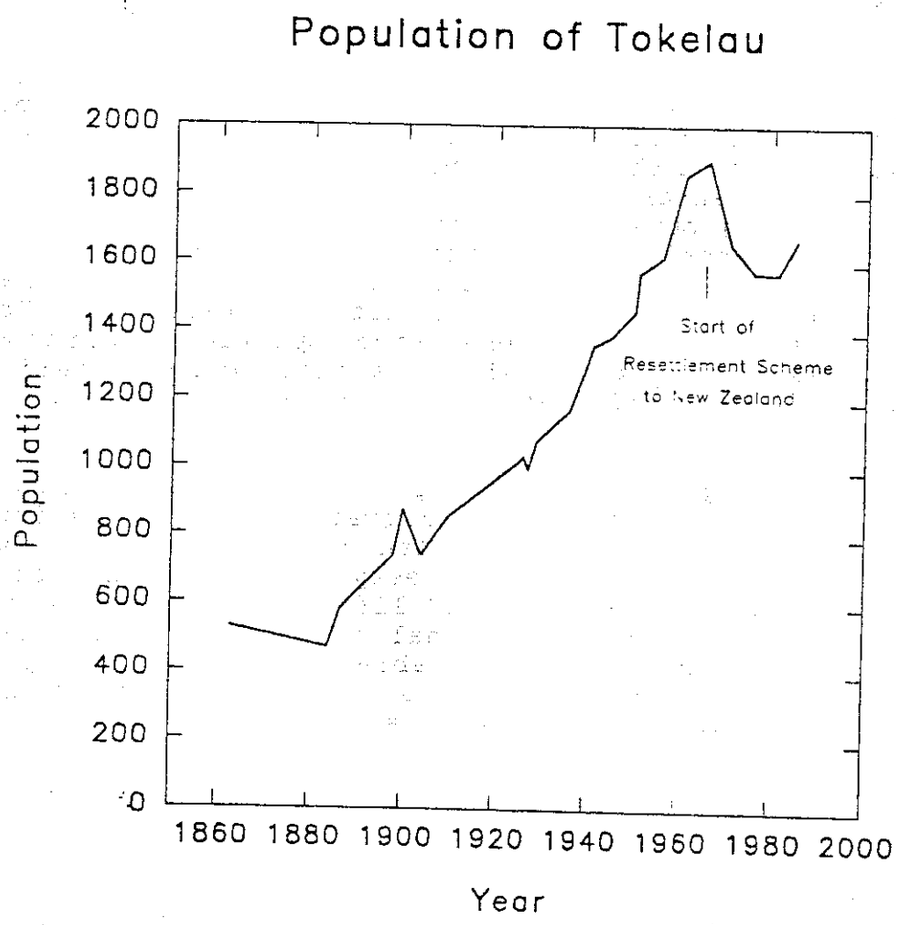

Figure 4 Population changes in Tokelau 1841-1986. (Early data based on Hooper and Huntsman 1973).

resources, estimated in 1926 that the total population should not exceed 1250; Atafu 350, Nukunonu 500 and Fakaofo 400 (cited in Prior, I. and Stanhope, J.; 1980). Despite this, the population continued to increase. Between 1945 and 1951 the growth rate reached 2.06%.

By the mid-1960's the population rose to approximately 2000. A severe destructive storm in 1966 catalysed an emigration programme by the New Zealand Government, the Tokelau Islands Resettlement Scheme. This increased the flow of emigrants to New Zealand and eased the overcrowding. Emigration accelerated and by 1971, 1848 Tokelauans were living in New Zealand. In 1975 the island communities decided to stop the resettlement scheme and to restrict subsequent emigration to that which was within family resources and desires. The rationale was to stop the outflow of able-bodied men which interfered with the fulfillment of traditional communal responsibilities. This has not precluded assistance being given for education and training.

Changes in the sex structure reflect the depletion of males by emigration. In 1951 47% of the population was male and in 1971 this had fallen to 42% (Hooper and Huntsman 1973). By 1986 the ratio had risen again to 49%.

Some 4500 Tokelauan now live abroad with the majority residing in New Zealand. The Tokelauan ethnic community therefore spans two geographically separate entities.

The population has now stabilised with natural increases being met by annual emigrations. Traditional Tokelau culture promotes large families although attitudes appear to be changing. At present family planning advice is provided on a demand basis only. While current population growth is matched to the emigration rate the population growth problem is in abeyance but this may not always be so. Demographic policies for the islands are needed. These would require an assessment of the ecological carrying capacity of the resources including maximal yields and the assimilative capacities of the land and sea for waste. Furthermore social and economic questions around striking the desirable balance between the traditional and the market-based economies need to be answered as different lifestyles impose different types of pressure on resources. The type of technological innovations introduced for waste disposal, renewable energy, cropping systems etc. would also have a bearing on the population Tokelau could support.

Long-term planning for forced resettlement in the case of climate change has not begun. Among issues to be considered here is cultural sustainability within a western economy such as that of New Zealand.

3.4 Natural resource and environmental issues

3.4.1 Changing patterns of resource use

In a traditional culture typical of Polynesia the pattern of resource use was intimately linked with cultural aspects of the life and cannot be treated separately. Social structures, local leadership, cultural values, customs, rituals, tenure systems and use of time all influenced in a direct way the interaction of the people with their environment and their use of resources.

The Tokelau culture, sustenance and recreation has traditionally revolved around the sea. The sea provided a varied and bountiful resource whereas the land was comparatively harsh. The lifestyle hence revolved around fisheries and fishing which played a highly significant cultural and social role.

A multitude of complex rituals and customs had evolved around fishing with rights and responsibilities intricately controlled.

Two institutions were of central importance, the 'taupulega' or Council of Elders and the 'kaiga' or extended family.

Recruitment to the Council was by virtue of age. Age was an important principle in Tokelau culture: the older a person, the more wisdom they have. The 'taupulega' is dominated by men over the age of 60 but includes heads of families. Women have a role in decision - making in the General Fono, but in local councils, their participation is dependent on whether they are elected as a head of family.

The Elders were custodians of the knowledge of the natural environment and the techniques for exploiting it together with this they had a responsibility to provide equitable resources to different sections of the community. These skills were extremely important for the management of fishing and land resources.

Although the traditional methods of resource exploitation had the significant function of providing status, maintaining the authority of the elders and a stability in the social order, at the same time these restrictions and rituals had inherently conservationist effects which has sustained the resource.

Probably the most important explicit fishing conservation measure is the 'lafu' system whereby all types of fishing are periodically banned in specific areas of the main reef. Other measures are returning under-sized fish and banning of destructive measures of fishing. A variety of customs provide disincentives to over-fishing such as having to divide the catch equally amongst the community members. Customs encourage fishing for particular species at particular times which in effect results in a 'season' and customary laws discourage hunting for rarer species such as green turtles.

An essential factor in the council's controls of village affairs was their right to decide on the weekly schedule for the village and direct the activities of able-bodied men. Communal fishing expeditions were frequent.

With the comparatively recently move toward a cash-driven society came profound social changes which have totally altered the pattern of resource use. Men were removed from the labour force and communal activities declined. The authority of the Council of Elders diminished. Although the council could still direct the activities of non-employed men, these were done by custom for the welfare of the community whereas employed men work 'for themselves'. Community fishing expeditions were directly affected. It became difficult to ask men to labour in the hot sun and divide their catch at the end of the day with those who had earned money. Where previously revenue was from copra grown on kaiga land with kaiga labour, now money is paid directly to individuals. The kaiga remains the basic property owning unit but its economic and social significance has changed. Although members of the kaiga still own land in common there is no longer the need for co-operative enterprise.

With so many Tokelauans now salaried, there is not the time to catch fish by traditional methods and the easier but more indiscriminate western methods are used. As new fishing methods became popular, the expertise of the elders was no longer required and they began to lose the authority that went with the expertise. There has been an explosion of aluminium dinghies and outboard motors. In 1974 Fakaofo had 2 motorboats and 60 canoes and in 1991 it has 76 motorboats and 4 canoes. There are 142 outboard motor boats and 32 canoes in Tokelau today. Many men now claim that it is more difficult to obtain good catches of yellowfin from the most frequently trolled localities, but stock is not monitored so quantitative estimates are unavailable. Fishing effort in the lagoon is now concentrated on the 'easy to catch' species such as parrot fish instead of a broad range of species.

The disassociation of fishing from its social context has led to wasteful and delinquent behaviour. For example, nets are left overnight and the catch rots. Land crabs, another protein staple are caught for sport surplus to needs. Such practices would be unthinkable in earlier times.

At present the authority of the elders to impose management methods is diminishing while at the same time the far less discriminating and more intensive western methods of fishing are placing far greater pressure on the resource. Although the Department of Agriculture and Fisheries is attempting to institute controls, enforcement at the local level requires the support of the elders. Impressing upon the elders the needs for modern management requirements is not straightforward and elders are reluctant to impose laws which they do not fully understand.

Consequently, attempts at regulation such as stipulating minimum net sizes are not able to be enforced and monitoring or conservation programmes do not receive favourable attention in the budget.

3.4.2 Greenhouse effects.

The over riding long-term potential problem for Tokelau is sea-level rise and increased cyclonic activity from the 'greenhouse' effect.

Pernetta (1990) classifies Tokelau as having the highest potential for being most impacted of all countries in the South Pacific.

Roy and Connell (1989) discuss the effects of rising sea-level on coral atolls. There will be climatic differences in terms of increased frequency of storms, rises in air and sea temperature possibly altering upwelling patterns and the distribution of fish and fisheries. Coastal erosion will increase as sea-level rise accelerates beyond the upward growth of coral and this erosion will probably be accentuated by the greater frequency of storms. Erosion of the coastline will cause disproportionately large reductions in the freshwater-lens as storm over-wash becomes increasingly frequent (see Section 3.4.3 and Fig. 5).

Intrusions of saltwater into groundwater lenses will have direct effects of unknown magnitude on the terrestrial ecosystems. Agriculture is almost certain to be affected with effects obvious first in pulaka pits. Increased salinity may also lead to decreased productivity in other crops including coconuts, pandanus and breadfruits.

Groundwater influences the adjacent marine environment (Buddermeier and Oberdorfer 1986) and disruption to the freshwater lenses could disturb the ecology of fringing reefs. The difference between oceanic and lagoon systems could reduce affecting fishing potential and resource diversity.

The greenhouse effect will manifest gradually but ultimately could render the atolls uninhabitable.

How much climate will change and the magnitude of associated impacts are unknown at this time. Roy and Connell (1989) write: 'specifically in the context of atoll islands, it is likely that degradation of present-day living conditions will come about through local factors - increased El Nino events, droughts, more storms, higher rates of coastal erosion.'

Informal observations by the elders indicate current are faster and the patterns have changed, tides are more extreme, air temperatures are hotter, prevailing wind directions have changed and storms are more frequent and severe. Although these may be part of natural cycles of change apparent on time scales longer

than a human lifetime, they are a causes for concern to the local people and need addressing by the international community.

If worst-case greenhouse scenarios apply, Tokelau may cease to exist. Since escape to high land is not an option, the whole population is facing the possibility that it may be country-less. Emigration may be the only option. In this regard Tokelau is fortunate because Tokelauans have full rights as New Zealand citizens to emigrate to New Zealand. Providing current equal status policies apply, Tokelauans have a potential destination but questions of cultural sustainability within a western culture arise. Tokelauans need to plan for this eventuality and should receive assistance from the international community regarding up to date prognoses and assessment of effects and options within their local context.

3.4.3 Vulnerability of groundwater

Atolls above a certain size (about 1.5ha) form a permanent lens of fresh water surrounded by sea water. However, lenses are susceptible to mixing with the sea-water below during storms and become brackish. They are also subject to the vagaries of rainfall which in Tokelau are marked.

The most severe threat to the permanent water supplies is not from climatic factors directly, but from marine processes that cause coastal erosion and increase the frequency of storm overwash (Fig. 5). There is a dramatic effect of coastal erosion on the volume of the lens: a theoretical estimate is a 50% reduction in volume of freshwater with a 20% reduction of island width (Fig. 6; Roy and Connell 1989). Thus a small decline in island area has a disproportionate impact on availability of freshwater. The apparent increase in the frequency of heavy

storms is almost certainly eroding the coastline. As erosion reduces island size, groundwater lenses shrink beneath larger islands and disappear beneath smaller ones. Increased coastal erosion is linked with sea-level rise. Roy and Connel conjecture that in the next 50 years, greenhouse effect shoreline erosion rates of 1-2 metres per year could reduce the dimensions of some inhabited islands to the point where their groundwater supplies would no longer support viable ecology or permanent habitation.

Increased groundwater salinity reduces the potability of groundwater which has already occurred on Tokelau following Cyclone Ofa. Despite the change-over to rainwater tanks, groundwater is still an emergency supply for some domestic uses particularly during drought.

With storm overwash likely to become increasingly frequent, the salination of the soil and groundwater could increase to the

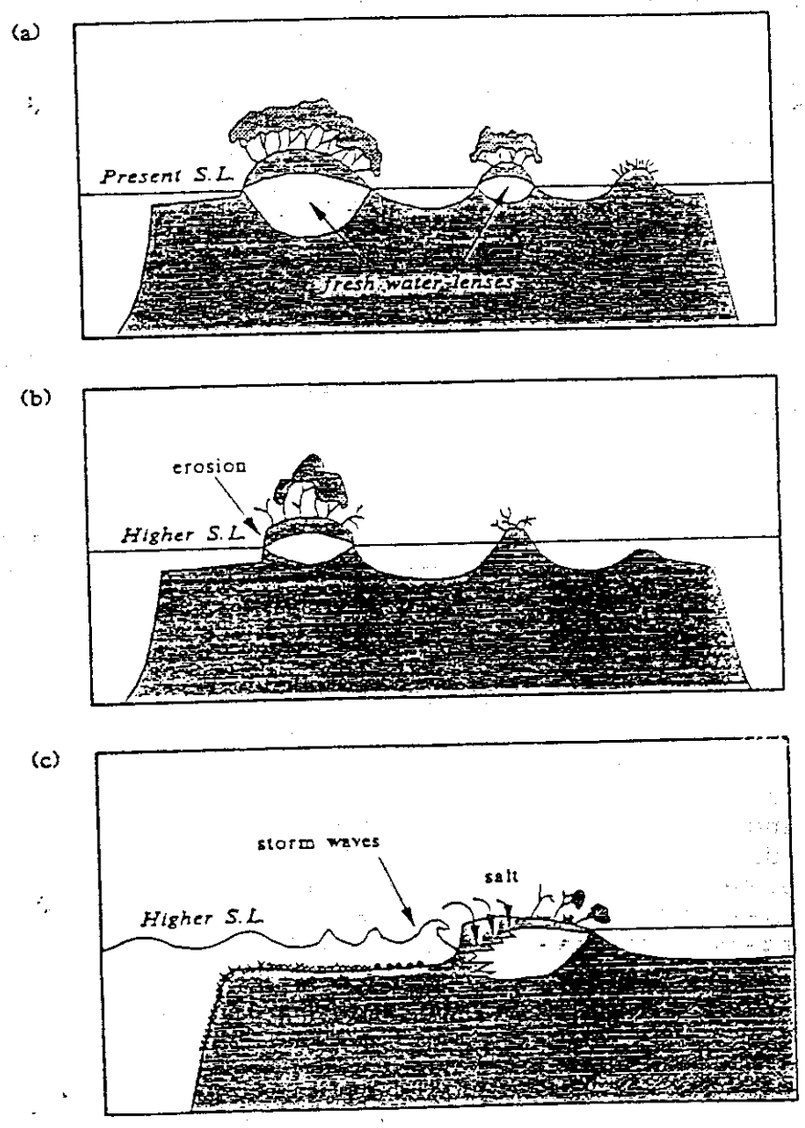

Figure 5 Freshwater lenses vary in size under islands of different sizes. The lenses will be significantly reduced or even disappear if sea-level rises and island shorelines erode. Because of the loss of 'freeboard' storm overwash of the islands causes salt intrusion into the groundwater to occur more frequently. (From Roy and Connell 1989).

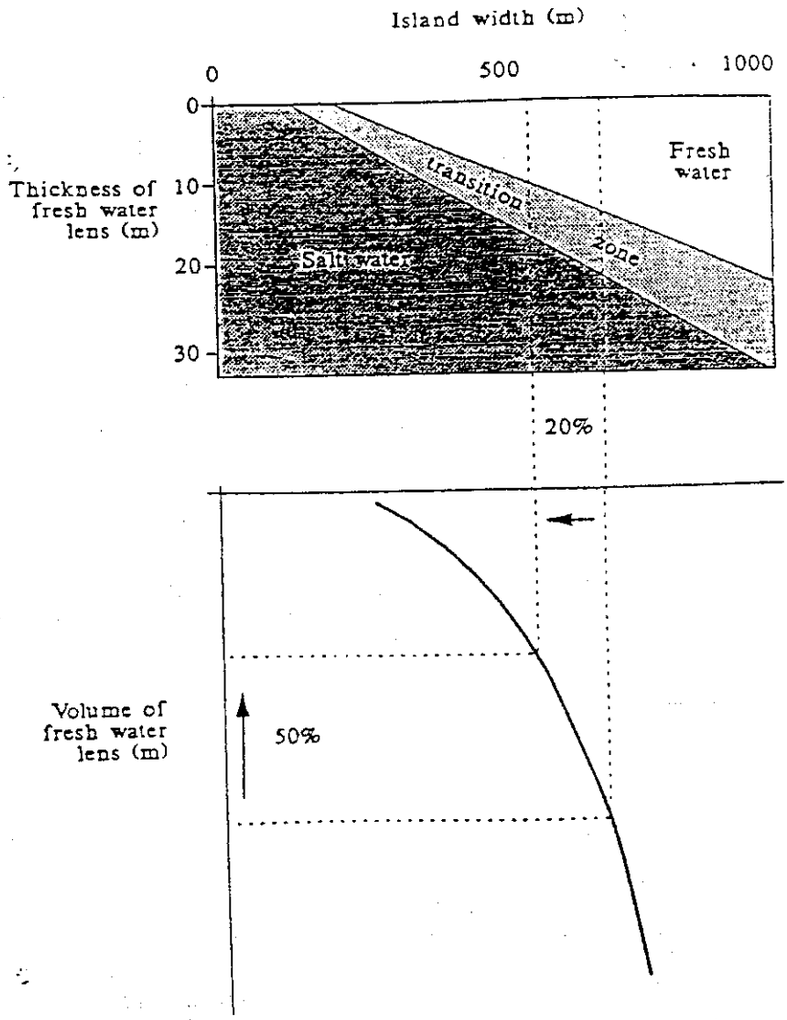

Figure 6 The maximum thickness of the Ghyben Herzberg lens of freshwater beneath atoll islands increases in direct proportion to island width but the volume of freshwater increases semi-exponentially. Thus changes in island width due to erosion or accretion have a disproportionately large impact on freshwater reserves. (From Roy and Connell 1989).

point of no longer being able to support food production. The construction of expensive sea walls to protect low-lying areas from salt-water intrusions would only be effective in the early stages (Roy and Connell 1989). The very construction of a sea-wall in Tokelau could accelerate erosion from the coastal areas from which rubble is removed for fill. The same holds for beach sand removal for housing.

Although groundwater is no longer used for human consumption it still remains an emergency source of water. The integrated environment of island ecosystems requires that the role of groundwater in the ecology of the terrestrial and reef systems and food production is understood. This understanding is essential for estimating the atolls' carrying capacity for human habitation.

3.4.4 Health

The isolation of Tokelau had contributed until relatively recently to a strongly maintained dependence on traditional foods, but since the 1960's imports have increased markedly (Table 1).

Table 1 Imports of certain foods and commodities to Tokelau in the period 1961 to 1973 (Prior and Stanhope 1980) and 1990-1991 (Office of Tokelau Affairs).

Commodity	1961-1962	1972-1973	1990-1991
Flour (kg)	11,000	48,000	60,000
Rice (kg)	2000	13,600	52,600
Sugar (kg)	10,000	46,600	83,500
Tobacco (kg)	230	290	4100

Now there is a high dependence on imported foods such as flour, sugar, rice, tinned fish, and mutton flaps. In thirty years the consumption of flour, rice, sugar rose by a factor of 5.5, 26, and 83 respectively. The consumption of sugar is now equivalent to 1kg per week per person. The population decreased over this period from 1900 in 1966 to 1690 in 1986 so the per capita consumption of imported foods increased even more than the raw figures suggests. The loss of activities that go with the 'gathering' of traditional foods has made the population more sedentary and the society has yet to adopt substitutes for the natural forms of exercise.

The transition from a subsistence economy to a mixed economy has led to the development of new health problems - hypertension, diabetes, coronary disease, respiratory disease, alcoholism, and malnutrition.

A 1991 survey revealed that 76% of males between the ages 30-50 and 92% of the women between 30-40 years were overweight defined

as 10% over ideal body weight. The number of medium (10-20 cigarettes/day) and heavy smokers recorded in the same survey was 75% among males of 30-60 years and 37% among women. Alcohol consumption is considerable[3] with 28% of males recorded as light drinkers, 26% as medium drinkers, and 46% as heavy drinkers assuming a consumption of 4-6 12oz bottles of beer per session as a 'medium' rate. Of 91 males and 129 females surveyed, 25% and 38% of males and females respectively had high blood pressure (diastolic blood pressure of over 90 mmHg). Between the ages of 30-40 years 15% of males and 38% of females had elevated random blood sugar levels of more than 7.8 mmol. In a six year period to 1989, 38% of mortalities in the population were due to diseases of the circulatory system and 28% were due to diseases of the respiratory system.

Fish poisoning has been reported largely from a particular area of reef at Atafu. Poisoning does not occur at regular or predictable intervals but as many as 40 cases can occur within a short period, usually two to four months and at no specific time of the year. In other years no fish poisonings are recorded. The reef associated with fish poisoning has large areas of dead coral known not to be caused from hurricane damage[4]. The local people associate the fish poisoning with military activity as it first appeared after World War II. The area of reef in question is still covered in military debris. Fish poisoning is locally a major concern and requires investigation.

The housing project begun in the mid-80's has greatly increased the domestic water supply. In 1986 the water availability assessment has gone well over the 75 litres per person per day. This accessibility to water has reduced the incidence of skin and diarrhoeal diseases. It also has increased the possibility of breeding places for mosquitoes.

The mosquito control program involves the weekly collection of plastic containers, tins, bottles, etc. which are either buried or dumped on other islets of the atoll. Malathion insecticide is used as an emergency measure when dengue fever is reported in the region. It is sprayed before and after a boat visit. There is a concern over possible ecological effects particularly since the locals encourage health workers to spray regularly to reduce flies. However, the introduction of fly traps has proved effective and will reduce the demand for spraying.

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3 In 1990-91, 120,000 bottles of beer (355ml) and 658 bottles of liquor (40 oz) were imported through the stores. This does not include private import or the consumption of 'kaleve' a style of high alcohol beer (15-25%) brewed from coconut syrup. The sale of alcohol through the local retail outlet is banned on Atafu.

4 Based on the results of a survey conducted by P. Laboute in 1987 after Hurricane Tusi.

The introduced tin, plastic containers, aluminium dinghy, rubber tyres, has facilitated the establishment of the newly introduced *Aedes aegypti* - the mosquito that spreads the dengue and yellow fever viruses. These mosquitos prefer dark, sheltered places so are commonly found in houses, particularly now that they are of an enclosed design.

Eye diseases such as irritative conjunctivitis and pterygii are common due to consistent exposure to salt water and glare. In 1988 a team of New Zealand ophthalmologists operated on a number of people in the atolls to remove pterygii.

It is not clear how any increasing ultraviolet radiation affects health. It is presumed that health effects will not be different from what is observed in other Pacific Island communities. In 1991 two cases were referred to the pathologist for suspected melanoma. Confirmation of the diagnosis is still to come at the time of writing.

Morale and mental health problems are difficult to quantify but Tokelauans are being affected by the threat of sea level rise and increased incidence of cyclones. Their response is most appropriately described as fear. The situation probably contributes to migration and destabilization of the society.

The decline in communal activities and changing patterns of social organisation are also likely to affect morale and general health. In Tokelau, as in other Polynesian societies, large gatherings promote unity, common purpose and well-being. The trend toward individual activities and responsibilities related to paid work has decreased attendance at social gatherings and communal activities. This increases individual isolation and lessens community feeling reducing community cohesiveness and sense of individual well-being.

In conclusion, better health would be promoted if the rapid move towards western style foods, diet and lifestyle can be regulated or slowed down by the preservation of the more traditional healthy foods, exercise patterns and social organisation. Individual and community education programmes to promote healthy lifestyles needs to be augmented.

3.4.5 Waste disposal

Solid waste is buried but due to such limited land area is becoming a problem with the increasing consumption of western goods. There is scope for improving the waste disposal problem through re-cycling programs which would also serve to heighten awareness of environmental issues and resource management. Ways to reduce the production of solid waste also need to be explored.

There are no facilities for toxic waste disposal and batteries, hospital refuse, chemical waste etc. are buried, with the leachate inevitably reaching the lagoon.

There are no drainage systems and household sullage containing chemicals such as detergents, bleach, disinfectants, solvents are discharged directly into the ground.

Sewage is currently handled by septic tank systems and over-water toilets. This system amounts to a waste of resources and pollution of the environment. Instead, an integrated sustainable resource management approach would be to increase agricultural productivity with land application of appropriately treated sewage.

Advice is urgently needed on environmentally sound household products and integrated waste management systems for drainage and

sewage, solid and toxic waste disposal. Consideration should be given to opportunities for re-cycling, minimisation of waste production and land-application of sewage.

3.4.6 Energy sources

The main energy sources on the island are diesel, petrol, kerosene and wood. Imports are increasing (see Section 3.1.5). There is tremendous scope for investigating alternative, energy sources such as solar power for electricity generation to minimise dependency on imports and environmental hazards.

3.4.7 Biodiversity

There are presently no protected areas or areas managed for conservation in Tokelau. Establishing such areas along the recommendations outlined by Lear (1989) is a priority issue requiring trained personnel for its implementation and continuing management.

The preservation and management of coral reefs is of special international concern since they are highly productive and diverse systems. The International Union for the Conservation of Nature (IUCN) and the World Wildlife Fund (WWF) have concentrated their efforts in areas of high species diversity. In the South Pacific region both terrestrial and marine biodiversity decreases from west to east, nonetheless the degradation and loss of biodiversity from relatively species-poor ecosystems like Tokelau is a significant issue on a national level (Lear 1989). The Tokelau falls within one of three provinces defined by IUCN within Oceania that has no protected areas (Lear 1989).

A Lagoon and Reef Conservation Strategy is urgently needed to address protection of species and ecological processes from pollution, siltation, overfishing. The Strategy should include the establishment of an ecosystem profile; protection areas; regulation of fishing; monitoring of fishing effort and stocks; monitoring of effects of land-based pollution sources.

3.4.8 Regional Issues

Because of Tokelau's dependence on its marine resources there is concern about the level of fishing effort exerted on migratory fish species, notably the tuna species. Although there is some control within each country's EEZ, fishing outside these areas goes on largely uncontrolled or monitored.

Tokelau joins the other member nations of SPREP in opposing the testing of nuclear weapons on Muraroa atoll and the proposed destruction of chemical weapons on Johnston atoll. There exists potential for release of toxic wastes both on the atoll and in the transportation of weapons to the atoll. The impact of such accidents could have a devastating impact on the marine resources of Tokelau.

4.0 RESPONSES TO DEVELOPMENT/ENVIRONMENTAL ISSUES

4.1 Government policies, legislation

Tokelau's legislative and judicial systems are based on the Tokelau Act 1948 and its amendments. A major law reform project funded by the UNDP has been in progress since 1985 with the purpose of developing a coherent body of law which responds to current needs and give due recognition to Tokelauan custom. There are no national laws in Tokelau to deal with conservation and resource management but each local Council has the ability under the Villages Incorporation Regulations 1986 to formulate their own village rules to deal with these. Likewise there are no explicit policies addressing contemporary resource and environmental issues.

4.2 Institutional developments

Environmental issues are now handled by the Department of Agriculture and Fisheries which can formally advise other sectors. However, the there is not the range of expertise or sufficient numbers of skilled personnel to deal adequately with the scale and scope of the demands.

The local authorities do not have the technical background to recognise or act on the environmental needs of the community and are dependent on advice from the Public Service.

The formation of the Agriculture and Fisheries Committee in 1984 to advise the Fono provides an institutional mechanism for bringing to the attention of the Elders any environmental and resource management concerns. It represents the best formal mechanism for transfer of knowledge and advice from the technically trained individuals to the decision-makers in the local authorities.

4.3 Specific programs and projects

There has not been a national strategy for the management of land, marine or groundwater resources in a sustainable way. Current development planning programmes and documents (such as The Tokelau Development Framework Plan produced in 1989 by the Department of Economics and Information) have not integrated environmental considerations with development planning.

The main emphasis of the management of the marine environment at present is on development of the tuna fishery and the

knowledge; and protection of the species which are endangered such as giant clams and green turtles.

Studies have been carried out on tuna, baitfish, turtles, clams, beche-de-mer, coral, bottomfish and crabs. Although output from these studies have been utilised to some extent, mechanisms are still needed to incorporate these into the management activities and responsibilities vested in the Council of Elders.

As the deterioration of traditional fishing skills is having a negative impact on marine conservation, there have been attempts to document the knowledge associated with particular fisheries. This has included documenting methods in written and photographic form for the tuna, nearshore pelagic and bottomfisheries. There are plans to continue this work for reef and lagoon species.

Some of the fisheries protection programs in place include: control of the net size sold at the village retail outlet (although individuals are still able to bring in nets of any size); bans on the harvesting of endangered species (turtles, on Nukunonu and clams on all three atolls) and the development of deep sea tuna fisheries in part to alleviate pressure on the lagoon and inshore species.

The idea for the development of a protected area(s) in Tokelau was raised at the Fourth South Pacific Conference on Nature Conservation and Protected areas (1989). Resolution 11 recognised the important role of protected areas in sustaining island societies and ensuring maintenance of biodiversity. The Conference identified for Tokelau the need to secure one area on each of the atolls as a national park.

As a response to this resolution a reconnaissance study was funded by UNDP (Lear 1989) to introduce the concept of conservation and protected areas.

Lear recommended development of conservation strategies including an inventory of plant and animal species for Tokelau and the establishment of a protected area network. This is still awaiting implementation, contingent in part on availability of personnel.

Response to the threats of sea-level rise and increased storm activity have been to build protective structures. Sea-walls are being constructed around the exposed ocean side of villages on each atoll. Response to recent cyclonic activity has been to construct houses from concrete.

Both projects went ahead without environmental impact assessment and are now causing problems, particularly in relation to the effects of excavation of fill and sand from the reef and shorelines.

4.4 Training, education and public awareness

Aspects of marine conservation are being introduced into the school curriculum. The science subjects include conservation and there is instruction by elders on marine resources but there is scope for greater integration of these.

A number of SPREP publications have been translated for the purposes of consciousness raising but there is a marked need for more teaching aids on environmental issues.

4.5 Cultural sustainability.

The decline of traditional culture under the influence of a changed economy is a problem common to many Pacific countries. In Tokelau the situation is perhaps particularly poignant because the transition has been so recent and so swift.

Tokelauans have recognised the detriments and have introduced a number of policies which act to conserve the traditional lifestyle and slow the rate of change. Among these is tTokelau initiated voluntary cessation of the resettlement scheme in the 1960's (Section 3.3); the teaching of traditional values and lifestyle methods in schools (section 4.4); the change to the use of Tokelauan language in primary school in place of English; the practice of sending children to a South Pacific country to receive a secondary education; not encouraging tourism.

An attempt is being made to address the difficulties associated with the introduction of the Public Service structure onto the traditional village and family systems. Redistributive mechanisms such as the community services levy and job rotation for waged workers are aimed at keeping the traditional principle of equal sharing.

The Morris Report (1985)[5] was commissioned by the New Zealand Government to examine the social effects of the paid public service and came up with a number of alternative recommendations including its devolution. Through the UNDP Integrated Atoll Development Project funded for three years since 1988, a Rural Development Officer has been funded to facilitate local institution building and strengthen its capacity for self-determination under modern pressures.

5 Brian Morris (1985) report to the New Zealand Government on the Tokelau Public Service.

5.0 PLANNING FOR SUSTAINABLE DEVELOPMENT

5.1 Prioritising sustainability issues

5.1.1 Summary of the current context

The primary influences on the traditional Tokelau community and economy have been population growth and emigration, western education, external budgetary support and external administering power[6]. These influences are directing Tokelau to a more cash-driven economy promoting individualistic behaviour and a move away from the traditional principles of equal sharing, collective ownership and village council control. Diversified consumption patterns are increasing waste production and health problems and increasing pressure on the resource base in a largely unknown and possibly unpredictable way (e.g the effects of construction-related activites on shorelines and groundwater).

Budgetary assistance is channelled into capital works, transport, telecommunications and wages and salaries.

The public service has introduced into Tokelau a new system additional to the village and family systems with two main recurring effects. The payment of cash wages places public servants in a privileged position in relation to the rest of the community; the TPS activities are not well integrated into the community and the ability and authority of the village councils to direct and organise life on each atoll is undermined.

The General Fono now endorses the budget for the TPS but this requires some decisions to be made for which the elders do not have the technical background or experience. This has two basic ramifications. The elders are dependent on technical input and advice from the TPS which further undermines their control; and because of a lack of inherent knowledge about current issues, there is a reluctance to make some of the necessary decisions. Consequently the delineation of authority is in practice blurred and affects the functioning of both the local authorities and the TPS.

The effects of these social changes and authority structures profoundly affects resource use and environmental management in the following ways:

1. The consumption of western products is causing waste, pollution and health problems for which only rudimentary management is in place.

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6 New Zealand is following policies to promote self-government and self-determination.

2. The availability of western technology is changing the pattern of resource use, in particular placing more pressure on lagoon and reef fisheries without adequate controls and monitoring in place.

3. Major construction projects are in train requiring massive amounts of building sand and fill which is potentially accelerating shore erosion and causing reef damage at the excavation sources; there is the possibility that erosion further affects groundwater.

4. The change from traditional to western lifestyles has been so rapid that the checks and balances to mitigate environmental effects have not kept pace. Consequently:

. development has been *ad hoc* and responses to issues have been *ad hoc*.

. projects and programmes have been approved without adequate consideration given to environmental consequences.

. a legal framework for conservation of resources and environmental protection in the contemporary situation is not in place.

. the public service organisational structure is not equipped to handle the range of cross-sectoral environmental issues in an integrated and co-ordinated way.

. laws and policies are not in place for integrated environmental planning, management, assessment and regulation.

. public awareness of environmental issues and consequences of new consumption patterns is not developed.

5. The level of community awareness and technical knowledge on the environment does not allow a full appreciation of what is required; consequently:

. allocation of budgetary assistance has been to conventional development projects and not to environmental projects such as monitoring programmes, waste management strategies, implementation of conservation programs.

. enforcement of contemporary management regulations is a problem since they are initiated by the TPS but need the approval of the local authorities; these do not fully understand the issues and are reluctant to impose local laws.

5.1.2 Key short to medium term sustainability issues

The outstanding short to medium term sustainability issues arising from the current situation are to set social goals determining the direction of development, to augment the knowledge base of contemporary environmental issues, and to strengthen the institutional capabilities to handle contemporary environmental and resource problems.

* **Explicit social goals need to be established to determine the balance between the western and the traditional lifestyles.** At the moment social goals are implicit and are likely to differ among different groups in the community. Discussion at the community level is essential to developing a common vision which will have the support of every social group. These goals which encompass the social values underlie every decision which follows and ultimately set the course for the future. Once they are in place, a strategy can be developed for managing daily affairs which are consistent with the goals and budgetary assistance can be allocated accordingly.

* **Augmentation of knowledge about the environment has to occur at every social level and in every group.** Community awareness is needed to support regulations and to manage household and village activities in an environmentally sound way. The councils need greater knowledge of environmental issues and management requirements so that budgets are appropriately allocated and regulations are made and enforced at the village level. The TPS needs to augment its technical knowledge base to cover a fuller range of environmental issues.

* As long as western technology, consumables and capital works continue, **there has to be a stronger capability for environmental management.** The TPS structure has to have the capability in the form of organisational structure, legislation and policies, formal procedures, cross-sectoral powers and skilled personnel to fulfill responsibilities for sustainable development. The local social, decision-making and authority structures should be developed and used as much as possible to fulfill complementary functions.

In addition to these general needs, specific requirements have been identified which are listed as actions in Section 6.0.

Among these a number of projects and programs are outstanding and it is recommended that these are addressed in the short term:

* **Undertake an assessment of the environmental effects of the construction activities** for the sea-wall and housing scheme giving consideration to alternative designs and technologies.

* Establish integrated liquid, solid and toxic waste management strategies with expert advice on environmentally suitable household chemicals and products; recycling opportunities; waste management options; opportunities for land-application of sewage; opportunities for minimising waste production.

* Develop and provide for the implementation of a Lagoon and Reef Conservation Strategy incorporating the establishment of: an ecosystem profile; protection areas; regulation of fishing; monitoring of fishing effort and stocks; monitoring of effects of land-based pollution sources.

* Investigate the localised pattern of fish poisoning.

5.1.3 Long-term sustainability issues

Other long-term management issues for Tokelau relate to demographic factors and potential hazards resulting from the greenhouse effect. The New Zealand Government estimate of maximum population for Tokelau has been exceeded (Section 3.3) and there are no population growth policies or family planning programmes in place.

The carrying capacity of the islands needs to be revised in the light of current stresses and technical and enrivonmental knowledge. The 'optimum' population cannot be determined without specifying a number of critical economic, environmental and resource parameters. Much depends on available natural resources, sustainable yields and the assimilative capacity of the environment for waste. The required standard of living and pattern of consumption also must be specified, together with the level of aid and the allowable trade deficit. Lifestyle goals underlie these decisions and these goals have to be made explicit.

The threat of the greenhouse effect is essentially that, sometime in the next century, the islands of Tokelau may become uninhabitable, either because the sea will overtake the land or because more frequent and violent storms, destruction of vegetation and salinisation of freshwater lenses will present unsurmountable problems for adaptation. Wholesale emigration may be the only solution. Part of the long-term planning is to consider greenhouse issues. These include better information on prognoses, prediction of effects in the local situation, maintenance of a cultural identity whilst assimilating into Western-style economies such as New Zealand.

Industrialized nations need to consider their ethical responsibilities to assist Tokelau and other states similarly threatened.

5.1.4 Responsibilities of donors

Setting the course for sustainable development is the responsibility of the Tokelau people but aid donors have a complementary responsibility to provide assistance.

The responsibility comes from aid having such a profound effect on development and the environment coupled with superior opportunities for aid donors to access technical advice.

Assistance should be provided to Tokelau to help its people better understand the interdependence between development and environment. Knowledge of technical options are needed for waste management and energy conservation. Knowledge of options for development and resource management are needed. It is essential for Tokelau to receive advice on environmental changes that are expected from the greenhouse effect as knowledge and forecasting capacities improve. It is essential for the people to gain a better understanding of the sustainable yields that are achievable from their natural resources base and the environmental tolerances of waste management practices. Responsibility for appropriate design of development projects and technologies also rests with donor organisations. Donors must ensure that their projects are appropriate to local needs and capacities and are adequately assessed for environmental effects. There should be provision for monitoring projects in the implementation phases with adjustments made as necessary.

Expert advice should be supported by extension work and counterpart training so that recommendations can be implemented.

Finally, ongoing understanding is needed of the implications of current development trends on the social and cultural base of the society, including health, demographic trends and options for possible emigration to other countries. These problems must be handled with great sensitivity and will require full participation by the Tokelauan community in the process of ongoing evaluation of goals and options.

5.2 Constraints to sustainable development

Constraints or barriers to the sustainable use of Tokelau's resources can be conveniently discussed under six broad headings as defined by Trudgill (1990). A summary is provided in Table 2.

Agreement

Solutions to the unsustainable use of resources are predicated on agreement between the governing authorities (the three local councils and the General Fono), the public service and the community at large.

Dialogue is increasing between the three groups through mechanisms such as Departmental Committees and environmental education programs. However, the differential in the technical base between the community leaders and the TPS poses difficulties which can only be overcome with patient persistence and maximising opportunities for communication.

Similarly the general community has to support policies and regulations which it will do only if there is an understanding of the underlying reasons. At present the level of environmental awareness is low.

Knowledge constraints

There is insufficient information about the natural resources for integrated management. For example, ecosystem profiles of the lagoon and reef systems are not available; the hydraulics and configuration of freshwater lenses is not understood in the local context and the carrying capacity of the resource base is not known. Knowledge of impacts of development programs is limited and problems are dealt with after they arise. Almost nothing is known about the possible local effects of climate change on resource viability. Technical knowledge is lacking to explore alternative energy sources or sewage systems.

The long-term implications of population growth, economic dependency, increasing consumption of western commodities is not widely understood.

Technological constraints

The most serious technical barriers to sustainable development relate to planning for greenhouse effects. Among the technical problems are accurate prediction of potential effects at a local scale such that adequate planning is initiated; the design of effective, practical and environmentally sound protective measures against sea-level rise; finding viable options for adequate food production under increasingly saline conditions of soil and water; understanding groundwater dynamics to minimise activities which increase salinisation.

Other technical barriers are finding alternative renewable energy supplies and technologically feasible and culturally acceptable methods for land-application of sewage for agricultural use.

Economic constraints

Aid promotes a living standard which is beyond the means of the resource base to support.

The capacity to buy and use western technology is disassociated with making a living from sustainable use of a resource.

Imported foods supplement local products so shortfalls in the event of mismanagement can be met. Commercial enterprises begun to supplement income needed to meet raised expectations potentially place further strains on the resource base.

Co-ordinated environmental management is costly and there are competing needs for funds. Unless the decision-makers fully appreciate the need for the expense, there may not be sufficient or consistent budget allocation.

Social constraints

The most serious social constraints are tied in with the differential in knowledge and culture between the traditional community leaders and the public service. The local governing authorities have a degree of power to formulate policy and allocate budgets but they are not in a position to fully appreciate environmental requirements. This may affect environmental management initiatives. Moreover, environmental matters have traditionally been their domain and now the public service administers this function. Consequently there is a reluctance to endorse initiatives which they don't fully understand and which have the potential to shift control away from them.

Furthermore, the growing aspirations of the people for western commodities within the limited and fragile atoll environment creates a rate of change which could become irreversible if mitigating actions are not taken soon.

5.3 Opportunities for sustainable development

Tokelau has many opportunities for sustainable development not the least of which is the national pride of the people and a strong appreciation of traditional values of sharing, co-operation and community life. There is a common concern for the environment and the global threats to which the islands fall victim.

Tokelau is dependent on a limited and very fragile resource base and sustainable development is an issue which intimately affects each Tokelauan. Once the understanding and the steps to the solutions are clear, it is likely that co-operative effort will be there to achieve the goals.

The tradition of community co-operation is still alive and is maintained through education programs and communal activities. The co-operative efforts following the recent natural disasters had the effect of strengthening community solidarity and at the same time raising environmental consciousness.

The small size of the nation also favours rapid dissemination of information and unity of purpose, as compared with larger, more socially complex societies.

Tokelau has been a monetary society for less than 20 years and communication links have been infrequent so that western-style development has not yet had a devastating effect. The environment is still comparatively unspoiled. This has bought Tokelau time to consider its position carefully and to take the opportunity to be extremely conservative in its future development policies.

The nation is now at a crucial point because the incremental effects of many small decisions are starting to be felt, there is a vastly increased construction program, communications with the outside world are increasing and the cause and effect cycle will quickly accelerate.

If the signs are recognised and heeded now, there is scope for keeping the development of Tokelau environmentally sensitive to retain its natural beauty, healthy ecosystems and productivity. Goal setting and forward planning to avert reactive management and to promote the use of appropriate technology are two vital pre-conditions.

The natural environment of Tokelau can only support a subsistence lifestyle and a modest commercial sector hence the link between sustainable development and survival is clear and direct. Moreover income is primarily derived from external assistance with only small scale exploitation of resources for export income. This situation translates into a strong opportunity for sustainable development in that complicating factors, and often conflicting objectives of sustaining major industries and servicing national debts do not apply.

Integrated environmental management and environmental sensitivity to development can be promoted through some of the recommendations in this report. The review of the legislation presently in train provides the opportunity to strengthen environmental, resource management and conservation goals and procedures.

Table 2 Key sustainability issues for Tokelau ; constraints and opportunities.

ISSUES	CONSTRAINTS	OPPORTUNITIES
Set social goals	* Difficult lifestyle decisions * Difficult economic decisions regarding aid dependency vs self-sufficiency * Uncertain long-term future due to greenhouse effect * Cultural difference between traditional & western educated population	* Traditional social values widely appreciated * Small population * Traditional social organisation * Assistance available from aid donors
Build environmental awareness	* Lack of technical staff * Poor information flow between administration and local people * Poor understanding of environment re impacts of specific actions	* Small population size * Improved communication links with Apia and atolls * Vital role of environment in lifestyle * Community programmes on resource use and environment * Expert advice on environmental effects of household products * Link with Samoan and other environment organisations * More resource material on ecology, environment etc.

Table 2 (cont'd)

ISSUES	CONSTRAINTS	OPPORTUNITIES
Strengthen institutional capacity	* Dual authority structure with local (traditional) & administrative (western) organisations * Insufficient number of skilled staff * Funding	* Establishment of environmental officers * Establishment of independent administrative unit for environment with cross-sectoral jurisdiction * Strengthening local environmental awareness * Improving information flow between local community & Apia * Establishing environmental assessment procedures for projects * Establishment of resource monitoring programmes * Improving regulation of fishing activities * Maximising traditional use & knowledge of resources * Planning & budgeting to fulfill environmental objectives * Provision of expert advisors * Provision of training for staff.

Table 2 (cont'd)

ISSUES	CONSTRAINTS	OPPORTUNITIES
Conservation of lagoon & reef ecosystems	* Lack of appreciation of degrading influences & need for integrated management * Competing funding priorities * Availability of modern catching technologies * Unknown impact of current fishing effort * No controls on discharge of household effluent * Siltation problems associated with construction * Lack of monitoring capabilities * No protected areas * No management strategy * Limited material for sea wall fill & construction	* Development and implementation of resource and conservation strategy * Promotion of traditional methods * Monitoring of catch and available stocks * Survey of reef and lagoon ecosystems * Regulation of individual fishing effort * Expert advice on pollution control options & household chemicals * Establishment of protected areas * Review sea-wall and housing design addressing environmental impacts.
Conservation of biodiversity	* Incomplete ecosystem profiles * Lack of knowledge of role of freshwater lens dynamics in terrestrial & reef ecosystems * Poor controls on harvesting of flora and fauna species * No protected areas	* Develop & implement lagoon & reef conservation & management strategy * Regulate harvesting of endangered species * Implement conservation farming practices * Establish protection areas

Table 2 (cont'd)

ISSUES	CONSTRAINTS	OPPORTUNITIES
Conservation of water resources	* Incomplete knowledge of groundwater supplies * Incomplete knowledge of processes affecting lens dynamics * Vulnerability of lens to contamination and depletion * Incomplete knowledge of ecological role of groundwater * Unknown effects of removal of construction fill & sand on lens dynamics	* Maximise rainfall catchment capabilities * Advice on effects of climate change on groundwater viability & consequences to agriculture * Advice on ecological role of lenses * Advice on effect of construction activities on groundwater
Waste disposal & pollution control	* Limited land area * Increasing waste production with consumerism * Lack of community awareness of waste & pollution issues * Direct discharge of household chemicals into ground * Proximity of fragile lagoon ecosystem * Porous soil facilitates leaching * Eutrophication of lagoons by sewage & detergents	* Increase consumer awareness * Advice on environmentally sound household products * Advice on waste management * Toxic waste disposal systems * Adivce on recycling potential * Policies to minimise waste production * Control of sale of undesirable products * Advice on pollution control measures

Table 2 (cont d)

ISSUES	CONSTRAINTS	OPPORTUNITIES
Energy conservation & self-sufficienty	* High dependency on imported fuels * Limited land availability * Hazards of storage & use of fuel * Increasing demands for durable goods & transport	* Development of alternative technologies * Increasing consumer awareness * Formulate energy policies
Conservation & optimal use of land resources	* Salinisation of soil & groundwater by storms * Low soil fertility * Increased reliance on bought foods * Lack of knowledge of yield capacities * Lack of understanding of role of groundwater in maintenance of crops vegetation	* Improve cropping systems * Advice on use of sewage to improve fertility * Advice on carrying capacity of land * Advice on ecological role of groundwater

Table 2 (Cont'd)

ISSUES	CONSTRAINTS	OPPORTUNITIES
Health	* Increasing consumption of low-quality foods * High consumption of tobacco and alcohol * No substitutes for traditional forms of exercise * High incidence of diabetes, hypertension, coronary & respiratory diseases * Confusion between traditional & western lifestyles * Uncertainty of future	* Concerted effort on health education * Improve availability of good quality foods in shops * Explore avenues for decreasing consumption of poor quality foods * Provide opportunities for regular exercise * Monitor health parameters
Conservation of traditional knowledge	* Monetisation of the economy * Western consumer ethics * Western technology * Western knowledge base * Emigration of youth	* Set social goals * Promote traditional values * Incorporate traditional knowledge into school curriculum * Promote traditional fishing & agriculture methods. * Document traditional methods

Table 2 (Cont'd)

ISSUES	CONSTRAINTS	OPPORTUNITIES
Formulate population policies	* Inadequate knowledge of climate change * Inadequate knowledge of resource capacity * Emigration options dependent on other countries * Family planning concepts not part of culture	* Seek assistance from aid donors * Seek assistance with information * Establish population limits of resource base * Small population size
Sea level rise	* Cause is external * Uncertainty * No available protective technologies * Lack of information * Long-term issue * Adaptive options dependent on emigration policies of other countries	* International fora * Long-term planning for relocation * Assistance in updating knowledge of greenhouse effects * Assistance with examining options
Increased storm damage	* Cause is external * Cost of building protective barriers * No available protective technologies known to be environmentally sound	* International fora * Improved early warning systems * Improved telecommunication links
South Pacific used for nuclear testing & toxic waste disposal	* Cause is external * Cost of protective measures	* International fora * International co-operation

6.0 RECOMMENDED ACTIONS

Below is a summary of recommendations made throughout the text. New initiatives are designated (N); ongoing programs and projects (O), those in place but requiring augmentation (A). Short to medium term priorities are discussed in section 5.1.2.

Greenhouse issues

* Address issues at international fora (O).
* Re-evaluate sea-wall project for efficacy and environmental impacts(O).
* Seek assistance for better understanding of climate change implications (N).
* Consider cultural sustainability issues in the event of forced emigration (N).

Sustaining the culture

* Facilitate the discussion of social issues in the community (N).
* Increase public awareness of the links between social stability and lifestyle decisions (N).
* Define social goals in relation to western and traditional lifestyles (N).
* Define and implement social and economic mechanisms to achieve national goals (N).
* Document traditional knowledge (O).
* Promote traditional knowledge and values (A).

Improving health

* Undertake community education on health risks of poor diet, alcohol and tobacco (A).
* Promote youth activities/attitudes discouraging smoking and drinking (N).
* Examine methods for increasing consumption of better quality foods (N).
* Determine cause of fish poisoning (N).
* Continue dengue fever prevention program (O).
* Continue monitoring of public health.

Sustainable resource use - water

* Identify potential changes to groundwater with climate change processes (N).
* Develop a sewerage system consistent with water and nutrient conservation needs (N).
* Increase water reserves

Sustainable resource use - marine

* Develop strategy to manage misuse of western technology (N).
* Continue management of endangered species (O).
* Continue development of deep sea fishery (O).
* Enforce net regulations for the lagoon fishery (A).
* Monitor fishing effort and stocks (N).
* Promote traditional techniques and knowledge (O).

Sustainable resource use - land

* Ensure risks to freshwater lenses from human activity are minimised (N).
* Investigate improving fertility using land application of sewage (N).
* Implement recommendations for conservation practices from previous studies (O).
* Maximise use of traditional methods of cultivation (O).

Sustainable resource use - energy

* Develop energy policy and conservation practices (N).
* Investigate renewable energy supplies (N).

Protecting biodiversity

* Establish lagoon and reef ecosystem profile (N).
* Develop a lagoon and reef conservation strategy (N).
* Establish marine and land protection areas (N).
* Implement conservation measures into cultivation practices (O).
* Regulate exploitation of endangered terrestrial flora and fauna (A).

Maximising economic self-sufficiency.

* Develop social goals related to balancing western and traditional lifestyles (N).
* Establish policies and strategies (A).
* Consider environmentally sustainable options (N).
* Minimise dependency on imported products (N).
* Pursue commercialisation of the tuna fishery (O).
* Investigate aquaculture potential (O).
* Maximise budgetary assistance for projects bringing long-term benefits (A).
* Increase revenue from EEZ.

Environmental planning and management

* Develop supportive legislation (O).
* Develop requisite organisational structures and procedures (A).
* Integrate environmental considerations into all aspects of development (A).
* Develop integrated and co-ordinated approach to environmental management (N).
* Ensure all aid projects are subject to appropriate environmental and social assessment process (A).
* seek expert adviced extension programmes (A).
* Maximise traditional methods of resource use (A).

Waste and pollution management

* Develop integrated waste management strategy (N).
* Develop and promote strategies for minimising waste production (consumerism) (N).
* Develop recycling opportunities (N).
* Find suitable toxic waste disposal (N).
* Seek advice on least environmentally harmful household products (N).
* Seek advice on managing sewage and sullage (N).

Demographic issues

* Seek advice on carrying capacity of resources; maximum yields; assimilation capacities for waste (N).
* Develop population growth policy and control measures (N).

Regional issues

* Lobby at international for against nuclear testing and toxic waste dumping in the South Pacific (O).
* Support international mechanisms for regulating fishing, pollution control and shipping (O).
* Lobby at international fora against practices leading to greenhouse effects (N).

7.0 PROCEDURAL MATTERS

1. The first meeting of the Tokelau National Task Force was held in May 1991 to facilitate the compiling of the Tokelau National Report for UNCED. The composition of the National Task Force included one member from each of the seven departments.

   The meeting prepared a list of environmental issues which are of concern to Tokelau prior the arrival of the two consultants, Dr. S. Humphries and David Collins.

2. The second and third meetings of the National Task Force held in May were to introduce the project and to identify and discuss the key environmental issues with the consultants; those in attendance were:

   Foua Toloa (Director of Agriculture and Fisheries - Chairman)
   Dr. Stella Humphries (Consultant)
   David Collins (Consultant)
   Matulino Iosefo (Director of Public Works Department)
   Mesepa Gaualofa (Personnel Officer)
   Manuele Pereira (Accounts Officer)
   Fenuafala Faafoi (Health Assistant)
   Oli Kupa (Examination Officer)

3. A draft report was prepared and circulated to members of the Task Force and the Faipule and Pulenuku from Tokelau.

   The fourth meeting of the Task Force in May 1991 discussed the draft report and made comments.

3. The fourth meeting was attended by:

   Matulino Iosefo (Director of Public Works Department)
   Sr. Juliana Perez (Director of Education)
   George Tinielu (Director of Administration)
   Lomia Gaualofa (Planning Officer)
   Manuele Pereira (Accounts Officer
   Foua Toloa (Director of Agriculture & Fisheries - Chairman
   Dr. Stella Humphries (Consultant)
   David Collins (Consultant)
   Casimilo Perez (Official Secretary)

4. Dr. Stella Humphries visited Tokelau between 13/7/91 - 20/7/91.

   A meeting with the Council of Elders was organized on each atoll to present a summary of the project and to discuss their views on key environmental issues.

Discussions were also held with the:

(i) The Agriculture and Fisheries Department on Atafu and Fakaofo
(ii) Women representatives on Fakaofo
(iii) Executive Officers on Fakaofo, Atafu and Nukunonu
(iv) Dr. Tekie Iosefo (Atafu)
(v) Rural Development Officer, Inter-atoll Development Project

Visits were also conducted to see the outer motus on Nukunonu and Atafu to see the coconut replanting scheme and the surrounding reef and lagoon ecosystem.

The three villages were toured to see the animal husbandry, coconut plantation, water project, sewage system, fish processing projects etc.

5. Information from the trip was incorporated into the draft report and was circulated to the Task Force.

6. Three meetings of the Task Force were held to discuss the draft and a final report was prepared. The representatives on the Task Force were:

Foua Toloa (Director of Agriculture and Fisheries - Chairman)
Matulino Iosefo (Director of Public Works Department)
Sio Perez (Accounts Officer)
Semu Uili (Director Economic Affairs and Information)
Saili Paulo (Teacher)
Lomia Gaualofa (Planning Officer)
George Tinielu (Director of Administration)
Fenuafala Faafoi (Health Assistant)
Stella Humphries (Consultant)

7. The report was approved by the three Faipule and the Official Secretary.

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