



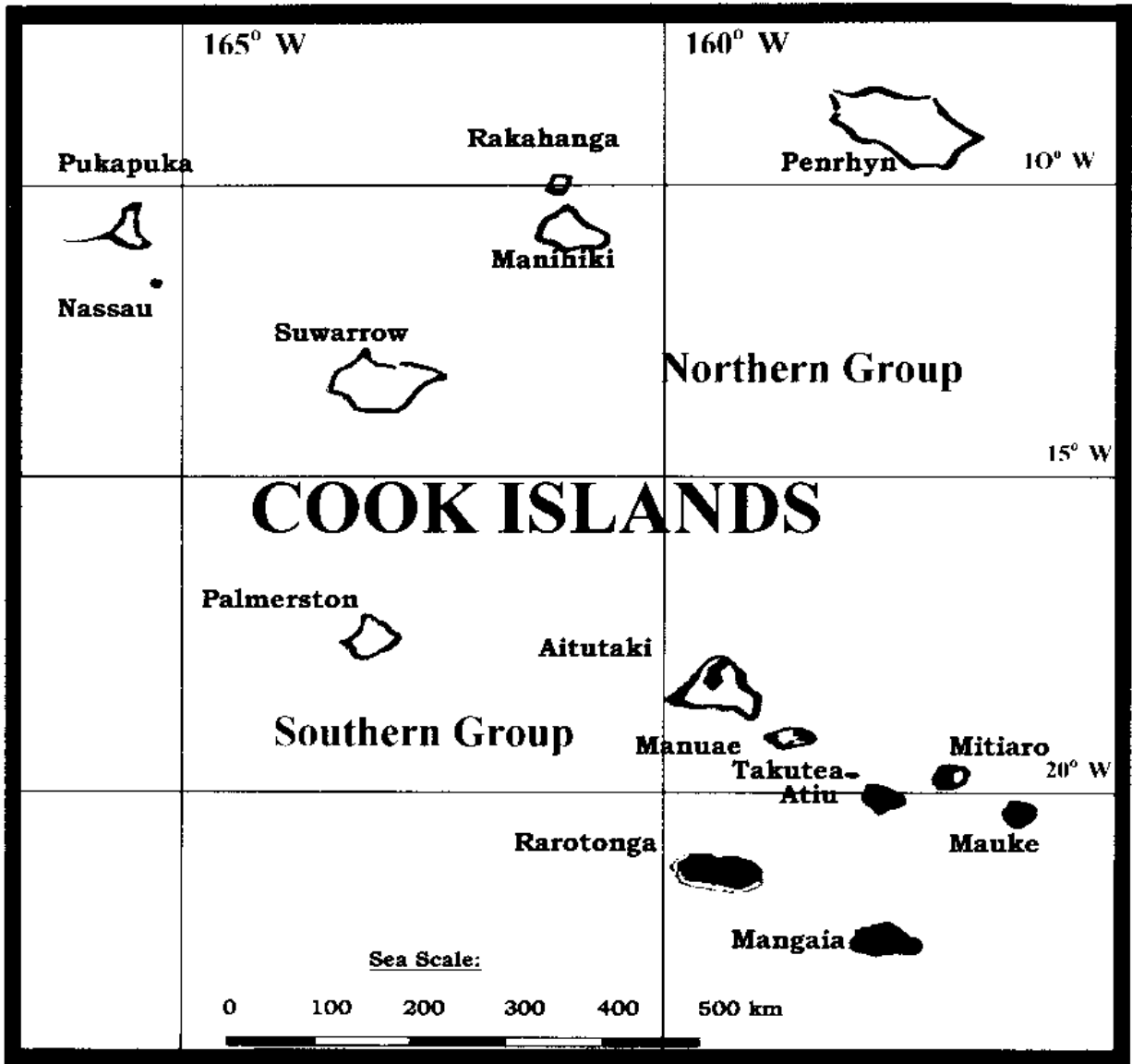
Cook Islands National Report



*United Nations Convention to Combat
Desertification (land Degradation)*

Map of the Cook Islands

8° SOUTH



23° SOUTH

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Acronyms

ADB	Asian Development Bank
CBD	Convention on Biodiversity
CDI	Capacity Development Initiative
CHARM	Comprehensive Hazard and Risk Management
CIG	Cook Islands Government
EIA	Environmental Impact Assessment
ENSO	El Nino Southern Oscillation
ES	Environment Service
FAO	Food and Agriculture Organization
GEF	Global Environment Fund
GMOs	Genetically Modified Organisms
HOMs	Head of Ministries
LMOs	Living Modified Organisms
MFEM	Ministry of Finance and Economic Management
MOA	Ministry of Agriculture
MOE	Ministry of Education
MOH	Ministry of Health
MOW	Ministry of Works
m.s.l	Mean Sea Level
NBSAP	National Biodiversity Strategy Action Plan
NEMS	National Environment Management Strategy
NZDSIR	New Zealand Department of Science and Industrial Research
NZODA	New Zealand Overseas Development Assistance Program
PERCA	Public Expenditure Review Committee Act
PIC	Pacific Island Countries
PICCAP	Pacific Island Climate Change Assistance Program
PIREP	Pacific Island Renewable Energy Project
PMs Office	Prime Minister's Office
REA	Rarotonga Environment Act
REAP	Rarotonga Environment Awareness Program
SFM	Sustainable Forest Management
SIDS	Small Island Development States
SOPAC	South Pacific Geo-Science Commission
SOE	State of the Environment report
SOI	Southern Oscillation Index
SPCZ	South Pacific Convergence Zone
SPREP	South Pacific Regional Environment Program
TCA	Takitumu Conservation Area
TIS	Taporoporoanga Ipukarea Society
TT	Tu'anga Taporoporo
TVET	Technical, Vocational and Training
UNCCD	Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
UNV	United Nations Volunteer
WSSD	World Strategy Sustainable Development
WWF	World Wide Fund for Nature

Glossary

arāpō	The nights of each lunar month. In the old ways of the Cook Islands people time was worked out by counting the nights as the moon ages during each lunar month.
Aronga Mana foreshore	The chiefs of an island. All that area between the mean high water mark (MHWM), an imaginary definition line landward measured at a right angle to a distance of 30 meters or else to the edge from the MHWM line, of the natural vegetation growth, whichever shall be the <u>greater</u> distance.
invasive species	This also includes every estuary and the area extending landward and measured at right angles from the mean high water mark in that estuary.
makatea	Species of plants that take over an area or space destroying the original species. Raised coral platforms between the reef and the interior of semi-volcanic islands. The makatea formed during the time when the sea level was higher than its present height.
marae	An important place with a special purpose
marama-ou	The Maori name given to the first ten phases of the moon referred to as the new moon. It also refers to the beginning of each lunar moon cycle.
mārangi	The Maori name given to the moon when it is full. It also refers to the fifteenth night of the lunar moon cycle.
motu	The Maori word given to sand-cay islets that were formed through the accumulation of broken coral on old reef platforms.
Ngati pa'i	The Clan The Maori word for an elevated mound or platform of soil. It is a place where taro is planted and is usually rectangular in shape. The pa'i is common in the wetland areas of Atiu, Mauke, Rarotonga, Manihiki, Rakahanga and Mitiaro.
pekāvai	A creek that feeds into a stream. These are found in the interior parts of the islands of Rarotonga, Mangaia and Atiu.
sloping land	Any land having a natural gradient in excess of 1:10 including mountains and hills, and the tops of such hills and mountains.
Tu'anga Taporoporo	The Government owned corporation established under the Rarotonga Environment Act 1994-95.
Vaka	The Maori word given to each major land division of the island of Rarotonga. The English word for vaka is district. There are three vaka on the island of Rarotonga; they are Teautonga, Takitumu and Puaikura.
umu	Polynesian earth oven.
uri-pa'i	The turning over of the ground or soil using a sharp shovel to form a pa'i.
uruātete	The raised makatea platform on the foreshore side of the island facing the reef and/or the ocean.
wetland	Areas of marsh, swamp or water, whether natural or artificial; permanent, seasonally flooded or temporary; with water that is static or flowing; fresh or brackish or salt water and includes water storage reservoirs, taro swamps and fish ponds.

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Summary

In summarizing the content of this report, a small proportion of the lands of the Cook Islands, less than 30%, is affected by activities carried out in the Cook Islands. This area of land is mainly on the main island of Rarotonga. Much of the natural environment described, which is very special to the continued existence and sustainable development of the scattered islands of the Cook Islands, is at the mercy of global events. To contribute to the efforts of countries to combat land degradation, and to address the global issues, this report provided a list of future initiatives that the Government intends to carry through in order to address the various land degradation challenges identified in this report and summarized in the table below.

Land Degradation Issues	Challenges	Responses	Strengths/weakness of the Responses	Future Initiatives
Land and Land Management	<p>Multiple ownership – leading to developmental activities on environmentally sensitive lands.</p> <p>Inadequate land – development of environmentally sensitive lands.</p>	<p>Land Commission Report of 1995 with recommendations.</p> <ul style="list-style-type: none"> * Realigning land laws and land decisions with Maori Custom. * Establishing a Cook Islands land Court. * Localization of Land Court Judges. * Introducing the concept of freehold land. * Provision of proponent legal professional services to the public. * Restructuring the operations of the land division. <p>* Rarotonga Environment Act 1994-95. The requirement of an EIA for major developments and an engineering report for a lesser development.</p>	<p>Only two of the recommendations of the Land Commission Report have been implemented.</p> <ul style="list-style-type: none"> * The localization of the Land Court Judges ongoing. * The establishment of a Land Trust combined with the provision of proponent legal professional services to the public is in progress this financial year. 	<p>Review and further analysis of the recommendations of the Land Commission Report recommendations with the view to:</p> <ul style="list-style-type: none"> * Explore and reach a decision on how to overcome difficulties on multiple and absentee ownership and fragmentation of land interests. * Explore and reach a consensus (where possible) of finding balance between the extremes of customary ways and western materialism. * Establish an accessible and affordable valuation system in the country. * Education and awareness of legal implications where information must be written in the vernacular language to ensure understanding. * Capacity building for the staff of Ministries with regulatory functions.
Land Development Foreshore	Government policy	<ul style="list-style-type: none"> * Support to Forestry program * Support to the NEMS process and outcome. * Support to Environmental legislative review and capacity building. * Support the EIA process and its implementation. 	<ul style="list-style-type: none"> * Applications to the Environment Council for approval is improving, but monitoring of approved projects is very poor. * Lack of funds to continue the program. * Lack of funds to implement NEMS * Support for legislative changes. * Lack of funds to continue capacity building. * Weak in the impact determination (EIA) phase of an application for approval; need guidelines and trained staff. 	<ul style="list-style-type: none"> * Capacity building in the executive of Government especially in strategic planning; budgeting; bidding; and spending within budget. * Capacity building for the staff of Ministries with regulatory functions.

Wetlands	<p>Construction and protection of tourist facilities</p> <p>Damage to residential areas</p> <p>Sanitation</p> <p>Flooding of low-lying areas or wetlands</p> <p>Unpleasantness</p> <p>Stench from septic tanks</p> <p>Building of residential houses</p>	<p>* Coastal protection structures such as rock revetments, retaining walls, gabion and reno mattresses and timber structures</p> <p>* Designing by MOW and engineers.</p> <p>* The supervision of the construction by engineers.</p> <p>* EIA and engineering plans provided for approvals.</p> <p>* Building plans approved by both MOW and Public Health.</p>	<p>* Most activities not supervised by a qualified engineer or field manager.</p> <p>* ES Officers are not engineers therefore they cannot see the structural faults in the constructions.</p> <p>* EIA and engineering reports always submitted.</p> <p>Builders do not stick to conditions of approval.</p> <p>* Build more coastal protection structures.</p> <p>* Buildings are closer to the sea.</p> <p>* Systems improperly built. Builders do not stick to conditions of approval</p> <p>* Lack of support for Officials with regulatory functions.</p> <p>* Flooding still taking place, due to lack of regular maintenance.</p> <p>* Construction of drainages, retaining walls and access ways not always to design.</p> <p>* Developers are not always sticking to ES and/or Public Health conditions.</p> <p>* Drainage systems are not always working because of siltation and debris build up at the outlets.</p> <p>* Increased mosquito breeding ground.</p> <p>* Smell from septic tanks that are not sealed.</p> <p>* Improperly constructed and badly sited septic tanks. Septic tanks are not sealed.</p> <p>* Increased application for the construction of residential houses.</p> <p>* A sign of supporting and recognizing the importance of properly developing the land to avoid further land degradation.</p>	<p>Current Environmental Legislation need the following action:</p> <p>* Capacity building in the areas of compliance, education and awareness, and monitoring.</p> <p>* Regulating of the ESD form for impact significance determination required under project application and approval by consent provisions.</p> <p>* Data compilation on applications and consultations for monitoring purposes</p> <p>* Environmental indicator monitoring</p> <p>There is an urgent need to pass the current National Environment Bill so that land degradation issues in the outer islands are also addressed. The current draft has the following important components:</p> <p>* The Act only applies up to the reef of each island.</p> <p>* If the Island Council agrees to certain provisions of the Act that are appropriate to the island they will be applied.</p> <p>* If there are no appropriate provisions for that island, the Island Council may create an environmental bylaw to address land degradation challenges and then if they so wish have the bylaw adopted under the National Environment Act.</p> <p>* If the Act or parts of it are applied to an island Environment Council will be established on the island to make decisions under the Act.</p> <p>* The Environment Service for each island has the power to work with any Government Agencies, and non-</p>
Sloping lands				

	<p>Construction and maintenance of roads and access ways</p>	<p>platforms for house sites. * EIA and engineering plans were provided. * Appropriate approvals by the authorities.</p>	<p>*Lack of trained operators to excavate and construct access ways. *The ES Officers are not engineers and are not able to detect all the weaknesses in the constructions. *Lack of supervision by a qualified engineer. *Developers are not complying with the conditions of approval. *Constructions of septic tanks are not supervised. Septic tanks are improperly constructed.</p>	<p>governmental organizations. Monitoring of approved activities is vital. This requires the following: * Capacity building within the Ministries concerned (MOW (Building Inspectors), Public Health and the Environment Services. * The collecting of data on environmental indicators becomes very important to monitor effects to the environment and detect the potentially</p>
<p>Stench from septic tanks</p>				

	Altering of streams		<p>*Lack of supervision by a qualified engineer. *Developers are not complying with the conditions of approval.</p>	<p>adverse changes that occur due to increased development. Therefore the following need to be put in place: * Guidelines and standards: there are no specific guidelines for the construction of a road, protective structures, and so on that may degrade the sloping land areas, wetland areas, foreshore areas or makatea land areas. * Guidelines and standards must include relevant specifications for the following activities: Construction, Excavation, Clearing, Planting, Reclaiming For: Access ways, Roads, Residential houses, Retaining walls, Protective structures, Commercial buildings Waste treatments, Infrastructure. The use of traditional knowledge for the purposes of: * Planning for projects such as excavation, clearing, construction and reclaiming on any environmentally sensitive areas. * The use of the Nassau and Pukapuka system of compliance to their environmental laws.</p>
Invasive species	<p>Loss of agricultural land Threat to interior and native species</p>	<p>*Extensive consultative meeting under NBSAP. Causing more awareness, preparation of eradication initiative and ecosystem management.</p>	<p>* Awareness only and no action due to lack of funds. * Awareness raising and no action due to lack of funds.</p>	<p>* Implement the eradication plan. A community and national cooperative effort. * Implement the ecosystem management plans for the interior of Rarotonga, coastal, wetlands and makatea areas aimed at protecting important native species from the impacts of invasive species.</p>

Population Changes	Decreasing population on the outer islands -	<p>* Introduction of value added tax (VAT) that benefited those Cook Islanders interested in self-employment or getting into business.</p> <p>* Extension of the non-taxable income from NZD6, 000.00 to NZD12, 000.00.</p>	<p>* Population decrease in the outer islands recorded after the 2001 Census averages, 25%.</p> <p>* Abandoned and affected lands in the outer island makes planting and maintenance of drainage systems more difficult.</p>	<p>* Politicians to be more aware of the country's population structure, population processes and socio-economic characteristics in order to plan for an adequate standard of living, and for a proper provision and distribution of goods and services.</p> <p>* Good governance and proper management of human resources.</p> <p>* CIG to Support HRD's new initiatives to support the capacity building required for better services.</p> <p>* Recognition that development strategies must be compatible with culture and tradition: improve worker and employer relationship through guidelines and legislation to protect both worker and employer; retain where possible the local skilled and trained labor force.</p>
Climatic variations	Increasing population on Rarotonga. – Pressure on environmentally sensitive lands.	<p>* Rarotonga Environment Act 1994-95 through the EIA process for major projects and engineering report requirements for smaller projects.</p> <p>* Building permits approved, together with approval for septic tanks, are on the increase.</p>	Monitoring of projects by Environment Service and Public Health is very poor.	Capacity building for the staff of Ministries with regulatory functions.
	Biodiversity – threat to their existence	<p>* PICCAP program responds to the commitments by Parties to the UNFCCC. Through the PICCAP, the Cook Islands are a member of the Alliance of small Island States that recognizes the potentially disastrous situation of SIDS.</p>	<p>* Signed the UNFCCC and ratified Kyoto Protocol.</p> <p>* Through PICCAP a number of projects have been initiated to fulfill the country requirements under the UNFCCC including the implementation of the adaptation initiative to be integrated across all sectors.</p>	<p>* Support preparedness activities in anticipation of changes as a result of global and regional climate changes through the DMU.</p> <p>* Support information collection and preparedness activities in anticipation of changes as a result of global and regional climate changes through the PICCAP program.</p>
		<p>* NBSAP program responds to the commitments by Parties to the CBD. The NBSAP have prepared national strategy for implementation.</p>	* NBSAP and awareness raising activities.	* Support the implementation of the NBSAP initiatives with an emphasis on using the language of the knowledge holders.

	Coastal erosion – threat to coastal resources and properties.	CHARM, a comprehensive hazard and risk management tool or process within the context of an integrated national development planning processes is being promoted and implemented by DMU. Rarotonga Environment Act 1994-95 through the EIA process for major projects and engineering report requirements for smaller projects.	* Highlighted the transportation problems due to isolation. * Preparedness activities. * Monitoring of approved projects is poor.	* Support preparedness activities in anticipation of changes as a result of global and regional climate changes through the DMU. *Capacity building activities for the Environment Service.
Ignoring of traditional knowledge	Knowledge not easily available for use. Recognizing traditional knowledge as being real and valid. Battle against the attitude that all things 'island' came from a 'dark age' without enlightenment.	* Knowledge collected in the English language. Traditional Management Practice (TEM) focusing on the arapo. A project to introduce TEM into the schools. This knowledge is good for land use planning. Support efforts to recognize traditional knowledge and practices through the Ministries of Culture, Tu'anga Taporoporo and the Ministry of Education.	TEM is an externally funded project and is currently in progress. Lack of funding to support the various Ministries to collect and process the information in the language of the knowledge holders.	* Establishment of a national marae, a place of learning traditions and valuable information. * Greater participation of traditional leaders in the process of parliamentary decision-making. * Establish a Language Institute to maintain Cook Islands Maori being taught in schools. * Set up on-going training program for archivists, curators and librarians to access and publish written resources as public information. * Establish a body to review access to, and the processing of, knowledge on Biodiversity and its use. * The Natural Heritage Project to become a Maori program, to record all the biodiversity of the Cook Islands.

Chapter 1 Background

1.1 Introduction

1.1.1 Historical background

Land degradation in the Cook Islands has occurred for much of the last century but has escalated dramatically in the last 50 years. Land degradation in the Cook Islands was first recognized during a regional conference in 1972 when the environment program of SPC was formalized. The Conference on Human and the Environment, convened on Rarotonga, introduced also to the Cook Islands Government the need to protect environmentally sensitive areas, such as the coastal marshes and coastal ridges, of Aitutaki and Rarotonga.

Further development in this area resulted in the establishment of the country's first National Park, the atoll of Suwarrow, in 1978. This was an effort to recognize the potential dangers of introduced pests that would drastically affect the copra industry of the Northern Group islands. Suwarrow atoll, being a popular port of call for yachts, was seen as a strategic position where introduction of pests could take place affecting the coconut plantation lands of the Northern Cook Islands.

Government officially established the Conservation Service in 1982 as required under the Conservation Act of 1975. In 1984, the Conservation Service became an active program of the Ministry of Internal Affairs.

Despite the early warnings and institutional establishments, land degradation continued with the introduction of bigger earth moving machineries; the construction of access ways and roads on sloping lands; the alteration and reclamation of wetland areas; and the continuous mining of the foreshore area.

The bigger machines cleared large areas of vegetation on the sloping lands of Rarotonga. The clearing work on sloping lands expanded to the islands of Mangaia and Atiu. Lands were not only cleared, they were excavated, terraced and ploughed for pineapple production. Huge amounts of chemicals and fertilizers were used on the plantation lands.

By the late 1970s, market prices were unable to sustain the agricultural development and much of the effect of the land development were starting to show. Classic erosion features on the sloping lands of Rarotonga, Mangaia and Atiu were apparent. Blocked drainage systems of the wetland areas were becoming the cause of increased breeding grounds for mosquitoes and land was lost through coastal erosion processes as beaches re-adjusted.

Government reaction to the continued land degradation issues was a "band aid" approach. In 1985 the business community pushed for protection of the foreshore and the watershed area in a move to improve the coastal environment. The two most important Government programs established for improving and dealing with land degradation challenges were; the establishment of the Conservation Service as an ad-hoc Government organization and the NZODA driven Forestry program of the Ministry of Agriculture.

The Conservation Service, has revised its legal standing three times since 1975. In 1986 a local businessman initiated the first legal review process. This review introduced the coastal zone management concept and the protection of the watershed. In 1990 under a FAO land rehabilitation

project, the Government initiated the second legal review process focusing on the concept of environmental impact assessments (EIA). At present, Government is in the middle of a third review that has been in progress since the year 2000. This third review focuses on an act to unite environmental management of issues in the Cook Islands.

The Forestry program implemented by the Ministry of Agriculture and assisted by the New Zealand Government and UNV program initially focused on nursery trials to find species that can best grow on the exposed soils of the sloping lands. After the initial phase, the forestry program started to plant lands affected by soil erosion. The program also focused on further erosion control research, capacity building and has expanded to the islands of Mauke, Atiu, Mitiaro and Mangaia.

During the UNCED process of the early nineties and through the NEMS process, Government realized the full impact of land degradation challenges caused by past activities and global events such as Global warming and agreed to be a party to the Rio Declaration, the United Nations Framework Conventions on the Climate Change (UNFCCC) and the Convention on Biodiversity (CBD).

1.2 Approach to UNCCD

In the Cook Islands context land degradation is primarily the result of human activities and climatic variations. The latter was accepted through the assessments of risks on areas that are vulnerable to climatic variations. It was also a point to highlight that traditional knowledge holders of biodiversity information have realized changes to the environment that are not the result of local activities but instead are global activity related. This change was noted through the losses or scarcity of particular species.

Having realized the scope of land degradation and the fact that the Cook Islands is more a victim at the mercy of Global events when addressing climatic variation challenges, Government acceded to the Convention to Combat Desertification, as a reflection of its support for global solidarity and consistency with the two sister conventions the UNFCCC and the CBD respectively. This move further confirms Cook Island's commitment to the position taken at the Rio Summit in 1992 along with the other nations.

In the assessment and analysis there are two major challenges, to preserve and protect the existing natural resources, and the other is to mitigate existing land degradation issues.

Chapter 2 About the Cook Islands

2.1 Physical Environment

2.1.1 Land & distribution

Table 1.0 provides the land and distribution details for the Cook Islands. See also the Map of the Cook Islands on the front page. The Cook Islands consist of 15 islands scattered over an area of 1.8 million square kilometers of the South West Pacific Ocean. Located between Tonga and Samoa in the west and French Polynesia in the east, the islands extending from latitudes 8° and 23° south and longitudes 157° and 66° west.

<i>Island</i>	<i>Land area (sq km)</i>	<i>Distance from Rarotonga (km)</i>	<i>Max. height meters above m.s.l</i>
<i>Southern group:</i>			
Rarotonga	67.2	0	652
Mangaia	51.8	204	169
Atiu	26.9	215	72
Mitiaro	22.3	263	15
Mauke	18.4	278	29
Aitutaki	18.1	259	124
Manuae	6.9	230	10
Palmerston	2.0	500	5*
Takutea	1.2	215	5*
<i>Northern group:</i>			
Penryhn	9.8	1,365	5*
Manihiki	5.4	1,204	5*
Pukapuka	4.3	1,324	5*
Rakahanga	4.1	1,248	5*
Nassau	1.2	1,246	9
Suvarrow	0.4	950	5*
Total area:	240.0		

Table 1.0: Land, type & altitudes -* Assumed to be 5 meters approximately (Source: Survey Office)

Rarotonga is the capital island of the Cook Islands and where the seat of Government is located. The Cook Islands extends to Penryhn in the north, at 1,365 km from Rarotonga, and to the southern island of Mangaia, which is the closest to Rarotonga, at 204 km.

The 15 islands of the Cook Islands are divided into the Northern Group with six low-lying islands north of Palmerston, and the Southern Group, with nine islands south of Suvarrow.

The Southern Group islands are closer to the capital island of Rarotonga where the main international ports of entry (air and sea) are located. Unlike the Southern Group islands, the Northern Group is far north and scattered.

The islands represent five different island systems found in the Pacific Basin. These are described in Table 2.0. Each island's elevation above mean sea level (a.m.s.l.) ranges from 5 to 652 meters. See Table 1.0.

The total land area of the Cook Islands is 240 square kilometers. Over 89% (53,030.9 acres) of the land area is situated in the Southern Group. With the exception of Manuae and Takutea, all islands are inhabited. There are three people that reside on Suvarrow atoll, which is also, the countries only national park.

2.1.2 Climate

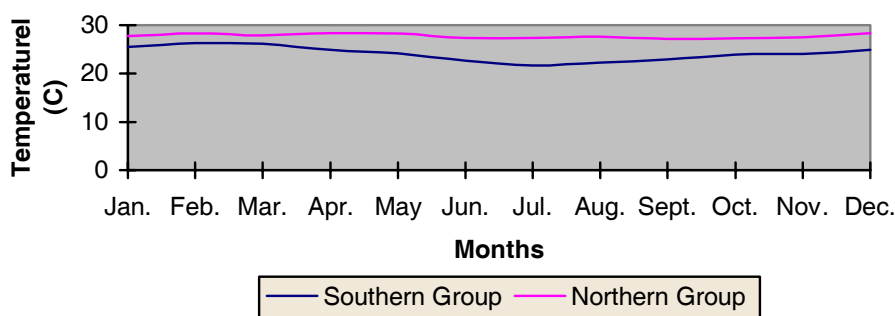
The climate of the Cook Islands is typical of tropical maritime climate. Despite the high average relative humidity, around 84%, the climate is pleasant and warm. Temperature ranges for the Northern Group are fairly uniform. (See Figure 1.0). For the Southern Group however, there is some variation in the temperatures and rainfall patterns.

The SPCZ

The South Pacific Convergence Zone (SPCZ) and its movement between the Northern and Southern Groups is an important phenomena for influencing the weather patterns of the Cook Islands¹. The SPCZ is a convergence zone of air between the equatorial easterly winds and the southeasterly trade winds. The SPCZ varies from month to month, and the weather in the Southern Group is largely dependent on its position and intensity.

Usually the SPCZ lies over the Southern Group during the months November to April. It brings high humidity and heavy rains. At this time the Northern Group will experience dry, hot weather. From May to October the SPCZ moves to lie over the Northern Group taking the unsettled rainy weather to the Northern Group mean while the Southern Group will be experiencing its dry season. See Figure 2.0 below.

Figure 1.0: Monthly average temperature for the Cook Islands (Source: Thompson Report)



Tropical Cyclones

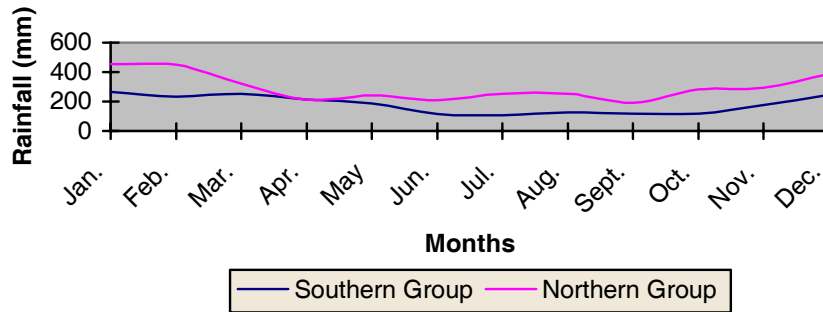
The formation of tropical cyclones during the wet season is a major climatic feature of the Southern Group. These tropical cyclones develop in low-pressure troughs on the SPCZ during the warmer months of the year. Tropical cyclones are a major climatic feature of the tropics, however they seldom affect the Northern Cook Islands. Between 1940 and 1997 there were 13 reported cases of tropical cyclones in the area and only four of these resulted in damage to the atolls².

¹ Thompson, C.S (1986).

² Including the 11 stated by Thompson, C.S. (1986).

Cyclone “Martin”, of November 1997, however, affected Manihiki and directly caused the death of 11 people. The last major cyclone before “Martin” was “Sally” in 1987, which affected and caused damage to the Southern Group islands.

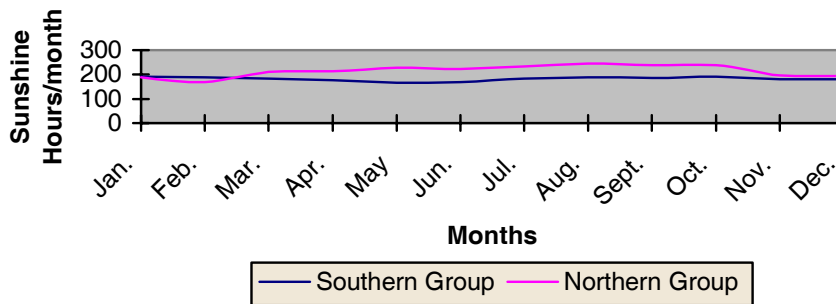
Figure 2.0: Monthly average rainfall for the Cook Islands (Source: Thompson Report)



The movement of the SPCZ causes variation in the number of sunshine hours experienced by both the Northern and Southern Group. See Figure 3.0.

Sunshine hours are highlighted in the Southern Groups during the hurricane season (October to April). For the Northern Group sunshine hours are highest during their dry season (April to October) months.

Figure 3.0: Monthly average sunshine hours for the Cook Islands (Source: Thompson Report)



El Nino and the SOI

El Nino (unusually low rainfall) and la Nina (unusually high rainfall) are significant weather events to the Cook Islands. Long El Nino spells were recorded in the 1982/83, 1986/87, 1991/1995 and the 1997/98 dry seasons. Currently a weak El Nino is forecasted for the Southern Groups till the end of February 2003.

This very important occurrence is measured and identified using the Southern Oscillation Index (SOI). The SOI is the difference between the atmospheric pressure of two points, Darwin in the east and Tahiti in the west. For each season the SOI fluctuates between a plus or minus 10 scales. If during a season the SOI remains in the negative, we can expect to experience dry spells. And if the SOI remains positive, we can expect to experience wet weather especially in the Southern Group. A further elaboration of this occurrence is given in Section 3.6.

The cause of this fluctuation in the SOI is unknown but is suspected to be associated with the global change in climate.

2.1.3 Geology

The Cook Islands is comprised of an archipelago, or line, of 15 islands extending some 1,400 kilometers from the most northern island of Penryhn to the most southern island of Mangaia. The islands represent five of the types of island systems found in the Pacific Basin. See Tables 2.0.

Most of the islands of the Cook Islands are atolls, with four makatea islands, two sand-cays and one high island. Refer to table 2.0 below.

<i>Island Type:</i>	<i>Features:</i>	<i>Islands:</i>
High volcanic island	Volcanic in origin, at least 100 meters above sea level, mountain and valley features, secondary volcanic cones, differentially eroded, and sharp ridges dividing the catchment valleys. Fringing reef system with wide reef flat.	Rarotonga
Raised makatea	Raised volcanic islands resulting in raised coral platforms or makatea surrounding an apparent interior volcanic plateau. Fringing reef with narrow reef flat.	Mangaia, Atiu, Mitiaro and Mauke
Sand-cays	Small low-lying islands or motu composed of sand and coral formed on old reef platforms. Fringing reef with narrow reef flat.	Takutea and Nassau
Almost Atolls	Partially submerged volcanic island, has the features of both a volcanic island and an atoll and surrounded by a barrier reef	Aitutaki
Atolls	Typically low-lying, the land is formed on old reef platforms that formed on the rim of marine volcanoes. Fringing reef, with Suwarrow and Penryhn having major openings in the reef.	Manuae, Palmerston, Manihiki, Pukapuka, Rakahanga, Suwarrow and Penryhn

Table 2.0: A brief description of the Geology of the islands

Beach rock

An important geological feature found in the Northern Group islands are beach rocks which are found on the ocean side of the atolls. These beach rocks were formed approximately one meter below the ground surface. Through a chemical reaction between freshwater and the calcium carbonate that make up the shells and coral components of the ground, and time, the resulting reaction produced lime that has bound the shells and corals together to form beach rocks.

This beach rock is natural protection for the inner more easily erodable coral rubble mound of the island. It also protects the underground water reservoir on atolls that are able to sustain a reservoir.

This is why; Pukapuka and Rakahanga sustain a feasible underground fresh water supply. Nassau Island also has this feature. Of the two sand-cays of the Cook Islands, Nassau, with an underground water reservoir, is the only other island with this feature that has a human population. Takutea is a seabird sanctuary.

Beach rocks are also common on the islands of Rarotonga and Aitutaki. Together with beach escarpments, they are indicators of extensive beach erosion and land retreat. For Rarotonga beach

escarpments are common along the Rutaki and Tikioki towards Muri foreshore areas. Beach rocks are exposed at places where extensive sand mining has taken place. At Tikioki and the Black Rock area towards the Social Center beach reserve was the area that Government used to extract most of its sand and gravel for road construction.

In Aitutaki, sand mining was carried out on the eastern side of the Airport run way. It is at these places and adjacent foreshore areas where beach rock and beach escarpments are exposed.

2.1.4 Soils

2.1.4.1 Northern Group

The soils of the Northern Cook Islands are typically atoll soils derived from reef materials with thin organic topsoil. These soils are inherently infertile, highly porous, capable only of supporting coconut, pandanus and other vegetation types described in Section 2.2.1.1. Where there are marshlands, normally, adequate quantities of organic soil are found. In these marshlands the local people plant the root crops taro and pulaka (*Spermatoma spp*).

Some attempts have been made to build up soil and soil fertility through composting for home gardening. The success of these attempts has not been monitored. However, it is common knowledge, with the exception of Manihiki, that most human settlements of the Northern Group prefer their own type of food, which does not include the type of vegetables that are commonly promoted and planted in home gardens. Soil improvement for the purpose of vegetable home gardening is therefore not an important undertaking. Soil improvement in the Northern Group is restricted to aiding the growth of tree crops such as breadfruit, lime or lemon and bananas. On the islands of Nassau, Pukapuka and Rakahanga, the use of green leaves to sustain soil fertility for their taro and pulaka in the marshlands is commonly practiced

With the collapse of the copra industry, little has been gained economically from the soils of the atolls of the North.

2.1.4.2 Southern Group

The soils of the Southern Group are derived from volcanic rocks, they are more diverse, and suitable for major agricultural use. With the exception of Rarotonga and Aitutaki, the other islands have large areas of makatea which is extremely rugged terrain. This has limited the land area available on those islands for agricultural use. (See Table 1.0, 2.0, 3.0, 4.0 and 5.0)

The steeper interior lands of Atiu and Mangaia have been subjected to severe soil erosion. This was the result of abandoned lands formerly used for pineapple planting in the early 70s. Despite the apparent classic erosion prevailing on these islands, a large proportion of the islands are unaffected. For example, some 89% of Atiu is largely unaffected by soil erosion (NZDSIR 1990).

Island	Makatea	Others	Arable land
Rarotonga	Nil	87.5	12.6
Mangaia	33.8	59.5	6.7
Atiu	50.1	11.1	26.7
Mauke	76.7	4.3	6.9
Mitiaro	80.0	18.2	1.8

Table 3.0: The makatea and arable lands of the Southern group (area expressed in %)

On Rarotonga, although there are significant areas of eroded soil especially in the interior sloping lands facing north and northeast, in most places there is a fast rate of regrowth, and this protects the soil from being continuously eroded and from further loss of nutrients.

There are four main categories of soil found on Rarotonga. These categories are: the interior³ soil which are limited in drainage, low in nutrient and prone to erosion; the alluvium soil of the lower foothills⁴ and onto the coastal plains which are moderate to good drainage, medium to high nutrient; wetland soils⁵, very poor drainage and cultivated through improved drainage; and the coral dominated coastal soil⁶ used for kumara planting where suitable.

It is very important to note that with these soil types mentioned for Rarotonga also exist on the makatea islands and Aitutaki. Their properties are what describe their ability to sustain or not sustain any changes that might be applied to them.

2.1.5 Land

2.1.5.1 Land Availability

<i>Island:</i>	<i>Land Area (acres):</i>	<i>Makatea area (acres):</i>	<i>Area used for agriculture (acres):</i>	<i>Others*(acres):</i>
Rarotonga	16,598.4	0	1,143.00	15,455.4
Mangaia	12,794.6	4,322.5	373.3	8,098.8
Atiu	6,644.3	3,334.5	152.6	3,157.2
Mitiaro	5,508.1	4,396.6	52.5	1,059.0
Mauke	4,544.8	3,428.7	271.8	790.30
Aitutaki	4,470.7	0	458	4,012.7
Manuae	1,704.3	0	0	1,704.3
Palmerston	494	0	0	494.0
Takutea	296.4	0	0	296.4
Penryhn	2,420.6	0	0	2,420.6
Manihiki	1,333.8	0	18	1,315.8
Pukapuka	1,062.1	0	56.9	1,005.2
Rakahanga	1,012.7	0	12.7	1,000.0
Nassau	296.4	0	3.9	292.5
Suvarrow	98.8	0	0	98.8

³ Te Manga, Pokoinu, Tikioki soils.

⁴ Tikioki, Arorangi, Tupapa, Matavera and Pouara soils.

⁵ Avarua soil

⁶ Muri soil.

Total	59,280.00	15,536.3	2,542.7	41,201.0
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Table 4.0: Land availability (Include land used for residential, commercial and marginal lands such as sloping lands and wetlands.)*

The total land area of the Cook Islands is 240 sq km or 59,280 acres. Of these 15,536.3 acres or 26.2% is makatea land, and only 2,542.7 acres or 4.3% is used for agricultural purposes. The other 41,201 acres or 69.5% are referred to in this report as marginal land. On marginal land there are landforms such as, sloping lands, wetlands of Rarotonga and atoll lands used for coconut planting in the Northern Group. This category also includes commercial land and land used for public purposes.

Over 70% of the land in the Cook Islands are land not used for agriculture, and consist mainly of sloping lands of the interior, makatea, unused wetlands and coconut lands of the Northern Group. These lands with their native biodiversity however play a very significant part in ground water retention and the hydrological cycle⁷.

Development of Rarotonga

On Rarotonga almost all of the development is taking place on the foreshore area. This area is 617.5 acres in size or, 3.7% of the total land area of Rarotonga. It is also observed that there is an increase in developmental projects on the sloping lands through the construction of more residential housing. This is described in some detail in Chapter 3, 4 and 5.

Table 3.0 provides the areas of land used for agriculture (arable) and makatea (not arable).

It is apparent that land available for development and public use is very limited. For this reason, the potential for land degradation is high as more lands unsuitable for development become developed regardless.

2.1.5.2 Land Tenure

Cook Islands land tenure system is based on communal or multiple land ownership. The Solemn Declaration of the Federal Parliament of the Cook Islands in 1894 states⁸ that “The land is owned by the tribe, but its use is with the family who occupy the land. The family consists of all the children who have a common ancestor, together with the adopted children, and all the descendants who have not entered other tribes”.

In accordance with the land court system, lands may be crown land, acquired by Government; customary land, held by natives or the descendents of natives; or else freehold land, which is customary land held by individuals through lease, license, occupation right or court order.

In the Northern Group, with the exception of Pukapuka and Nassau, the people own the land and its distribution is managed by the Families. Land is passed down through the descendents of family members. In the case where there is a dispute, for the outer islands, the Island Council acts as an arbitrator.

For Pukapuka, Nassau, Mangaia, and Mitiaro the land belongs to the Aronga Mana and they or their representatives manage its distribution. Individual inhabitants that are not one of the Aronga Mana are allowed to plant and inhabit the land with the consent of the Aronga Mana.

⁷ Ben Parakoti, Director of water works at the WSSD workshop.

⁸ Registrar for the Land Court, Mr. Nooroa Tearea

Table 5.0 presents details of the number and size of parcels according to land tenure for both in use and fallow classification.

Location of parcels	Total area of parcels (acres):	Land Tenure							
		Crown	Euro-peans	Custom-ary	Freehold leased	Freehold licensed	Freehold occupat-ion right	Freehold long occupat-ion right	Not stated
Rarotonga	1,143.0	3.3	1.0	301.6	164.7	168.6	405.4	83.8	14.6
Other	1,308.4	1.0	8.4	625.0	82.8	62.5	499.8	7.4	21.6
Southern Islands									
Northern Islands	91.5	0.2	0.2	91.1	0	0	0.3	0	0
Total	2,542.9	4.3	9.5	1,017.8	247.4	231.1	905.4	91.2	36.2

Table 5.0: Area of parcels, by Land Tenure and location of Parcel (Source: CI 2000 Census of Agriculture & Fisheries.

Despite the restrictiveness of this land tenure system, the development of lands has taken place through customary ownership involving large family units and freehold occupation allowing small and large-scale developments of the land available.

Land in-corporation through special arrangements in the past with the bank and interested groups such as the Government has resulted in land having been developed during the pineapple and citrus eras of the 1970s in the Cook Islands. This has resulted in large areas of the flood plains of Rarotonga, the plateau lands of Mauke, the good lands of Atiu and Aitutaki and the sloping lands being developed.

2.1.6 Water

Being without water is unthinkable⁹. Water is the key resource for social and economic development because it sustains human productivity and life.

Water is also a strategic resource to ensure that integration of economic, social and environmental planning takes place. This is a vital statement taken out of the Cook Island's WSSD conference plenary session.

2.1.6.1 Northern Group

The Northern Group, being coral atolls, are without surface water and depends for supplies on the vulnerable fresh water lens, which is subject to rapid depletion. Individual homes traditionally depend on rainwater stored in small containers.

For islands such as Pukapuka, Nassau and Rakahanga, fresh water is obtained from wells that have sustained human inhabitation since first lived on by the early Polynesians.

Island	Source of Water	Water supply in the dwelling
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⁹ Atatoa Herman, Secretary of Works, WSSD Conference

	Public water main	Public water catchment	Own rainwater tank	Other	Piped to inside dwelling	Piped to outside dwelling	Cart or carry to dwelling
Palmerston	0	5	11	-	8	2	2
Pukapuka	4	78	58	-	10	58	56
Nassau	11	4	1	-	1	10	4
Manihiki	5	23	103	-	48	37	33
Rakahanga	4	2	26	-	8	16	8
Penryhn	10	16	79	-	21	29	33
Suvarrow	0	0	1	-	0	1	0
Total:	34	128	279	-	96	153	136

Table 6.0: Number of private dwellings by island and Water supply for the Northern Group (source¹⁰: Statistics Department)

With the improved income earnings of the people of Manihiki and Penryhn from the pearl industry and assistance provided to Manihiki after cyclone Martin, household capacity for storing water has increased. This is shown in Table 6.0. The figures show that for the Northern Group 63.3% of households have their own rainwater tank with 65.3% of that being for Manihiki and Penryhn.

It is also noted from Table 6.0, that where there is a significant population and developmental opportunities, such as in Pukapuka, Manihiki and Penryhn most of the dwellings have either water piped into the house or to just outside of the house. The population is stable despite the decrease in respective populations. See Section 2.4.2.

2.1.6.2 Southern Group

The volcanic islands of the Cook Islands are well supplied with good quality drinking water and this situation has no major challenges during normal climatic conditions. On Rarotonga and Mangaia, the springs and streams within the catchment valleys provide good running water sources. These springs have already been developed using filter intake facilities. The Rarotonga water supply features 12 water intakes sited within small catchment areas along with 4 horizontal water galleries and limited storage reservoirs¹¹. On Rarotonga water from stream catchments is piped into the main reticulation system which serves the majority of households.

The volcanic outer islands of the Southern Group have adequate underground resources. Under the Government water development program, pumping facilities have been provided. The island's almost flat terrain makes gravity-fed reticulation impossible. With pumping systems using wind powered and complemented with diesel power, settlements on flat or slightly higher grounds are supplied with water.

On Rarotonga, where tourism and other developmental activities have been on the increase since 1974, water supply has become a major challenge. Experiences on how difficult the situation can become and how the water supply system has been ineffective at times were observed during the El Nino dry seasons mentioned in Section 2.1.2. The challenges were: the limited or lack of storage capacity; lack of back up system; insufficient financial resources; water quality due to low water flow in the streams; high flow losses in network due to leakage, the lack of maintenance and the continuous development of infrastructure.

¹⁰ Provisional data.

¹¹ Ben Parakoti, Director of Water Works.

Island	Source of Water				Water supply in the dwelling		
	Public water main	Public water catchment	Own rainwater tank	Other	Piped to inside dwelling	Piped to outside dwelling	Cart or carry to dwelling
Aitutaki	433	23	162	-	283	157	36
Mangaia	197	88	50	-	80	113	1
Atiu	138	16	100	-	61	78	6
Mauke	109	1	31	-	61	49	22
Mitiaro	56	15	45	-	20	35	0
Total:	933	271	388	-	505	432	36

Table 7.0: Number of private dwellings by island and Water supply for the Southern Groups (source¹²: Statistics Department)

2.1.7 Energy

The Cook Islands is dependent on fossil fuel for its energy. It is estimated that 85% of the Cook Islands primary energy sources are from fossil fuels which electricity generation and transportation are totally dependent upon¹³. The rest are biomass. Given the current trend in population growth, growth of the tourism industry and the commercial sector, and the changing lifestyles of the people, the current future energy path of the Cook Islands would be one of continuing reliance on imported fossil fuel. Ninety percent (90%) of the current population of the Cook Islands has access to electricity¹⁴. Currently the Government has a draft National Energy Sector Policy that provides practical guidelines, and clearly states Government's intentions, energy pricing policies, and priorities in the energy sector.

Dependence on imported fossil fuel will continue despite efforts to introduce alternative and renewable energy sources, as these options prove to be expensive and or impractical.

On the international scene, the developing small island states reliance on fossil fuels for energy generation underline the urgency to develop alternative and renewable energy sources. Larger countries and international organisations that are always finding ways to offer assistance by way of cheaper and affordable fossil fuels further make the challenge, to develop alternative and renewable energy sources, difficult¹⁵.

The most used and the only natural alternative source of energy that is easily harnessed in the Cook Islands is the firewood from plant materials.

Island & Region	Electricity	Gas	Firewood	Kerosene
Northern Group	4	228	131	22
Southern Group	130	494	277	72
Total	134	722	408	94

Table 8.0: Private occupied dwellings by region and principal means of cooking fuel (This data does not include Rarotonga). (Source: Statistics Office).

¹² Provisional data.

¹³ Energy Sector overview report to the WSSD Conference, April 2002.

¹⁴ Energy Sector overview report to the WSSD Conference, April 2002.

¹⁵ Taken from the plenary discussion during the WSSD Conference in April 2002.

The use of coconut husks and coconut shells is common and widely used in the outer islands for cooking in the traditional 'umu'. However with improved shipping to the outer islands, the use of a convenient cleaner energy, gas, has increased. Table 8.0 shows the distribution of use of various sources of energy. Gas is clearly the main source of energy used followed by firewood.

Renewable energy project currently possible, but still in investigation stage is copra oil for electricity generation.

Solar energy is the most accessible natural form of energy in the Cook Islands for the generation of electricity. Solar panels designed for this purpose are available on the market here. Solar panels for solar water heating are also available locally. For the Northern Group the average annual total sunshine hours is 2,580, averaging about 7 hours of clear sunshine and no cloud cover per day. For the Southern Group, the average annual total sunshine hours is less than that of the Northern Group, at 2,168, averaging about 5 hours of clear sunshine and no cloud cover per day. See Figure 3.0. Another renewable energy project currently in place for the Cook Islands is the Pukapuka Solar PV system. This system has supplied the islands electricity for the last ten years. Nassau Island also uses the same system but it now requires some maintenance and upgrading.

2.1.8 Minerals

2.1.8.1 Coral materials (silt, sand, gravel, cobbles and boulders)

Coral materials are an important resource to the islands of the Cook Islands. In the Northern Group, much of the sand is formed from broken corals that are subjected to the abrasion activity of the waves on the reef, on the reef flat and lagoon floors. The same natural process is also responsible for the formation of coral materials on the foreshore of the makatea islands. In Rarotonga and Aitutaki where the beaches are wider much of the sand is derived from the skeletons of the algae, halimeda.

Silt, sand, gravel, cobbles and boulders are very important building materials in the Cook Islands. Prior to the arrival of the Missionaries, these were used for the foundation of houses. Gravels in particular were used for paving the floors and exteriors of any kind of structure, such as, marae, roads and other important places.

The arrival of the Missionaries introduced the use of lime using cooked coral heads for building. Many old churches and houses of important people to the Church, at the time, were built of lime and coral materials. Since the time of the Missionaries until the mid 1990s much of the sand of the islands were removed from the beaches. In the early days, however, not as much material was removed in comparison. The arrival of machineries in the 1950s made sand mining a feature activity of the beach area. Sand and gravel were removed for community projects that included road making, construction of public buildings and water tanks, and other community projects.

Mining of the foreshore for coral materials still prevails in the outer islands of both the Northern and Southern Groups.

On Rarotonga now, no mining is allowed in the foreshore areas. Sand is obtained for construction from sand pits along the coastal ridge area as well as in areas just behind the coastal ridge.

2.1.8.2 Beaches

On the islands of Rarotonga and Aitutaki, particularly, beaches have become an important and valuable asset. The fine sandy beaches found on the leeward side of the islands of Rarotonga and Aitutaki provide the center of attraction to visitors to the two islands. On Rarotonga alone, there are 45 tourist accommodation places on the beach or having direct access to the beach. All of Aitutaki tourist accommodations have direct access to the beach area.

Beach areas are also important for protecting the lands behind them. With their graded nature and high porosity, the materials on the beach provide a medium for the wave's energy to be dissipated through.

On Rarotonga's north-to-east coastline, the beach material is much coarser reflecting the consistent and high-energy waves that prevail with the trade winds. On the leeward side the beaches are much wider and with sand that is finer. This part of the island also has wider lagoons.

In the Northern Group, the beaches on the ocean side are barriers where beach rocks have formed. These beach rocks have become the outer protective layer for the natural fresh water lenses or reservoirs that have formed on the old reef formation (limestone platforms). Refer to section 2.1.3.

2.2 Biodiversity features

2.2.1 Flora

2.2.1.1 Atoll communities

The vegetation of the Northern group is very special and dominated by typical atoll environment species. They are species that have developed in the tropical maritime conditions and so have features that enable them to survive as well as protect the land and provide for the people who live on these atolls. They have high salt-tolerant levels that help to keep the soil moist and support fauna and other flora that are important to the overall biodiversity of the atoll environment.

2.2.1.2 Makatea communities

The makatea community is an important plant community. Prior to the introduction of goats and pigs it is probably the only community whose vegetation composition has remained relatively unchanged by man since it was first settled. This is attributed mainly to its rugged nature. With the introduction of pigs and goats some species of herbs and ferns may have been lost. The makatea community has provided for the islands an important protective cover for crustacean species such as crabs that are important in the food chain of inshore fisheries. It also supports a huge supply of plant species that are used for housing construction, medicinal purposes, canoe building as well as general household uses. The makatea also support the survival of local bird species including the edible rupe or Pacific pigeon. On Mauke and Mitiaro the alyxia or maire (*Alyxia elliptica*) plant has provided an attractive earning for the local people. The four makatea islands of the Cook Islands, namely, Mangaia, Atiu, Mauke and Mitiaro, generally have similar vegetation species.

2.2.1.3 Coastal ridge communities

Coastal ridge species referred to here are those found on Aitutaki and Rarotonga. Some of them are also found on the makatea and atoll communities. Like the atoll and makatea communities, these species do not only hold the ground together, they are also an important part of the ecology of the coastal environment. For Aitutaki and Rarotonga, they contribute to the commercial value attributed to

the foreshore area of the two islands. Rarotonga's coastal ridge vegetation has been subjected to extensive alteration. Almost all of the species found are of a secondary and tertiary growth kind. This is also where a large number of species have been introduced and have become naturalized. Some remains of the original coastal ridge communities may be found on the reef islands or motu of the islands of Aitutaki and in the Muri Lagoon on Rarotonga.

Outside of the indigenous species list, a wide range of introduced weeds, herbs and grasses occur, including the irritating mimosa or tita pikikaa (*Mimosa pudica*).

2.2.1.4 Wetland communities

The wetland communities include species associated with swamplands and marshlands. Marshlands are those associated with lake environments as found in Mitiaro and the salt marshes of Aroko on Rarotonga and selected areas around Aitutaki, Rakahanga, Nassau, Pukapuka and Manihiki.

According to local knowledge, swampland vegetation cleans the water and traps fine silt that move through the wetlands. When wetlands are left in fallow, there is a build up in fine silt or mud. This provides a good foundation for the planting of the traditional staple food, taro. In areas where siltation has taken place, normally, other species that do not have the ability to filter while allowing the water to flow such as lawn-grass have taken over. This creates an imbalance in this natural drainage system thereby causing blockages that adversely affect the swamplands. Photograph 1.0 shows a typical wetland that has been subjected to siltation. The patches in the foreground showing signs of clay soil that originated from the sloping lands.



Photograph 1: Wetland on Atiu with taro plantations

The salt marshes of Aitutaki and Ngatangia village (Rarotonga) are important fish grow-up areas. It is widely accepted that these marshes provide shelter and safe hatchery conditions for important lagoon fish species.

2.2.1.5 Fernland communities

The fernlands are one of the most important plant communities on the islands of the Southern Group, particularly on Mangaia, Atiu, Mauke and Rarotonga. Fernlands are found on the lower and upper sloping lands of Rarotonga and in the interior plateaus and sloping lands of Atiu and Mangaia, as well as the interior escarpments of Mauke. It is widely understood that fernlands were the result of repeated burning of the original vegetation while the clearing of adjacent lands for planting has taken place in the past.

Fernlands have an important environmental function. They provide physical protection to the poor underlying soil of the upper sloping lands of the island, by intercepting and reducing the velocity of rain and retarding surface runoff so that infiltration is improved and runoff reduced.

Although burned frequently, fernlands have a fast regrowth rate¹⁶. For the past decade the forestry division of the Ministry of Agriculture have been carrying out trials to identify other valuable and suitable species that could be planted on fernlands and similar landform types. Other soil conservation measures involve the mass production of vetiver grass used to trap runoff soil into terraces.

In Rarotonga, there are landowners who are planning to and have constructed buildings on fernland areas. One of the major challenges concerning housing development on fernlands is the problem of fires because fernlands, when litter accumulates, are very prone to burning.

Fernland communities may be the best type of protection for these lower and upper sloping lands. The accacia mangium, originally introduced as fuel wood, and planted in fernland areas, is currently a pest on Mangaia, Atiu and part of Rarotonga.

2.2.1.6 Forests¹⁷

The forest community described in this section is found on the island of Rarotonga. The Rarotonga forest is a typical rainforest community and takes up 64% of the islands total land area. In this report, the forest community covers all the sloping land area of Rarotonga. Although much alteration has taken place, the rugged interior of the island still remains intact at present.

This area is very important as it supports and is where the island's water catchments are located. The forest vegetation provides cover and protection for the erosion prone soil that is prevalent on the sloping lands.

It is also expressed here, and described in Chapter 3 and 4, that sloping lands, especially on the north side of the island, have become a feature of developmental activities practices that have caused major land degradation on Rarotonga.

The slope community also supports a number of introduced species, which are strong colonizers, posing a great threat to the indigenous forest. These are described below in 2.2.1.7.

The second type of inland community is the Rarotonga cloud forest. The cloud forest contains the most restricted plant community on Rarotonga, and also contains most species unique to the Cook Islands as a whole. This community is situated at and above the altitude of 400 meters. The cloud forest covers

¹⁶ Forestry Development Expert, Mr. O Tangianau.

¹⁷ The information contained in this section requires reviewing and may have changed. The updated report on the biodiversity through the NBSAP cannot be located.

less than 3 percent of the total land area of Rarotonga. It supports nine species of flowering plants not found in other communities on Rarotonga. Four of these species are not found anywhere else in the world. Two spectacular-looking species endemic to Rarotonga are the Te Manga cytandra (*Cytandra lilliana*) and the Rarotonga sclerotheca (*Sclerotheca viridiflora*). Twelve ferns are restricted to the cloud forest and two of them are Rarotonga endemics.

2.2.1.7 Introduced Species

There are a large number of introduced species in the Cook Islands, mainly of the food plant and ornamental plant types, however, there are also a large number of plants introduced to improve soil for agricultural production. Such plant species include mimosa, Desmodium spp, kudzu (*Pueraria lbata*), the Brazilian lucern (*Stylosanthes guianensis*) and others. These leguminous plants have become widespread, particularly in the Southern Group, and are common along roadsides. Some species, for example the mimosa, have become unpopular weeds due to their prickly nature.

Other introduced weeds however have become a major concern and are considered to be a potential threat to the indigenous forest systems particularly on Rarotonga. The balloon vine (*Cardiospermum halicacabum*), balsam bear (*Momordica charantia*) and red passion fruit (*Passiflora rubra*) are three such weeds that almost always occur together. The balloon vine is only found on Rarotonga, (Wilder, 1930). In his publication on the flora of the Cook Islands, described the weed as only found in Avarua. Seventy years later this weed is found all over the island and is a feature of old neglected orange plantations. On the other islands the balsam bear and red passionfruit are common, especially on old and unattended plantations. The mile-a-minute (*Mikania micrantha*) is another commonly recognized weed, which has posed challenges for growers.

Another introduced weed from the post-European era is the sorghum or tarapi (*Sorghum bicolor*), commonly found on plantations.

Other invading and colonizing tree species are the cecropia or rau-maniota (*cecropia palmate*), and the African tulip or patiti-vai (*Spathodea campanulata*). The patiti-vai has a bright red-orange flower and is mainly found in the interior of Rarotonga. The rau-maniota are trees that are very destructive to the interior because of the way they cause large areas of land to be exposed every time a mature tree falls. This exposing of the inland soil provides the opportunity for noxious weeds to get into the interior. It also makes it easier for soil to be eroded. The java plum or pistat (*Syzygium cumini*) is widespread throughout the Southern Group. It is another large and fast-growing tree.

2.2.1.8 Species at risk

There are numerous species listed as endangered and they are mostly found on the island of Rarotonga¹⁸.

2.2.2 Fauna

There is very little known of the fauna of the Cook Islands especially from the point of view of species that indicator dramatic changes to an area. Traditional knowledge holders have indicated that the animals of the land are the first to react to changes about to take place or taking place. For example, the reason we have so many agricultural problems is that certain insects have increased in population quickly because extensive monoculture farming has increased their food source.

¹⁸ Refer to footnote 17.

The scarcity of land crabs or kara'i indicates long periods of dry weather. There is much more such local knowledge that is important in seeing the changes to land for better or worse that have not yet been collected. Unfortunately, the longer we ignore this knowledge, the harder it is because knowledge holders are nowadays usually old people.

The following description is therefore an attempt to describe the fauna of the Cook Islands and to fit the description into the context of land degradation.

2.2.2.1 Mammals

Terrestrial mammals are restricted to introduced species such as pigs, dogs and cats. The flying fruit bat or moakirikiri (*Pteropus tonganus*) is perhaps the most important terrestrial mammal found in the Cook Islands and is also referred to as the Tongan flying fox. The fruit bat is only found on Rarotonga and Mangaia and is referred to as a pest because they feed on fruit trees such as the coconut and the introduced kapok or mama'u (*Cieba pentandra*) as well as the rau-maniota. The rau-maniota is eaten by the moakirikiri, and has helped to spread this noxious weed in the interior. The effect of the rau-maniota is described in Section 2.2.1.7.

Although not considered of value, rats are also environmentally significant. The rats especially the 'kiore' (*Rattus exulans*) feed on the fruits of balloon vine, balsam bear and red passionfruit and the fruits of the rau maniota. They help to spread these noxious weeds that smother useful vegetation cover in the inland forests.

2.2.2.2 Crabs

The coconut crab or unga kaveu (*Birgus latro*) is regarded as a delicacy. The coconut crab is the largest land crab and is common on most islands but has become extremely scarce on islands with a significant human population.

Another threatened species is the banded prawn killer or varo (*Lyslosquilla maculata*). It is a burrower, found in the mudflats of Ootu on Aitutaki. This species is now very hard to find.

Crabs are very sensitive to changes in the environment. The 'tupa' (*Cardisoma carnifex*) common on Rarotonga, is a very hardy animal. It is a scavenger that lives in wetland areas especially where, groundwater flows out of the ground near streams and estuaries. In the old estuaries (now reclaimed land) the tupa still lives. It is another indicator of an environment that used to be a wetland. Too often, occupiers of such lands are not prepared when flooding occurs. At such times the tupa, which normally lives on very low ground will move to higher ground, an indication that major flooding is about to happen.

Coconut crabs are known to live in extremely dry and humid conditions. On Nassau, with their strict ra'ui system, coconut crabs live on coconut trees during the day and come down at night to feed.

Crabs or crustaceans in general are very important natural indicators and so they are used in the traditional moon calendar, or arapo. The middle of the first quarter, or the half waypoint between the first quarter and the marama-ou (new moon), is the time when all crustaceans start to accumulate their eggs under their belly or tail. From the marama-ou, they start to protect their eggs until spawning time during the marangi (full moon). Having knowledge of this will give machinery operators and major project planners an indication of the distance to the marangi which is when heavy (or flood) rain usually occurs.

2.2.2.3 Seabirds

Takutea and Suvarrow are the two main seabird-breeding islands in the Cook Islands. However, it is also common to see nests of some of these sea birds on the atolls of the Northern Group and on Aitutaki and Rarotonga.

Very little is known and recorded locally on the effect of land changes or climatic changes on seabirds, except that the lulu is very sensitive to human presence¹⁹. In discussing the matter with a member of the in-country PICCAP office, it seems likely that seabirds may be affected by changes in weather patterns. Most seabirds are found in the Northern Group where the Climate is quite different from that of the Southern Group. Increased La Nina in the north would mean a shift in the weather that is normal to the Northern Cook Islands. It is quite possible that the sea bird populations may be able to show us a lot about weather pattern changes. It is worth looking into.

2.2.2.4 Land birds

Like the seabirds, there is very little known at present about the behavior of land birds that might indicate weather condition changes.

There are four native land birds that are found living and breeding in small numbers in the inland mountains and bluffs of Rarotonga. With the exception of the myna, all these birds appear to be low in numbers.

The Indian myna or manu kavamani (*Acridotheres tristis*), an introduced species is the dominant land bird on the Southern Group islands. It was initially introduced to control stick insects, which were damaging coconut plantations during the early 1900s.

2.2.2.5 Species at risk

There are a number of species at risk in the Cook Islands. These include endemic species such as the much-publicized Rarotonga flycatcher and the less-known Mangaia Kingfisher. Other endemic species such as the Atiu swiftlet and the Rarotonga starling require urgent protection. Work on the coconut crabs of Suvarrow show there is a need to protect this important species as well.

2.3 Social Environment

2.3.1 Cultural Practices

2.3.1.1 Land use practices

Traditional practices are normally in the form of resource management and the way that people plant their crops. 'Ra'ui', a form of resource use management, is still being practiced in the Northern Group on coconut lands. In the case of Pukapuka and Nassau, there is ra'ui on most resources of the land. On Manihiki and Rakahanga, the ra'ui is less strict but still observed. As the population of those two islands are heavily dependent on imported foods, and local resources supplement these, the pressure on the ra'ui lands is less. Pulaka (similar to taro) is one such land crop that used to be managed under the ra'ui system but this is no longer the case because not many people eat pulaka now.

¹⁹ Gerald McCormack, 1991.



Photograph 2.0: Taro patches in a wetland area.

For Nassau and Pukapuka the use of the green leaves of trees, except for coconut fronds, to sustain soil fertility in the uwi lands is a very important practice. The belief is that green leaves have more nutrients in them and therefore are much valued. Leaves are also placed on ra'ui. It is common to see selected puka trees all stripped of their leaves.

In the planting of swampland taro, the construction of the taro patch is a practice whereby the planting area for taro is turned and the level is raised using a spade. Raising the normal water table allows growers to plant certain varieties of taro. The taro patch also allows the grower to sustain the nutrient level for each patch by burying any litter or vegetation in the patch each time the patch is turned over. This is commonly referred to as 'uri-pa'i'. This is a common practice in Rarotonga, Atiu, Mauke, Mitiaro, Mangaia, Pukapuka, Manihiki, Rakahanga and Nassau. See photographs 1.0 and 2.0. This practice also helps the water to flow properly, thereby maintaining the natural role of the wetland as a drainage system.

Where the water is flowing or made to flow, terraces are constructed and wetland taro is planted. In both types of taro planting the drainage of surface water is very important. Wetland taro is common in Mangaia and in the Valley's of Rarotonga.

Trees planted to signify land boundaries are also important. Normally boundaries are on ridges, or where the land topography changes. Currently the land, using the "theordolite" system, may have a boundary in the middle of a stream. Changes to the stream flow direction has often changed the shape of the land resulting in disputes between landowners.

There may have been more land use practices but these were not passed down through the generations and are no longer practiced or known.

2.3.1.2 Traditional Knowledge on land use practice

As described above, the planting of taro is a means to sustain the nutrient levels in the ground and to allow drainage of the area to flow properly.

The use of the traditional moon calendar, 'arapo', is a practice and knowledge that is not now widely used, except by growers who plant kumara and other root crops. The arapo, depending on the season, also indicates to the grower or fisherman those nights or moon phases suitable for certain other planting and fishing activities. For example, when preparing land for planting, this should be done prior to the full moon or the new moon. For a grower, his taro or vegetable or root crop has to be in the ground before the new moon. By the time the rain of the new moon or the full moon arrives, it helps the crop to grow. Whereas if it is planted at the time of the full moon and the new moon, crops could be flooded or too much water is received.

This practice is used in conjunction with the seasons. For example in the dry season, the rains of the new moon and full moon will be light. Major land clearing activities are carried out during the dry season as opposed to the wet season.

There is also the knowledge on the types of lands. In the old ways, the ancestors who have lived on the land know what sort of land they are living on. Therefore they also know how to use the land. If it is a land that is frequently flooded, they know how to live on it to make their life convenient instead of changing the land.

The knowledge on the types of land is sometimes heard in chants of families, but they are just chants that signify humor, nowadays, any other purpose has been mostly lost.

2.3.2 People features

2.3.2.1 Ethnic origin

The people of the Cook Islands are of the Polynesian race. Both the people of the Northern and Southern Group have the same origin. There are four languages in the Cook Islands²⁰, the Pukapuka, the Manhikian, Rarotongan and the English language.

The people of the Cook Islands are Maori and share a bond and culture with the indigenous people of French Polynesia and New Zealand. Cook Islanders are also citizens of New Zealand.

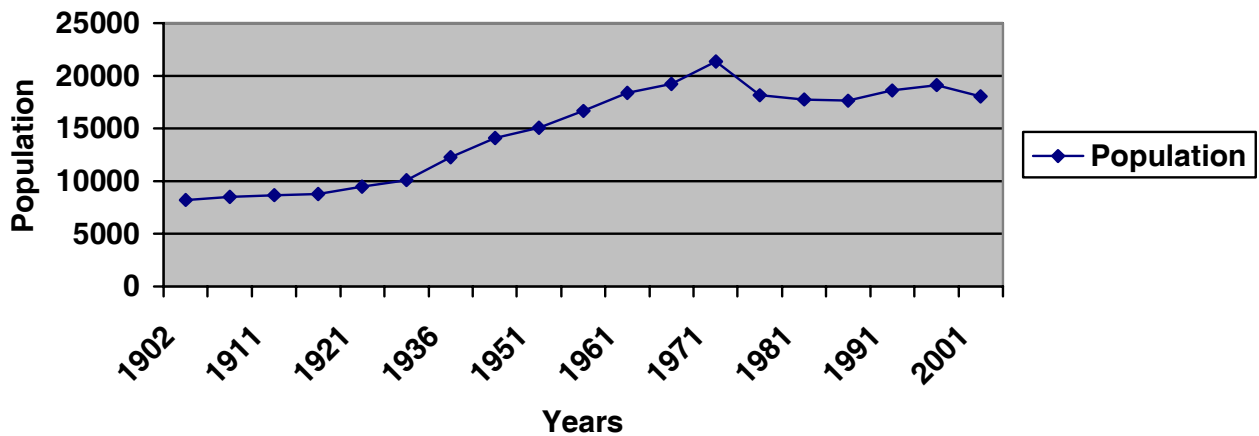
2.3.2.2 Population

In the 2001 census²¹, the population of the Cook Islands was recorded at 18,027. Of this number 10.1% lived in the Northern Group and 89.9% in the Southern Group, with 67.7% of the Southern Group population living on Rarotonga.

²⁰ Tingika Elikana

²¹ Provisional

Figure 4.0: Population trend in the Cook Islands



The population of the Cook Islands had experienced steady growth from a population of 8,213 in 1902 until it peaked in 1971 at 21,323. Census figures of 1991 showed that, for the first time since 1971, that the population increased by 5.55%, bringing the population number to 18,552. This increase peaked in 1996, when the population was at 19,103.

The 2001 figures, however, marked a decrease in the population by 5.6% after 1996. All of the islands except Rarotonga experienced a population decline when compared to the 1996 census. The Southern group islands decreased by 26.2%, with Atiu Island decreasing to almost 35% followed by Mangaia which decreased by 32.8%. The Northern Group islands also faced a population decline of 25.9% with Penryhn Island experiencing the biggest decline of 41.1%.

2.3.3 Economic features

The economy of the Cook Islands continues to recover from the traumatic period of financial and economic crisis of the mid 1990s. The combination of economic recovery and modest decline in the total population of the Cook Islands shows an increase in per capita GDP²². GDP per capita income growth is commonly seen as a necessary, if not, efficient statistics for indicating the quality of life of a nation's people.²³

The economy of the Cook Islands is unfortunately characterized by a very large number of imports and proportionally a very small number of exports. Initially an economy dominated by the primary sector and focusing on agriculture, fisheries and quarrying, it has now moved towards a service-orientated economy to cater to the demands of tourism.

Tourism is the major industry of the Cook Islands with the current annual average of 60,000 visitors. The pearl industry of the Northern Group however has become the second major industry and has been steadily increasing since 1985.

2.3.3.1 Government Development Policy

²² Cook Islands Budget Policy Statement 2002/2003

²³ Cook Islands Budget Policy Statement 2002/2003

Government's development policy is reflected in its budget statement for 2002/2003. The policy basically attempts to create opportunities, whereby the community can have direct participation in the decision-making process regarding important national challenges. To do this, government proposes to revive the National Development Council and have more sector orientated policy discussions.

In the Budget policy it recognizes that "our people, every one of them, constitute our most important resource." Further, the policy recognizes the growth generating role of the private sector, greater emphasis on lifting the standards of both health and education services and it also recognizes the right of every individual to a good life.

Having stated the above, the Government, Coalition IV, will focus its 2002/03-budget allocation on the following areas and is strongly committed to promoting the following national outcomes:

- Social cohesion
- Economic sustainability
- Good Governance
- Infrastructure Development
- Sister Islands Development
- Environmental Management

2.3.3.2 Sectoral Growth

2.3.3.2.1 Tourism²⁴

Cook Islands tourism is young by international standards only starting 27 years ago with the opening of the Rarotonga international airport.

The tourism industry has led the growth of the Cook Islands economy for the past 20 years with an average growth in visitor arrivals for the period 1987 to 2000 of 6.3% well above the global average growth for international tourism of 4.5%. Tourism contribution to GDP for the same period has increased from 27% to 51% clearly reflecting its importance to the economy. Tourism revenues have grown in nominal terms from \$20million in 1997 to over \$81million in 2000. The Cook Islands tourism industry still looked good until September 11 2001.

Tourism is spread over the Southern Cook Islands but centres mostly on Aitutaki and Rarotonga. While tourism growth has been limited by basic and minimal support services in those islands there is still a growing interest in developing and expanding tourism to all islands of the Cook Islands.

2.3.3.2.2 Marine Resources

Pearl Farming

Black Lip Pearl Culture was first recognised in the 1950's. Through research into spat collections locally owned farms started in Manihiki in 1986. This was followed by Penryhn and Rakahanga, which started farming in the early 90's. In this regard the Cook Islands pearl industry is relatively young having been established only 20 years ago. Today there are 2 communally owned farms in Rakahanga, approximately 150 farms in Manihiki and 50 farms in Penryhn.

²⁴ Taken from the presentation by Chris Wng, Director of Tourism Corporation during the WSSD Conference in April 2002.

The Cook Islands pearls contributed to NZ\$14.5million in exports representing 90% of total value of exports for 2001. The domestic market value has been placed at approximately NZ\$600,000. The economic sustainability of the pearl industry will hinge on Government adopting a strategic development and environment plan for the lagoons of Manihiki, Penryhn and Rakahanga and the development of a strategic marketing plan as well as quality control of pearls.

Other Marine Resources activities:

Other activities of marine resources development identified were: giant clams, fresh water prawns, milkfish, seaweed and trochus.

Marine baseline studies

In support of the continued marine resources development and monitoring of the Cook Islands inshore fisheries, the Ministry of Marine Resources together with the Environment Service have initiated baseline studies on the reefs of Rarotonga, Rakahanga, Manihiki, Palmerston, Nassau and Mitiaro. Government funded the Rarotonga survey while the New Zealand Government, under its NZODA programs funded the others.

2.3.3.2.3 Agriculture

There are three main export products from the Cook Islands with the nono (*Morianda citrifolia*) being the new trend and having expanded to being harvested from the outer island's naturally grown stock. Generally, export products from the agricultural sector have declined in the last ten years. Pawpaw exports in 2000 brought in NZD350, 000 compared to a peak of NZD1.5 million in 1993. Maire (*Alyxia elliptica*) exports to Hawaii continue though production has dropped to less than NZD50, 000.00 in 2000 compared to NZD200, 000.00 in 1994. Maire export has expanded to include Mangaia and Mitiaro.

Approximately NZD20million worth of fresh and processed foodstuff is imported into the Cook Islands annually; about 2 tons of fruit and vegetables are imported from New Zealand on a weekly basis²⁵.

²⁵ Helen Wong's draft WSSD reports.

Chapter 3 Land degradation challenges in the Cook Islands

3.1 Land and land management

3.1.1 Land Tenure

3.1.1.1 Current situation

Multiple ownership - The lands of the Cook Islands belong to the native inhabitants of each Island.

Land administration is carried out through the procedures of the land court for most of the islands with the islands of Mangaia, Mitiaro, Nassau and Pukapuka still under customary control.

All members of the family inherit customary lands unilaterally; this has resulted in large numbers of people having ownership to a small section of land. This is known as multiple-ownership and has resulted in land titles becoming extremely fragmented.

Freehold lands are lands owned by one or more individuals. This has allowed individuals to develop land as well as groups of the extended family to develop large areas of land for commercial purposes. This is described in Section 2.1.5.2.

Absentee ownership – This is where a lot of landowners that have been allocated land through occupation right have left the country or have moved from one island to another.

3.1.1.2 Challenges

Many people own land and lands are parceled in small areas where individual owners have the right to change the land anyway they want to. As a result, there is a lot of property development whereby the activities of one landowner affect the next. This has created degradation along the foreshore or coastal ridges; reclaiming of the wetlands affecting the drainage network that drains the sloping lands and watershed areas and the low-lying areas behind the coastal ridges; as well as the erosion of sloping lands thereby causing drainage blockages in streams and stream mouths.

3.1.1.3 Causes

There are two issues that need to be addressed. The first is the issue of family-ties and the inter-relationships between families of each Ngati. This issue of family-ties has made it difficult for family members to take land whose owners have been absent from the Cook Islands for more than a generation. The highly limited land area available has caused problems for those who have stayed.

The second issue regards the squabbling of landowners amongst themselves when developing a piece of land. Parcels of land are allocated and boundaries are surveyed and made legal in the Land Court. The owner of each parcel of land remains within the legal boundaries approved by the Court. As such, he/she has the right to use the land in any way he/she likes. The only system to address this issue is through an expensive process with the Court involving lawyers. This discourages people from addressing problems through the courts..

3.1.2 Inadequate land

3.1.2.1 Current Situation

The situation with land availability is described in Chapter 2.0. It is expressed here that the challenge is to address land management issues. Normally, land identified as significant for any public purposes is acquired by warrant or by lease. During the colonial era and the early years of self-government, small areas of land were acquired (by the Crown) for public purpose by warrant under the Cook Islands Act of 1915. Crown lands are used for public purposes other than conservation. Suwarrow atoll is the only island declared for conservation at the national level in the Cook Islands. Takutea Reserve, for the protection of a seabird sanctuary, is under the control of the people of Atiu.

3.1.2.2 Challenges

It is very difficult to protect lands that are environmentally sensitive such as, water catchment areas; forests and sloping lands; erosion prone areas; areas of archaeological and historical value; areas of recreational value and areas for the proper disposal of waste. There is a need to acquire adequate land suitable for the aeration and drying of septic tank contents, which are normally spread over agricultural lands. The sites for the Rarotonga and Aitutaki Landfill and seepage pond took many years to establish.

In the last ten years the Cook Islands Government has engaged in using solid waste management methods such as to fill low lying wetlands. Most of these wetland areas are used for taro crops. Other than taro cropping, wetland areas play an important role in the natural drainage of the sloping lands of Rarotonga, Mangaia, Atiu, Mauke and Aitutaki.

To date the Takitumu Conservation Area, identified to protect the endangered Rarotonga Flycatcher, has yet to be formally declared as a reserve or a national park.

3.1.2.3 Causes

Multiple land ownership has made the implementation of any organized land management system very difficult. It is believed that the involvement and support of landowners would make establishing areas and enforcing management procedures easier if the intent of the establishment were clearly understood and appreciated.

With the changing lifestyle in the outer islands and increasing dependency on imported foods, like Rarotonga, they face the problem of limited suitable land for waste disposal and for residential purpose, and have therefore extended land usage to environmentally sensitive lands such as the wetlands, foreshore and makatea areas. In the case of Rarotonga this move has caused adjacent lands and properties to these sensitive areas to be flooded, eroded, and damaged.

3.3 Improper land development

3.3.1. Current Situation

Improper land development is on the increase because of the increasing number of foreign investments into the Cook Islands. Rarotonga, being the capital of the Cook Island with an international communication and transport system, an attractive tropical environment and an open Government investment policy, has caused pressure to the limited land available for such uses as, residential, commercial, agricultural, infrastructure and recreation.

For Rarotonga the population increased by 8.7%. This increase is related to the growth in the tourism industry.

As a result of the influx of people to Rarotonga, the easier to develop and more accessible lands on flat grounds and near the foreshore have become in demand and therefore have become valuable. It has also become a trend where foreign investors, as part of their development plan, become residents on the island. According to Cook Islands Development and Investment Board, for the last 12 months, the Board has approved three applications in respect of tourist accommodation for existing businesses on Rarotonga. A third application for existing investors to purchase land for residential purpose was approved for Rarotonga. In the previous 12 months the Board approved 12 registrations, three existing businesses and eight new businesses.

Local landowners already pressured financially are taking this situation as an opportunity to sell the leases of their properties to make some money or pay bank loans. Also, as the lifestyle on the main island of Rarotonga has become heavily commercialized and dependent on the money system, properties of local people that were developed using borrowed money from the banks, became saleable assets as they become unable to make the repayments. During the year ending 2000, the banks advertised for sale over 18 acres of land on Rarotonga (acres in total) alone. This trend continues.

Tourism has become the number one industry of the Cook Islands with an average growth in visitor arrivals for the period 1987 to 2000 of 6.3% well above the global average growth for international tourism of 4.5%. Tourism contribution to GDP for the same period has increased from 27% to 51% clearly reflecting its importance to the economy.

3.3.2 Challenges

3.3.2.1 Foreshore development



Photograph 3.0: Rock revetments in the background has resulted in the degradation of adjacent properties.

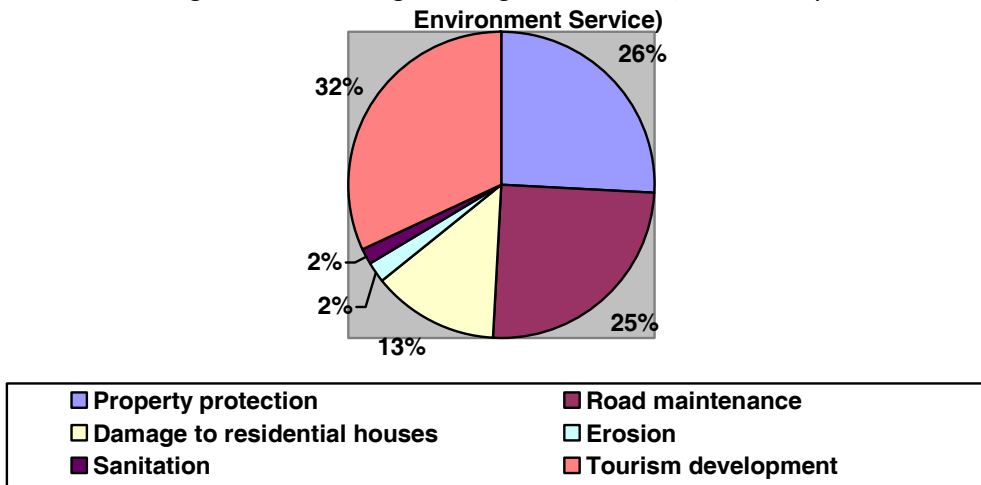
Tourism development has focused on the development of the foreshore, 63.8% of the foreshore’s problems are to do with the construction of tourist facilities and the protection of property; including tourist facilities. Because coastal processes are dynamic, damage to the land, affecting coastal roads along with the public infrastructure system as well as other properties has become a feature of the Rarotonga foreshore area. This accounts for 13% of the erosional damage to residential properties adjacent to a tourist development or adjacent to a tourist related property.

Building too close to the sea; completely clearing natural vegetation and the replacing it with ornamental species not well suited to the environment as well as the disposal of liquid waste are three issues associated with tourism development; that are contributing greatly to growing land degradation problems in the Cook Islands, especially on Rarotonga and Aitutaki.

On the outer islands, especially in the Northern Group, mining of the beaches still continues.

Figure 5.0 shows a list of the main problems facing the foreshore areas of Rarotonga.

Figure 5.0: Challenges facing the foreshore, 1997-2001 (Source:



3.3.2.2 Flooding of low-lying areas



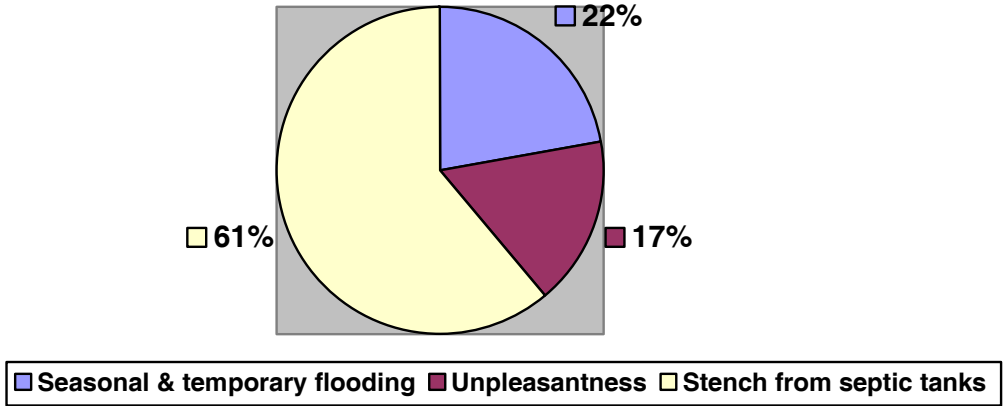
Photograph 4.0: Floodwaters may remain for days after a flood.

Flooding occurs during the wet season (November through to April) of each year. This is a natural occurrence and the debris discharged onto the wetland areas from the sloping lands has caused the natural drainage systems to be blocked and ineffective. 61% of the problems on the wetlands are caused through the inability of the drainage systems to cope with the siltation and debris. This affects the settled areas and places where tourism has become a feature.

The presence of large volumes of stagnant water increases breeding areas for mosquitoes and as the water remains stagnant it becomes unhealthy and smelly until it subsides.

The outer islands of Mangaia, Atiu, Mauke, Rakahanga, Manihiki, Pukapuka and Nassau all have this same problem, however, the most affected lands are those that only have taro plantations on them. There are no housing developments on these wetland areas. The effect to them is mainly through the loss of taro crops. A recent landslide in Mangaia’s major taro planting valley has totally destroyed the taro plantations of a village. Figure 6.0 shows a list of the main issues in the wetlands for Rarotonga.

Figure 6.0: Challenges facing the wetlands (Source: Environment Service)



For Rarotonga there is also the risk of sewage contamination while residential areas are partially under water.

3.3.2.3 Sloping land developments

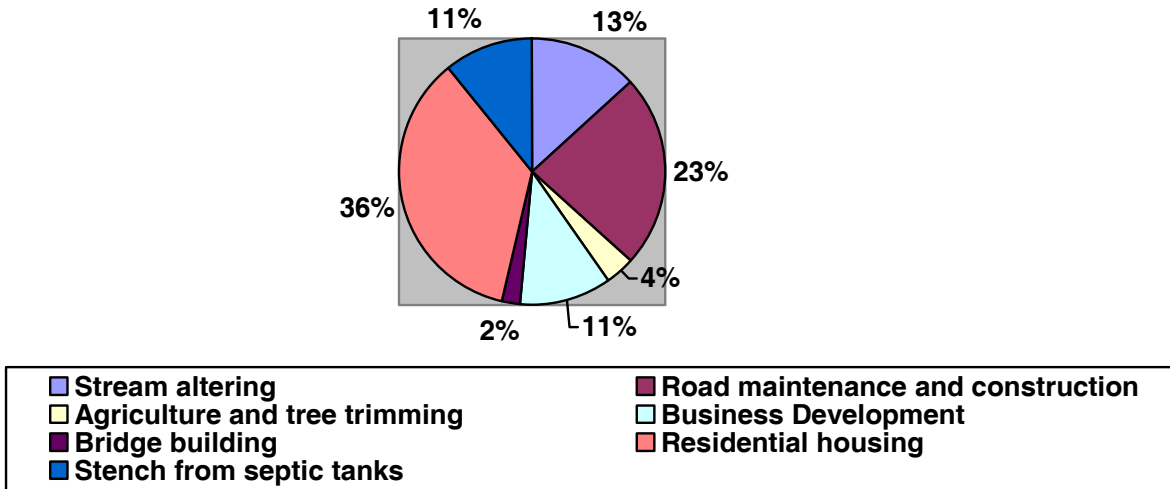


Photograph 5.0: A typical work site on sloping lands.

With the value of flat and accessible lands becoming higher, the local population has looked at the sloping lands as an alternative area to build their homes on. This has resulted in an increase in the number of improperly developed lands on the sloping lands areas. Problems areas associated with this development are: complete clearing of parcels of land; the lack of engineers to supervise the excavation and clearing of lands; and the construction of access ways. This situation has also resulted in an increase in

surface water runoff in turn increases siltation and the loss of soil from sloping lands; the invasion of the inland forest by noxious weeds and there has also been the problem of the improper construction of septic tank systems. Refer to figure 7.0 below.

Figure 7.0: Challenges facing the sloping lands (Source: Environment Service)



3.3.3 Causes

3.3.3.1 Foreshore development



Photograph 5.0: Land preparation on the foreshore area

Because of the small size of the islands, especially the two islands that have emphasized tourism development activities, all the known accommodations are either on the foreshore or have direct access to the foreshore. On Rarotonga alone there are 45 known tourism accommodation places around the coastal rim of the island. Of these 84% are actually located on the foreshore (and extend to the legal land boundary of the mean high water mark) and the other 16% have direct access to the foreshore. There are also the non-accommodation Tourist commercial activities that have access to this area such as the diving businesses, sailing clubs and tour operators for both land and sea tours.

Property development and protection structures along this area have increased dramatically in number over the last five years. In total, between 1997 and the end of 2001, 24.85 acres of foreshore land has had buildings and/or protection structures constructed on it

Over this period, despite the fragile nature of this area, 71.6% of the buildings constructed have had concrete foundations and concrete floors²⁶.

During this period also there has been an increase in the number of buildings constructed after the economic crisis of 1996. The increase is attributed mainly to an increase in the number of visitors mainly for budget type accommodations and also for the existing resorts expanding their premises²⁷. The foreshore area in the outer island of the Cook Islands is different from that of Rarotonga and Aitutaki. As described in Chapter 2 (Section 2.1.3), the geology of the islands makes that difference.

The makatea islands is surrounded by the uruatete therefore, foreshore in the sense of land degradation, focuses on the challenges of the loss of sand and gravel from sea level changes (i.e. rising sea level) that will result in coastal erosion. As the people of the outer islands change in terms of their life style, a shift from the coconut frond and pandanus thatch roof housing to western style concrete and imported timber, the mining of coastal resources become increasingly important. With the exception of the islands of Mitiaro and Nassau, all of the other islands no longer use the old style housing. On Mitiaro and Nassau, these old style housing are still in use but decreasing.



Photograph 6.0: A typical sand pit in the outer islands

²⁶ Building Inspector Files

²⁷ Comments made by Tourism Corporation representative at the WSSD conference in April 2002.

For the Northern Group, coastal resources are equally important to them for housing and construction purposes. Like the makatea islands, a change in the sea level and increasing frequency of cyclones will affect this very important resource. As mentioned above, in Penryhn, people reclaim onto the shallow lagoon area using their household rubbish. This gives protection to the more established lands where the coconut and fano trees grow. As also described in Chapter 2, the geology of these atolls makes it susceptible to major climate changes that change the sea level. The challenge therefore is how to adapt to the effects of climate change, or of course, to somehow halt the sea level rise.

3.3.3.2 Flooding of low-lying areas

For a small island like Rarotonga where land is inherently scarce and this geologic feature, the wetlands, having the special function of providing a medium for filtering contaminated water, there is becoming less and less land available to perform this natural function. It is significant to note that, wetlands continue to be altered through the construction of more buildings.



Photograph 7.0: Reclaiming and filling in of a wetland area on Rarotonga

Like the foreshore areas, a large number of the homes built (87.5%) on the wetlands have concrete floors. Where these buildings were erected the area was either filled to the level of that structure or elevated to a height above normal flood levels. See Photograph 7.0.

For the islands of Atiu, Mangaia and Mauke, the extensive cultivation of the sloping lands during the pineapple era for Mangaia and Atiu, and for Mauke during the planting of ginger and constant burning of fern land escarpments, much of the silt that was eroded by surface water runoff has blocked the underground water outlets through the makatea. Photograph 8.0 below and 9.0 shows a typical pineapple plantation and a classic erosion feature respectively.



Photograph 8.0: A typical pineapple land on the interior of the makatea islands of Atiu and Mangaia.

Consequently, the land became harder to cultivate as clay silt made the soil harder to cultivate. Where possible for example, in Mangaia, the silt is being piled up manually to form the banks of wetland land taro terraces. On Mauke and Atiu, dry land taro patches replace the wetland taro, this is a way also to improve the soil as described in Chapter 2 and illustrated in Photographs 1.0. and 2.0.

It is understood that during the banana era, Aitutaki growers used to clean their equipments used for spraying the plantations in the wetlands and at the stream outlet at Nikaupara.

For Manihiki, the wetlands of Porea and Te Puka are important milkfish breeding areas as well.

3.3.3.3 Sloping land developments

3.3.2.1 Rarotonga

For Rarotonga, the increasing number of activities taking place on the sloping lands has caused the challenges described in 3.3.2.3 to arise. These activities are described below:

Water Intake development - Water intake development takes the form of maintenance of access ways; gravel filter system repairs; and the collection of data such as those from rain gauge and water flow meters. These are required to monitor and predict water level changes. Tourist operators and the general public cause the water intakes to be regularly maintained in order to have use of these access ways.

At times, replacement of filter components are required. This is usually because of large discharges that occur during the times of flash floods.

Tourism - With the increasing number of visitors, especially the back-packers type, the cross-island track through the centre of the island, the Takitumu Conservation Area, and Pa's trekking tours through the various inland tracks provides a busy usage of the sloping lands of Rarotonga.

The most significant of this type of use is the Raro Mountain Safari Tours. This operation uses vehicles to access the interior of the island, fern lands (forested by the Forestry Program) near the

hospital, the eastern heights of the Muri area and the water intakes of Wigmore falls, as the outstanding tour sites.

Agriculture - The use by local people of this area is mostly limited to planting in the lower foothills.

As a result of the development of water intakes a large area of the wetland taro has been abandoned in the valleys of Rarotonga where streambeds have dried up.

In the development of properties on the slope lands, especially on the lower foothills, many access ways have had to be put in place for the electrical power supply, water and the telephone networks to reach homes and other properties.

Transportation services - Landowners have privately developed much of the transportation network, other than those parts that were developed by Government to access water intakes. Government has assisted in the improvement of roads to privately owned properties where at least ten proposals were received or else after an area has been developed. Once at least ten landowners have applied for transportation services, Government will develop and maintain those services. This is a common policy for both the electrical and telecom services also. For telephone services trenching is usually carried out privately with cables provided by telecom Cook Islands.

During the repair work by Water works much unearthing is done to allow water supply pipes to be installed. Normally the trench is dug at approximately one meter deep and 0.6 meters wide. For each trench, 0.1 meter of sand is used to buffer the cable from gravel that may damage the pipes when covered. Because of the scarcity of coral sand, other alternatives to sand have been investigated but so far the options have been found to be too expensive to use.

Property development - Although expensive to develop, sloping lands have proven to be very attractive areas on the island of Rarotonga. The scenic views, whether they are ocean or forested peaks or valley, have attracted people to live on the sloping lands. A few people have developed properties on higher lands.

Building inspector files shows that over the past five years, 21 acres of sloping lands have been subjected to some kind of development. Despite the difficulty in accessing and the expense of building in this area, Building Controller's figures shows that 57% of the buildings constructed have concrete foundations and floor. The other 43% were constructed with wooden floors on poles. Over the last five years however there has been an increase in the number of houses built with wooden floors²⁸.

During the interval 1997 to 2001 there has been an increase in the number of buildings constructed on sloping areas. This has picked up markedly from 1999. There is speculation that this trend is mainly due to mortgage sales of properties to foreigners who have bought homes and have become involved in business ventures, particularly in the tourism industry.

It is worth mentioning here that for each new house and most extensions in the sloping lands area, a septic tank was also constructed. The Public Health Department now recommends the three-chamber septic tank.

Agricultural activities on the sloping lands are restricted to the foothills. Clearing of land for agricultural purposes involves the use of tractors to cut and slash and then ploughing to obtain the right

²⁸ Building Inspector Files.

soil texture for planting. By observation, more lands are being prepared on the lower foothills for nono planting.

For the islands of Atiu and Mangaia, extensive soil erosion began and became a feature of these islands during the pineapple planting times of the early 70s. This is described in Chapter 2, Section 2.1.4.2.



Photograph 9.0: Now a typical feature on Atiu and Mangaia.

Extensive erosion of the sloping lands has a drastic effect on the wetland taro planting areas of Mangaia and Atiu. This is made worse with the frequent burning of the fernlands on these islands.

For Aitutaki, the bulldozing of topsoil is one of the outcomes of heavy machinery use, which has become a feature of those outer islands closer to Rarotonga. There is no proper training for operators except to get the work done and have all the vegetation cleared so that planting or construction can begin.

3.4 Invasive & Alien species

3.4.1 Current Situation

Invasive species are described in Chapter 2 and contained under in section 2.2.1.7 (as in “introduced species”) for the plant species and 2.2.2.1 for animal species, excluding man.

3.4.2 Challenges

On Rarotonga, those species described in Section 2.2.17 have invaded agricultural lands and have made the cultivators not continue with the use of their land or have made them extensively use herbicide chemicals that have placed other aspects of the environment under threat.

In the case of the more vigorous plant species, such as the mile-a-minute and the balloon vine, they destroy indigenous species by smothering them and covering them disallowing the plants to have full access to sunlight. Photograph 10.0 illustrates this point.

As described in Section 2.2.1.7, the rau-maniota is very destructive to the soils of the inland forests of Rarotonga by opening up a large area of the forest every time one tree falls over. It also provides the opportunity for balloon vines and mile-a-minute to colonize large areas. On Aitutaki, the giant mimosa has for years prevented lands from being cultivated. The prickly weed is a fast growing and spreads very quickly.



Photograph 10.0: Cleared forest area with extensive balloon coverage.

3.5.2 Causes

The transfer of alien species through the use of earth moving machineries is very common. On Aitutaki where special attention was placed on the amount of land being affected by the Giant Mimosa, this problem was identified and a plan of action was put in place.

As for the weeds, such as the tita pikikaa, its presence usually means the land needs extensive work or crops cannot be grown without difficulty. Other species, such as the balloon vine, balsam pear and mile-a-minute, stop natural and more useful vegetation from establishing cover. The rau-maniota opens up the ground and causes small landslides especially near any creek or stream causing more soil and land loss. The spread of the rau-maniota in the forest of Rarotonga is aided by moakirikiri (bats) that feed on its fruits.

There are also the various species of rats described in Section 2.2.2.1 that spread balsam pear and red passion fruit on agricultural lands, as well as in areas in the interior, stunting the growth of indigenous trees species such as mato.

3.5 Population changes

3.5.1 Current Situation

The population of the Cook Islands is described in Section 2.3.2.2. Of great importance to this section is the decrease in the outer islands population and the increase in Rarotonga's population caused by tourist foreign investment activities. The later is described under section 3.3.

3.5.1 Challenges

Vast areas of wetland taro on the islands of Mangaia and Atiu are being left uncultivated. There are increasing acres of land that are now being colonized by lawn grass and other invasive species. The silt clay build up in the wetlands has blocked drainages and made digging of taro patches more difficult. On Rarotonga, there is increasing pressure on environmentally sensitive areas for residential and commercial developmental activities. These have been described under section 3.3.

3.5.2 Causes

The increase in the population of Rarotonga is attributed to the open investment policy of the Cook Islands Government and the avenues provided by the money system that allow foreigners to cheaply and easily buy leases increasing in investment activities and also the resident population.

For the outer islands, the cause of this decline is not quite clear. However, it is widely accepted that Cook Islanders like people of other countries, migrate to look for opportunities that best suit their abilities and potentials.

3.6 Climatic variability

3.6.1 Current Situation

The climate of the Cook Islands is described in Chapter 2 under section 2.1.2.

3.6.1.1 Challenges

The protection and preservation of the Cook Islands environment (physical environment and biodiversity) is vital to the existence of the people of the Cook Islands. The linkages in the physical and living environment that compliment their existence must be preserved. Although more than 70% of the lands of the Cook Islands are currently unaffected by human activities, the preservation of this portion of lands is vital in sustaining the linkages that sustain a balanced ecosystem.

For example, the crabs (some species) live in the makatea under the cover of the makatea vegetation; when it is māurangi (full moon), they migrate to the coast to spawn. The lagoon and reef fish come closer to feed on the millions of young crab hatchlings. People catch the fish for their families or sell them and contribute to the money system.

Another example: the coastal features of some of the Northern Group atolls, the beach rock that provides protection for the underground water reservoirs that sustain the existence of people on those islands. Increased erosion due to climate change will be accelerated beyond the rate that the beach rock forming processes will be able to cope with.

Another example: there is so much not known about the flora and fauna other than their physical appearance. These are species that have developed in the tropical environment that have remained this way for a long time. A change of the weather patterns which results in the La Nina effects in the Northern Group will certainly affect the flora and fauna on those islands. Not enough is known about these species at present to enable us to gauge potential effects from changes to the environment. On Nassau Island, the people have expressed that they have to weed more now than any living person can remember.

The increasing number of dengue cases from a particular species of mosquitoes or the cases of ringworms (tanea) are other examples of the challenges caused by climatic variations.

3.6.1.2 Causes

As a result of differing proximity to the equator and trade wind convergence zones, contrasts in seasonal climatic conditions are seen between the Northern and Southern Groups, especially in terms of impacts of the El Nino and La Nina phenomenon and possibly the Pacific Decadal Oscillation. Rarotonga's distinctive high volcanic mountains create local orographic effects, while the lower lying islands are largely affected by the southeasterly trade winds.

The occurrence of cyclones tend to be more frequent during the El Nino Southern Oscillation (ENSO) when the warmer than usual sea surface temperatures are found between latitudes 10 – 15° S. During the ENSO, droughts with up to 60% rainfall reduction are more common in the Southern Cook Islands, while the Northern Cook Islands experience up to 200% rainfall increases. La Nina periods are associated with resulting expensive property and crop damage from surface water floods in the coastal plains of Rarotonga, contrasting with fresh water rationing and airlift supplies being required in the Northern Group. Mangaia, the southern most island of the Cook Islands, has experienced a five-year drought even while Rarotonga has experienced La Nina floods, which is perhaps part of a longer scale circumstance such as the Pacific Decadal Oscillation. The cause of this situation is unknown but is suspected to be associated with the global change in climate.

3.7 Ignoring of traditional knowledge and practices (tkp)

3.7.1 Current Situation

Traditional land use and traditional knowledge referred to as tkp is described in Chapter 2 under section 2.3.1. Other descriptions are also given throughout this document.

It is expressed here that traditional knowledge is not recorded in Maori but in English. The danger, of this type of recording is that the recorder does not understand the diverse base from which the knowledge being recorded came about. Hence, it is common to read about tkp written in English or translated back into Maori and it lacks depth and often it doesn't make sense either.

3.7.1 Challenges

Having expressed some of the aspects of the environment that may be affected by climatic variations in Section 3.6, there are a number of challenges facing land degradation as a result of taking the tkp seriously in the Cook Islands. These are:

- Understanding the language of the knowledge holder
- Collecting the knowledge on biodiversity as indicators
- Reliable traditional knowledge
- Having access to places where knowledge is known and practiced
- Lack of recognition by Government of traditional knowledge and traditional practices.

3.7.2 Causes

Traditional knowledge and practices has given way to faster, short term modern machinery and imported technology. Traditionally, crops are planted where particular species grew naturally. Prior to Missionary contact land development was site specific. Water wells were developed where there is water; banana and taro crops were planted where they naturally grew. Houses were constructed on elevated areas and away from areas where flooding and sea surge inundation takes place.

Of the traditional knowledge and practices remaining those relevant to fishing have been maintained. However, those relating to land use have been forgotten and/or ignored.

Chapter 4 What are the mitigating measures applied to land degradation challenges?

4.1 Government Development policies

4.1.1 Sectoral policies (Collective, over the past ten years)

Government in the past has supported programs of various Ministries to combat land degradation in the Cook Islands. These programs stemmed from developmental policies, which were transmitted into action by the various Ministries. Such policies were:

- ✓ Development of forestry on the Islands of Rarotonga, Mangaia and Atiu (MOA)
- ✓ Assistance to growers on taro production in the outer islands (MOA)
- ✓ Setting up of the Land Commission enquiry to investigate the challenges regarding the current land tenure (Justice Department)
- ✓ Sustainable development in the Tourism Industry (Tourism Cook Islands)
- ✓ Support to the Conservation of national resources of the Cook Islands (TT)
- ✓ Improved infrastructure and associated services (MOW)
- ✓ Continual support to the Ministry of Education through a sector review and implementation of findings. (MOE)
- ✓ Continual support to the Ministry of Health through sector review and implementation of findings (MOH)
- ✓ The reform policies of 1996 that saw the creation and approval of the MFEM Act, PERCA Act and Public Service Commission Act. All designed to achieve accountability. (MFEM)
- ✓ The commissioning of a report on political reform. (PMs Office)

4.1.2 Activities from Sectoral Policies

These developmental policies formed the basis for a number of activities that are directly linked to land degradation, these were:

Jointly funded by NZODA and CIG, the Forestry program for Rarotonga, Mangaia, Atiu and Mauke. Other agencies such as FAO and volunteer organisations were involved such as UNV. This commenced in 1989.

- Outer islands programs to combat land degradation on Mangaia, Atiu and Mauke. (MOA)

FAO funded soil rehabilitation and legislation review. This project was applied to Aitutaki, Mangaia, Mauke and Rarotonga, 1992.

- Policy formulation and drafting of the EIA provision that was refined and included in the Rarotonga Environment Act (REA) 1994-95 (MOA and TT)

ADB funded National Environment Strategy and the establishment of the National Taskforce on Environment and Development.

- EIA guidelines for the Cook Islands (complemented the REA) (TT and PMs Office)

UNDP and SPREP funded Island Environment Plans for Penryhn, Mangaia, Mauke and Aitutaki which continued to produce environmental plans, policy instructions for an Environmental bylaw, and then a draft Resource Management Bylaw for the islands of Aitutaki, Mangaia and Mauke, 1997.

- Draft Bylaws for Mangaia, Mauke, Aitutaki (TT)
- Policy formulation, drafting and enactment of the Rakahanga Bylaw (TT)

NZODA funded Environmental impact assessment project to establish the EIA program of the Tu'anga Taporoporo and the preparation of EIA guidelines, 1998.

- Establishment of the EIA process (TT)
- Establishment of the approval by consent form (TT).

USEPA/? Funded Sectoral training program for Senior Government Officials involved in project planning, 1994.

- Training of EIA staff of the Tu'anga Taporoporo (TT and MOPED)

4.2 Land and land management

4.2.1 Land Commission Report and its implementation

A land commission was set up in 1995 with an aim to look at land tenure and land use policy including commercial interests in land and administration of land matters.

The major outcomes of the commission were:

- ✓ The administration arrangements for the determination, allocation and confirmation of land issues were cumbersome.
- ✓ Land issues as a result of human determination and intervention were complex and historical inconsistencies in land claims appear consistently in present day disputes.
- ✓ A pattern of unregistered lands and disputes arising from Crown land misuse.

Key recommendations of the commission were:

- ✓ Realigning land laws and land decisions with Maori Custom
- ✓ Establishing a Cook Islands land Court.
- ✓ Localisation of Land Court judges
- ✓ Introducing the concept of freehold land
- ✓ Provision of legal professional services to the public
- ✓ Restructuring the operations of the land division of the Ministry of Lands and Survey.

At the WSSD Conference, the Registrar of the Court clearly outlined some of the solutions that could be put in place which supports the land commission outcomes, however, he cautioned that there is danger in trying to find a balance between customary ways and western materialism, and this is made worse because of legal language and the monopolising of the English language in the Land Court.

Localisation of Land Court Judges has commenced with JPs presiding over undisputed land cases on Rarotonga.

4.2.2 Rarotonga Environment Act 1994-95

The Rarotonga Environment Act of 1994-95 under the project application provision requires from applicants an EIA report; prior consent for activities in the sloping land areas, wetland areas and

foreshore areas as a matter of policy (to be regulated); a copy of the land map from the survey department and a site plan of where he/she intends to carry out the proposed activity.

The purpose of this policy is to allow the Environment Service Officers to have knowledge, before site inspection, of the legal status of the land ownership and how the applicant intends to mitigate effects that may impact surrounding properties. This process, therefore, allows for the prevention and mitigating of land degradation as described in some detail in Section 3.2 and 3.3. The process includes the investigation of technologies that are appropriate in mitigating the adverse impacts with regard to other landowners because of the challenges described in Chapter 3.

4.3 Improper land development

4.3.1 Legislation

4.3.1.1 Land Use Act/Zoning

Land use zoning in the sense used overseas is not applicable in the Cook Islands, despite various past attempts because of the land tenure system. The non-applied Land Use Act of 1978 was an example of such an effort. This Act was only used once to declare a portion of the beach in the Puaikura Vaka (district) on Rarotonga to be a public Reserve. The order made under this Act for the Public Reserve was cancelled five years later.

4.3.1.2 Legislative Review and the Conservation Act

The enactment of the Conservation Act 1997-98 and the current Rarotonga Environment Act of 1994-95 is an attempt to mitigate land degradation challenges on Rarotonga, Aitutaki and the Outer Islands.

The Conservation Act 1987-88, an effort from the local business community to protect the beaches, introduced the concept of coastal zone management. It recognize the importance of this area both economically as well as to protect the lands behind it from further degradation. Consequently Government, under a FAO soil rehabilitation project in 1992, saw a review of the 1987-88 Act, the preparation of environmental Plans for Mauke and Aitutaki and the concept of environmental impact assessment introduced into legislation.

For reasons that are, unclear, Government also in 1995 decided to repeal the Conservation Act 1987-88 and replaced it with the Rarotonga Environment Act 1994-95. Despite this move, Government still supported the SPREP/UNDP funded capacity building Coastal Zone Management project which saw the preparation and completion of environmental management plans, policy instructions and proposed Resource Management Bylaws for the islands of Aitutaki, Mangaia and Mauke. Penryhn Island, also part of this project, did not want the bylaw options completed. This project also introduced the concept of EIA to the outer islands.

The island environmental plans for Mauke and Mangaia identified the issues of improper land use development and recognized the efforts of the Forestry programs to combat soil erosion and reduced soil values.

However, Government support to these efforts was not continued because of lack of funds and ability by decision makers of the time to comprehend the basic principles involved.

4.3.2 Forestry program

The purpose and goals of the planted forest plantations were to: counter soil erosion resulting from the pineapple production days in Mangaia and Atiu, protect critical island watersheds, and to establish forest resources on existing low value coastal forest areas.

Species grown were, pinus carribaea and accacia mangium. The Mangaia plantations are approximately 1000 hectares, while Atiu and Mauke have 300 and 18 hectares respectively²⁹.

Following the downsizing of the public sector in 1996, forestry maintenance (after their establishment in the early 90s) suffered through the lack of funds for further project development, training, minimal capacity of local specialists and also the lack of research capacity.

To add to the above, there are continued unacceptable practices still on going such as the burning of makatea areas and plantation forests, and inappropriate land preparation methods continue.

4.3.3 Specific responses to Challenges facing the Foreshore area

The following responses are those carried out by Government and NGOs.

4.3.3.1 Tu'anga Taporoporo

The responses provided here are those undertaken mainly by various consulting engineers and others to assist property owners to deal with their individual challenges. The responses are obtained from applications to the Environment Council, where landowners tried to address the challenges facing them particularly along the foreshore.



Photograph 12.0 An example of a improperly built rock revetment.

Forty percent (40%) of the applications approved were for the construction of coastal protection structures. These involve the use of rock revetments, retaining walls, Gabion and Reno mattresses and timber structures. Forty three percent (43%) of the applications were for clearing of land, excavation and the construction of buildings. Over twelve percent (12.8%) of the applications included the construction of septic and liquid waste systems;

and the remaining were to build access ways and drainage systems. The appropriate figures are provided in Figure 16.0.

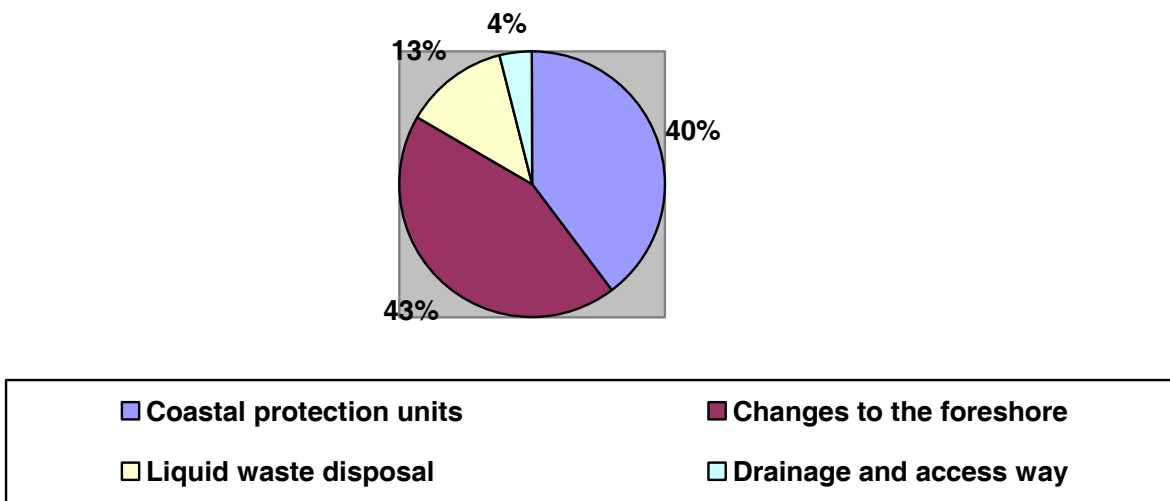
²⁹ Helen Wong's draft WSSD report



Photograph 13.0: Another example of an attempt to construct a coastal protection structure.

There are a number of issues that need to be highlighted and these are: project owners do not notify the authorities when work commences or structures are built; the lack of qualified supervision of work; the inability of people to communicate with their neighbours and the lack of proper responses by the public on circulated EIA reports requiring public input. Therefore, although responses to challenges looks good on paper, the actual implementation of those responses is not as good as it should be.

Figure 16.0: Responses to Challenges facing the foreshore of Rarotonga (Source: Environment Service)



4.3.3.2 Ministry of Works

Most of the coastal protection units (CPU) and all designed man-made structures along the coastline of Rarotonga were derived from designs of the Ministry of Works or from projects with their assistance.

With regards to Building permits, there is a poor response to the Environment Service and Environmental Significance Declaration (ESD) forms that are filled in by property owners or builders for obtaining Building permits. Figures show that over the five-year period between 1997 to 2001, 29.4% of permit applications to construct a structure on the foreshore did not bother to fill in the ESD forms.

4.3.3.3 Public Health Department

In terms of the foreshore, and other than the issue of enforcing its septic tank policy, the Public Health Department has very little to do with this area. It assisted in the determination of the water quality of the Muri lagoon area in 2001 to verify the land-based source and cause of the degraded, (or seemed to be the case at the time) Muri lagoon. Although the Public Health has in the past undertaken some water quality testing that was useful for the management of land-based activities polluting the lagoons, they are no longer able to provide that service. There are current moves to revive this function.

They do however have various policies and work programs that may be useful in addressing some of the challenges faced on the foreshore. One most important aspect of their work remains the issuing the permit for the construction of septic tanks.

4.3.3.4 Ministry of Education

The Ministry of Education policy does not specifically focus on the foreshore areas and the challenges provided in this report, but instead covers a broad area of the environment in its Social Studies, Science and Maori programs.

From an ecology point of view it covers the basic principles and interrelationships between marine life and beaches. In the social studies classes, students are often required to do projects on tourism and how it affects the environment. This normally looks at tourism and the beaches and has a look at some of the more superficial environmental challenges such as littering.

4.3.3.5 Development and Investment Board

The Development Investment Board is currently reviewing its investment policies on developmental opportunities and mainly covers the island of Rarotonga as well as, to a lesser extent, Aitutaki.

The Board do not have a policy for responding to the environmental challenges listed, or any challenges of the environment, however, as it deals with the approval of foreign development investments in excess of a million dollars, especially tourism developments, it requires those investors to comply with local legal requirements. These include environmental impact reports, through project permit and consent applications, to the Environment Council.

4.3.3.6 Environmental NGOs

There are four known environmental non-Governmental Organisations (NGOs) and only one registered environmental management consultancy company with the Environment Service that operate from Rarotonga. These are, the Takitumu Conservation Area Program (TCA), Rarotonga Environmental Awareness Program (REAP), Taporoporoanga Ipukarea Society (TIS) and the World Wide Fund for Nature (WWF). The environmental management consultancy company is Island Friends Ltd, the writers of this document.

The WWF, who initiated programs on the Raui of Rarotonga's lagoons, and in doing so may have increased pressure on the foreshore, have no specific programs to address the challenges of the foreshore area.

Generally, the REAP program has adopted the Environment Service's "adopt-a-beach" campaign around Rarotonga with its Rangers youth groups.

The Aronga Mana, an NGO but not specifically for the environment has, through the House of Ariki and Koutu Nui, implemented the Raui program of Rarotonga, also has no specific response program for the environmental challenges listed.

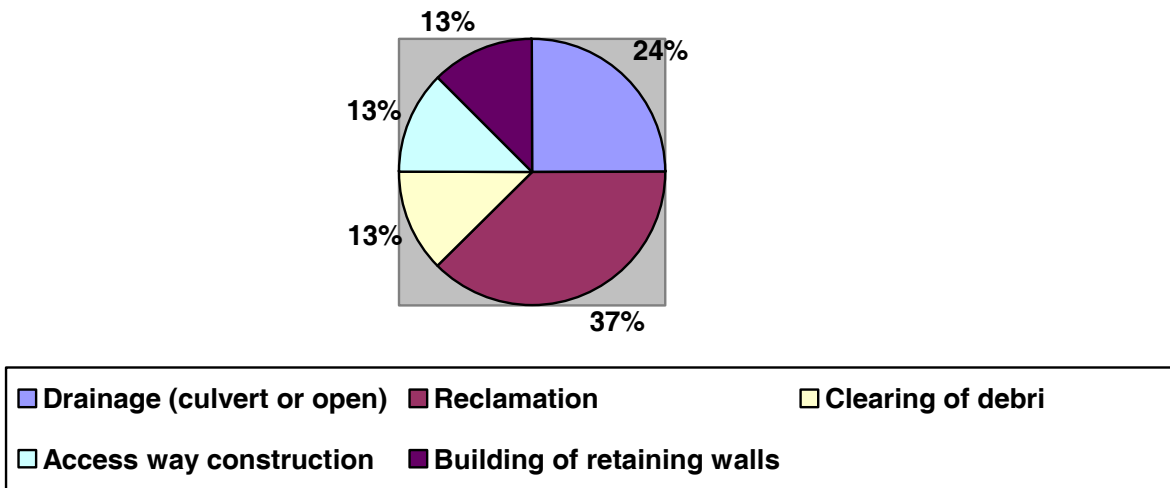
4.3.4 Specific responses for Wetland area challenges

The responses provided here are those suggested and undertaken mainly by various consulting engineers as well as the Ministry of Works to deal with the problems identified.

4.3.4.1 Tu’anga Taporoporo

The second most common problem facing the wetlands is seasonal and temporary flooding. Applications to the Environment Council, over the five years from 1997 to 2001, show that 37% of the applications were to do with the reclaiming of wetlands as a way to address the problems of flooding and unpleasantness; 24% were to do with the installation of drainage systems to improve the flow of water; and remaining 13% address the problems of the construction of retaining wall to improve their access ways as well as regular clearing of debris from the drainage system of the wetlands. See Figure 17.0.

Figure 17.0: Responses to Challenges facing the wetlands (Source: Environment Service)



Not all of the buildings constructed in the wetlands went through the Environment Service for determination, nor were any complaints lodged for not following the Rarotonga Environment Act 1994-95.

4.3.4.2 Ministry of Works

Building inspectors data on file reveals that buildings constructed between 1997 and year ending 2001 showed a high percentage of building that had not filled in the Environment Service (ES) form.

Government agent’s constraints to being able to monitor and supervise constructions are primarily due to builders and property owners not following the conditions of approval given. For the Building Inspectors, the builder is suppose to contact them at least 24 hours before pouring concrete. For the

Environment Service, any clearing of the land, or filling must have the officers advised at least 24 hours before the work is done. For the Health Inspectors, checking of the constructed septic tanks is not done and builders usually do not inform the Inspectors.

4.3.4.3 Public Health Department

The major problems listed as facing the wetlands are directly linked to the Department of Health. Stench from septic tanks is the major issue facing the wetlands followed by the unpleasantness caused by the outbreak of mosquitoes during and after flooding. As mentioned in the foreshore section, there appears to be all the paper work in place, but the follow-up action to ensure that the Public Health policies and regulations were followed on site has been very poor.

4.3.4.4 Ministry of Agriculture

Despite the fact that wetlands areas are extensively cultivated, especially with vegetables on Rarotonga, the Ministry of Agriculture has not made any known responses to the problems of the wetland areas. However, the Agricultural Ministry was involved in the spraying of Malathion poison to eradicate the dengue carrying mosquitoes.

The Ministry have however stated that the advisory unit has provided advice to growers in this area before and he believes most people who are cultivating these low lying areas are landowners who know when to plant and when not to. They (the landowners) are also aware of the risks they are taking. and flooding is nothing new to them.

For the outer islands clearing of drainage systems or removal of debris resulting from sea surge that have covered the marshlands of the Northern Group is carried out through organized community work.

4.3.4.5 Ministry of Education

The Ministry of Education policy do not specifically focus on the wetlands or the problems listed above for Rarotonga but covers a broad area of the environment in its Social Studies, Science and Maori programs.

In the social studies classes, students are often required to complete projects on land use and how usage affects their environment. This normally looks at agricultural activities, which covers the wetland areas that are used for the planting of taro and short-term crops such as vegetables.

4.3.4.6 Development and Investment Board

The Development Investment Board is currently reviewing its investment policies on developmental opportunities. Its policies are mainly relevant to the island of Rarotonga, and to a lesser extent, Aitutaki.

The Board does not have a policy for responding to the challenges provided, or any problems of the environment, however, as it deals with the approval of foreign development investments in excess of a million dollars, especially in the tourism developments, it requires those investors to comply with local legal requirements. These include environmental impact reports via project permit and consent applications to the Environment Council.

However, as shown in Chapter 3 most of the wetland problem areas on Rarotonga are where so much Tourism development is happening and this situation seems likely to continue to escalate.

4.3.4.7 Environmental NGOs

TIS and REAP have focussed their efforts on waste management issues which are not specific to the wetlands.

Island Friends has focussed on the giving out of environmental information in the form of children's books as well as its consultancy reports work.

Although not an environmental NGO, the Aronga Mana has expressed, through the House of Ariki and the Koutu Nui, their concern on land issues. It has also recently opposed the proposed mariner for the Avana Harbour area, which included areas of the wetlands.

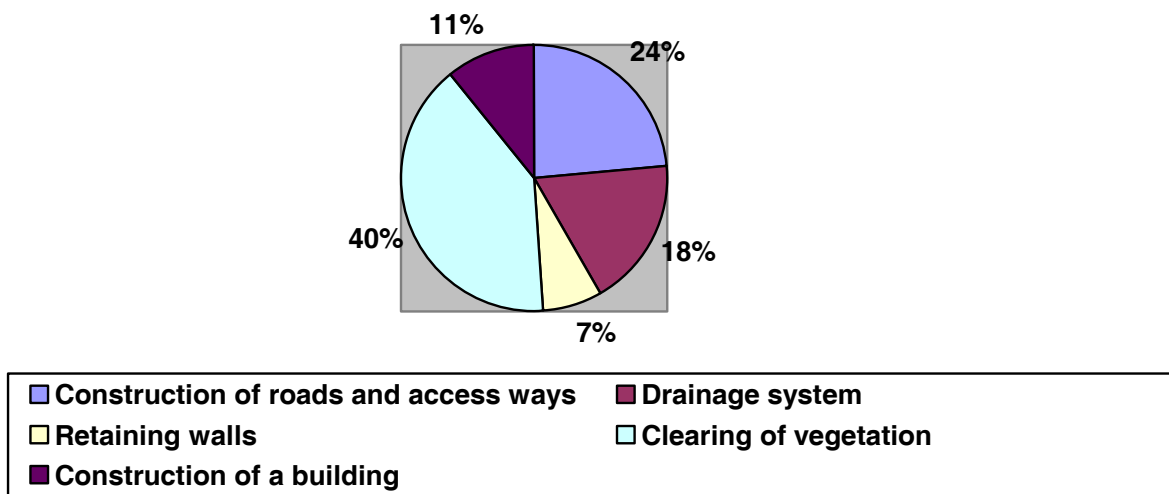
4.3.5 Specific responses for sloping land area challenges

4.3.5.1 Tu'anga Taporoporo

Much of the response to the challenges caused by altering streams comes through the work of the Vaka Councils and that of private individuals who are trying to protect their property. In the case of the Vaka Council where infrastructure (roads etc) have been affected, they have organized community work.

Road maintenance and constructing involves the commissioning of engineers to prepare engineering reports. This has become a major feature for developers in slope land area. About 60% of the engineering reports prepared between 1997 and 2001 were required to address those challenges³⁰.

Figure 18.0: Responses to Challenges facing the sloping lands (Source: Environment Service)



³⁰ See Numerical data in Appendices

Data on applications approved by the Environmental Council clearly show that the clearing of vegetation to prepare land is the most common activity that people apply for an approval to do. This is followed by activities to construct accessways, drainage systems, retaining walls and the building of structures. This is an indication of people responding to challenges that have been seen as causing problems on the sloping lands. They want things to be done properly to avoid damage to their property.

On Rarotonga property development activities have become a major feature on the east and south side of the island. Most business development taking place in these areas are subjected to either a requirement for a project permit, or consent from the Environment Council. In both cases, a project permit could be required with an EIA, or an engineering report submitted to the Council

4.3.5.2 Ministry of Works

The Ministry of works has provided local services, and also machinery, to clear debris from blocked streams especially during flash flood times.

The Ministry of works has also provided their machinery and experienced field managers for the implementation of road and stream maintenance programs.

It is noted here that the Ministry of Works Water Supply Division carry out water quality tests at the water intakes and selected points on their service lines network. Although the Public Health has in the past undertaken some water quality testing in this area, they no longer do this work due to lack of equipment and properly trained staff. However having said this, tests undertaken still do not cover parameters that may be useful for monitoring solutions to the challenges.

4.3.5.3 Public Health Department

In terms of the sloping lands, and other than the issue of enforcing its septic tank policy, the Public Health Department has very little to do in this area. As mentioned in Chapter 3.0, they use to carry out water quality tests of the drinking water at the intakes but are no longer able to provide that service. They do however have various policies and work programs that may be useful in addressing some of the environmental challenges faced on the slope lands.

4.3.5.4 Ministry of Agriculture

Challenges resulting from agricultural practices and trimming of vegetation have not been dealt with much. Despite the fact that these small activities do impact on the environment in a collective manner, landowners are pretty much left un-interfered with. And usually much of this type of work is on the lower foothills where it has always been done this way and where not many people live as yet.

Although covered by the Environment Act 1994-95 in only a very general way, chemical use control measures for weeds and crops leave much to be desired. In the case of herbicides safety precautions, especially for people spraying crops and weeds, are totally ignored. The general public is not even considered at all by the users. The spraying often takes place while children or people are still in the area on public roads. The attitude at present is that the chemicals must be completely safe because they have not been made illegal and have been sold and used for many years. No one seems to be interested in checking!

4.3.5.5 Ministry of Education

The Ministry of Education policy do not focus on the sloping areas of the Cook Islands but instead cover a broad area of the environment in the Social Studies, Science and Maori curriculum programs.

It covers the basic principles of soil formation, erosion and other areas but is not specific to sloping lands. In the social studies curriculum, students are often required to do projects about how the people use their lands.

Chemical safety, use or control is not covered at all.

4.3.5.6 Development and Investment Board

The Development Investment Board is currently reviewing its investment policies on developmental opportunities.

The Board do not have a policy for responding to the challenges facing the sloping lands, or any challenges of the environment, however, as it deals with the approval of foreign development investments in excess of a million dollars, especially in the tourism developments, it requires those investors to comply with local legal requirements. These include environmental impact reports through project permit applications and consent applications to the Environment Council.

4.3.5.7 Environmental NGOs

The TCA is the only organisation that is involved directly in the area of sloping lands. Being responsible for the management of the Kakerori reserve, TCA has promoted the protection of sloping lands, especially the water catchment area and the interior of the island, through the implementation of proper trekking methods and track maintenance. In the construction of its park buildings all of the processes of approval were followed.

Although not an environmental NGO, the Aronga Mana has expressed through the House of Ariki and the Koutu Nui their concern on land issues.

Also Island Friends, a private company and registered with the Environment Service, have published children's books, colouring books and cards in an effort to promote appreciation of the local environment.

4.4 Invasive & Alien species

4.4.1 Rarotonga

Public awareness and extensive public consultation by the NBSAP project has created a lot of awareness about the presence of various species that are causing problems on the island of Rarotonga. The consultative meetings brought to the public's attention the need to do the following:

Eradication initiative:

- ✓ To develop a programme involving all islands to survey invasive species in natural ecosystems and in the agro-ecosystem,

- ✓ Develop a community based programme to eradicate those invasive weeds and animal pests that are not yet widespread on particular islands,
- ✓ Develop national programmes to assist with the control of the more serious invasive weeds and animal pests in both natural and man-modified ecosystems,
- ✓ Undertake a multi-sectoral review of the control of trans-boundary and inter-island movement of terrestrial and marine plants and animals, and of LMOs/GMOs (Living Modified Organisms/Genetically Modified Organisms), with a view to establishing an independent Bio-security Agency.

Ecosystem Management:

- ✓ Develop a programme to select areas to establish a national system of community-based protected areas to protect important terrestrial ecosystems;
- ✓ Develop a programme to select areas to establish a national system of community-based protected areas to protect important reef and lagoon ecosystems.

4.5.2 Outer Islands

Eradication initiative:

As for Rarotonga.

Ecosystem Management:

- ✓ Establish an independent Suvarrow National Park Authority to administer the Cook Islands' only national park on behalf of all the major stakeholders. A management group with the responsibility to conserve the atoll's wildlife, and to monitor and control revenue-generating activities;
- ✓ Develop a programme to select areas to establish a national system of community-based protected areas to protect important terrestrial ecosystems;
- ✓ Develop a programme to select areas to establish a national system of community-based protected areas to protect important reef and lagoon ecosystems.

4.6 Population Changes

Government's new policies were put in place after the 1996 economic crisis. This policy encourages Cook Islanders to be involved in self-employment generating activities. The policy includes the introduction of the value added tax, which benefited those Cook Islanders that were interested in self-employment or getting into business. Also included was the reduction in the income tax deductions whereby the first NZD6, 000.00 was tax-free. This was designed to allow low-income earners to retain much of their money as domestic disposable income.

In Mitiaro, the community worked together with Government and instead of downsizing the public sector, the number of days for each working person, except those in the Police Department, Health Department, Welfare services, and justice Department, were organized into working groups on shift work. Each of the working groups would work for 2 to 3 days a week. Each worker would earn up to NZD100.00 a week. Each individual would then plant crops or harvest maire for export for the rest of the week thereby retaining a reasonable income.

Despite these moves however, people continued to leave the outer islands. The present Government is in the process of increasing the non-taxable income amount to NZD12, 000.00.

4.7 Climatic variability

4.7.1 Climate Change Program

As described in Chapter 2 and 3, the Cook Islands is characterised by small islands scattered in a large ocean and most of the islands are low lying. The weather in the Cook Islands is very dependent on the SPCZ which is in turn very influenced by regional and global weather patterns. An abnormal SPCZ situation results in the hydrological cycle being affected.

Certain activities have been taken on during the last five years which are aimed at data collection to improve weather forecasting to enable people to be more prepared. Such activities include tide station upgrade, traditional knowledge collection and the making available of data that was already collected.

4.7.2 PICCAP

The Pacific Islands Climate Change Assistance Programme (PICCAP) is a regional project managed by SPREP, and responds to the commitments by Parties to the United Nations Framework Convention for Climate Change (UNFCCC). The project ended in June 2002 and efforts are being made for Add-on activities such as the two-year Adaptation project for Aitutaki, and the Capacity Development Initiative (CDI).

The Cook Islands is a member of the Alliance of Small Island States that recognises the special situation of Small Island Developing States (SIDS). The Cook Islands also signed the United Nations Framework Convention 1992 and ratified the Kyoto Protocol 2001.

The implementation of the PICCAP Project marked the start of climate change information dissemination activities in the Cook Islands initiated by the creation of a multi-disciplinary group to be part of the Climate Change Country Team. Other activities under the project were the implementation of national vulnerability assessments and national greenhouse gas inventory as well as the drafting of the 1st national report to the UNFCCC. Priority areas identified were:

- ✓ Institutional arrangements so the project can proceed in its implementation,
- ✓ Needs assessment to identify training needs,
- ✓ Skills development and policy development.

Island specific vulnerability assessments are targeted for Mangaia, Penryhn and Aitutaki. A community-based adaptation project will be starting in Aitutaki in 2003.

Further actions required include the implementation of the adaptation initiative to be integrated across all sectors such as the environment sector; marine resources (coral bleaching); agriculture (drought resistant crops); water (water storage) and biodiversity (habitat loss); social sector under health (dengue fever) and education (capacity building); and or the economic sector specifically energy and tourism (coastal infrastructure).

Greenhouse gas inventories – 1st national greenhouse gas inventory submitted to UNFCCC 1999; Pacific Islands Renewable Energy Project (PIREP); GEF medium size projects

Further actions required further GHG inventories to become institutionalised in the statistics office, energy office, transport, and agriculture. Using renewable energy as a tool for sustainable development.

4.7.3 Island Vulnerability Risk Management

The Disaster Management Unit (DMU) is adapting a comprehensive hazard and risk management (CHARM) tool or process within the context of an integrated national development planning process in the Cook Islands. A SOPAC regional adaptation initiative is based on recognized standards and provides a consistent approach to risk management across the region.

This system recognizes the isolation factor of the Outer islands being scattered around the an ocean space of around 1.8 million square kilometers and transportation limitations are just some of the factors highlighting the small island's vulnerability to disaster risks.

The approach to disaster management has shifted focus from recovery and response to preparedness and risk reduction.

The attributes of CHARM are the following:

- ✓ It is linked to national development planning (social, economic, and infrastructure)
- ✓ It assists in establishing and prioritising development activities,
- ✓ Targets the management of both current and future risks
- ✓ Creates an environment for enhanced collaboration at national and regional levels
- ✓ Creates a programming environment that maximises the use of available resources and minimises duplication.

4.8 Ignoring of traditional knowledge and practices

4.8.1 Biodiversity as Indicators

The National biodiversity strategic action plan (NBSAP) is an activity that fulfils a commitment under the Convention on Biological Diversity (CBD). With funds being made available (approximately NZD400, 000.00) the Cook Islands has completed this requirement and forwarded the report on to the CBD. The Global Environment Facility (GEF) notes that in this report (from the WSSD Conference in April 2002) a further Capacity Building Add-on project for the Cook Islands is currently awaiting approval.

It was noted, from the information gatherers of the NBSAP, that there are plants in the Cook Islands whose value is no longer appreciated. And that this and other traditional information cannot be collected in the English language as it distorts the information. It has therefore been recommended that the information be recorded in the language that the tkp holder is most comfortable speaking.

4.8.2 Traditional Environmental Management Project

The traditional environmental management project is funded by ADB through SPREP and the Tu'anga Taporoporo. The project has chosen as a pilot undertaking, the arapo or traditional knowledge practices which use the phases of the moon as a sort of information calendar as each lunar cycle ages. This knowledge is known universally in the Cook Islands with each island having slight variations.

The project's goal is to document this information through the local language using a local consultant who has fluency in the local language. It is the aim of the project to obtain as much quality information as possible.

The knowledge of the arapo combines climatic factors, seasons and biodiversity. This project is drawing to a conclusion with two outcomes, a reference material on the arapo of Atiu and curriculum material on how to teach the arapo in the junior high school.

The arapo is considered a valuable planning tool for land and other resource management.

Chapter 5 Effectiveness of responses to the Challenges

5.1 Government Policies

Budget and financial resources allocation is vital to the effective implementation of Government Policies. However, this has been identified as a weakness in Government's financial resource allocation system.

- This has led to budget bids being excessive, lacking in priorities and strategies as well as being short term orientated.
- The inadequacy of negotiating skills among some HOM's has caused Cabinet to assume the role of prioritising needs and taking control of the budget process. This in turn has caused the budget to be burdened with political agenda's which have a short rather than long term objective and strategy.
- The 1996 reform introduced the output based budget process. This process is not understood by most HOMs.

5.2 Landownership and Management

The only part of the Land Commission report that was implemented is where local Justices of the Peace now preside over land Court to determine land titles on Rarotonga, that are not disputed. This has further increased the availability of land to people for development. Prior to this, the High Court Judge presided over all land title determinations and the process would often take up to four months. Now Land Court sessions are scheduled every month.

5.3 Improper Land Development

5.3.1 Effectiveness of Responses to the Challenges Facing Improper land development issues.

Government, as described in Chapter 3, has implemented Land development policies on both the outer islands and Rarotonga, for infrastructure development and by large families for agricultural development activities. Government has attempted to address the problems by putting in place various laws that are mainly aimed at managing activities so that they do not repeat the problems raised. This also includes the forestry programs of the makatea islands.

During the late 80s and the 90s however, and as a result of Government taking on a regulatory role, there was a change in the development of lands. Private companies and private individuals who either have leasehold lands or freehold occupation rights on the land carried out most developmental activities. The outer islands however remained dependent on Government for large and impacting land development projects.

Since most of the developments in the Cook Islands are taking place on the main island of Rarotonga, most of the information provided to evaluate the responses is from Rarotonga. The following are some of the effectiveness of the responses to the challenges facing land degradation in the Cook Islands.

5.3.1.1 Tu'anga Taporoporo

For Rarotonga much of the developments on the foreshore, wetlands and the sloping lands has followed the processes provided by the Tu'anga Taporoporo as defined under the Rarotonga Environment Act 1994-95. In an attempt by the Environment Service to assist the applicants, approval by circulation was a policy that allowed certain applications to be fast-tracked. These do not however include projects that require the applicant to submit an environmental impact assessment report.

**Figure 19.0 Number of applications to the Environment Council
(Source: ES)**

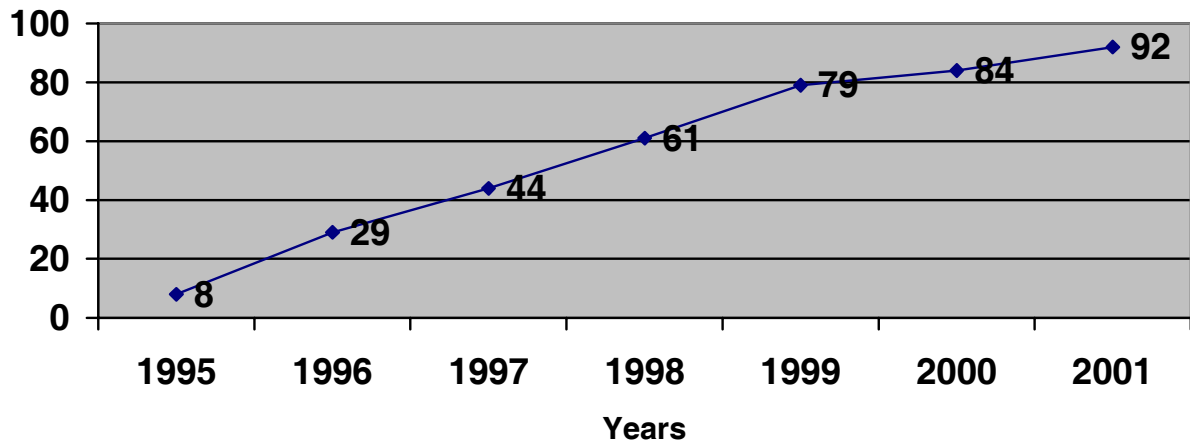


Figure 19.0 illustrates the increasing number of applications to the Environment Council since 1995.

It is observed that all the activities carried out on these environmentally sensitive areas are mostly unsupervised by qualified people and are carried out by machinery operators did not have the background or training on proper methods to excavate, dredge or remove earth materials. One operator of a major company informed the Environment Service that after years of experience in excavation, he had learnt through his mistakes and that it had made himself, in his own opinion, “now very qualified”.

The monitoring of approved activities is one that is very difficult for the Environment Service. Where the Environment Council has given an approval, the Environment Service delivers this approval with a list of conditions. One of the simplest yet most ignored conditions is for the client to inform the Environment Service at least 24 hours prior to the excavation or clearing or construction work taking place. Normally, a short notice of an hour or a few hours is given. Sometimes the Environment Service staff are not available or there is no transport at the time. This gives rise to the suspicion that the client does not intend to follow Environment Service (ES) conditions giving the ES staff little or no time to witness the actual work.

The other often ignored condition is that the engineer who prepared the report is supposed to be present when the work is initiated. Therefore, the solutions tried are hard to measure in terms of effectiveness. Responsibilities of the engineer and client are being ignored and the ES staff used as scapegoats if a problem is uncovered.

Despite the above problem the Environment Service has always maintained the position that the exercising of any powers given to it under the Act to protect these environmentally sensitive lands must, at all times have regard to the principle that the ES must try to serve the community through consultation, negotiation and education first.

Therefore Court Cases are still always the last option. There is always an attempt to work with the client to ensure that what was improperly carried out is corrected. This has usually caused more problems to the property in question as well as adjacent properties.

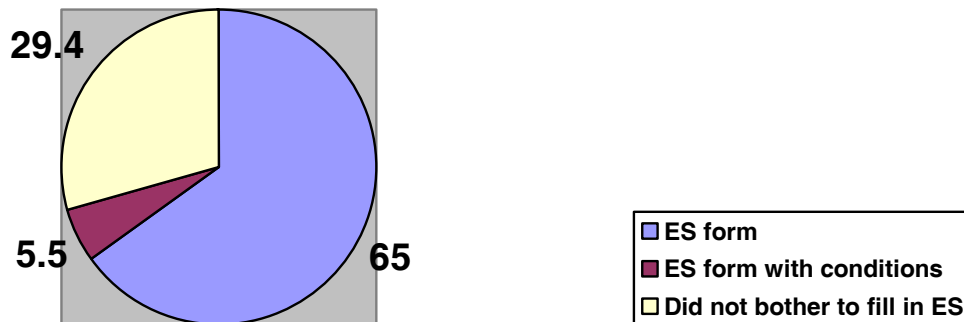
5.3.1.2 Ministry of Works

As with the Environment Service, the Building Inspectors also have the problems of not being able to monitor the builder's activities to and after a building is built. Most builders and property owners do not follow the conditions of approval. A number of minor alterations to the plan may eventually become significant³¹. For the Building Inspectors, the builder is supposed to contact them at least 24 hours before pouring concrete.

If the laws were strictly followed, builders would be ordered to rip concrete floors apart to allow the inspectors to see clearly whether the proper re-enforcement steels were used, or to pull down retaining walls for inspection to take place.

Figure 20.0 confirms also the lack of compliance by builders and property developers of the Environment Act and the lack of thorough follow-up checking by Building Inspectors of the required information to properly give approval to have a building constructed. However, it is noted that consideration of the Environment Forms by the Building Inspectors is a matter of courtesy and they were not obligated by law to observe the forms when giving an approval for a building permit.

Figure 20.0: Response to Environment Service form during application for building permits, 1977 - 2001 (Source: MOW)



5.3.1.3 Public Health Department

Despite the fact that septic tank problems are a significant one, the current response to actually ensuring that newly constructed septic tanks on site are functioning properly from the Public Health is very poor.

³¹ Comment by Building Inspector

The effectiveness of the Public Health inspector's role in dealing with matters pertaining to poorly constructed septic tanks has not been dealt with. Developers do their own thing. In the case of big resorts, they make their own decision on what system to use and they advise the Health Department and at present convince the Health Department staff of the effectiveness of the system they want to use. This has happened, to name two examples, in the case of the enviro-flow system installed at Nikao-Tepuka to treat the sewage from residents on the sloping lands in this area, as well as the Pacific Resort's (one of the largest tourist resorts on Rarotonga) current sewage treatment system.

A study by the Onu Group Consultants (a private local company) in August 1999 showed that "basic understanding of the sewage treatment process was not common knowledge in the local community, apart from a selected few". As a result, water-tight structures are not always constructed and therefore, as found by the Onu group, the water levels in the tanks surveyed were found to be less than 50%, with minimal sludge and an absence of solids.

According to a reliable plumber on the island, he has come across builders who claim that they have constructed septic tanks the right way because they have always done it that way over the years and they do not make sure that the tank is properly sealed by testing.

The Public Health Department laws are currently under review.

5.3.1.4 Development and Investment Board

Although not identified in the data presented, it is safe to state, because of the amount of money and size of overseas investor's projects, that all of the overseas investor projects must have applied for at least one of the requirements by the Environment Service under the Environment Act 1994-95. This is one of the reasons for the trend shown in Figure 19.0.

In attracting investors the Development and Investment Board has identified investment limits for foreign investors in excess of a million dollars in tourism developments with much of the focus on the Tourism industry, so it is highly possible that compliance to any of the requirements of the Environment Act would be followed. The Board is currently reviewing its policies to make this more certain.

5.3.1.5 Ministry of Agriculture

The advisory service of the Ministry of Agriculture is available for advice to any person that may require their service. However, it is noted that most of the challenges and responses mentioned are those that have resulted from practices over a long period of time. This means people cultivating in the lower foothills area have always been following the present trends for a long time, except when working with different types of crops, e.g. nono planting.

There is no data available to the writer on whether or not any advice given out by the Agriculture advisory service has been effective. As the Ministry's role is advisory and regulatory performance is difficult to measure.

5.3.1.6 Public Awareness and Education

5.3.1.6.1 Government Agents

The preparing of educational materials for schools and the communicating of messages to the general public is an expensive process. Despite the need for people to fully understand the laws for protecting the environmentally sensitive areas such as the foreshore, sloping lands and the wetlands, budgetary allocations to Government agents have been inadequate; this was the message from the Ministry of Education, Public Health and the Environment Service during the WSSD workshop held in April 2002.

In response, Ministries like the Public Health have used other means, such as increasing staff and involving staff from other areas to “preach” the importance of following guidelines and laws on environmental health.

The Environment Service on the other hand have started to re-develop its formal link with the Ministry of Education (in 2000) in an attempt to re-start and continue the development of curriculum materials for schools. However this attention has been re-directed to other areas such as the media due to NGO outcry on matters such as the Draft Environment Act.

It is observed that, in regards to most issues, awareness has been more of a response to complaints rather than a planned activity to ensure that information is passed on in an organised manner thereby developing a proper transfer of knowledge rather than emotions caused by media or personal gossip.

Public awareness and education has been a focus for the Tu’anga Taporoporo since its inception in 1987. Focus has been on the media using radio and television spots, documentaries and news articles.

It is expressed by MOW Head³² and Building Inspectors, that awareness-creating activities are very important so that people are aware of the requirements of the Building Code. However, since MOW is always known to build infrastructure and have the image of road gangs and machinery, the process of communicating these guidelines and laws has become almost non-existent. Interest groups such as Builders and Engineers are the only people that make it their business to know about these laws and guidelines and even they have problems with understanding them.

The experience with the waste management program consultation process has been an excellent opportunity, according to MOW Head, to show the public that there is a need for the Officers of the Department to explain why things are done the way that they are. Again, as with the other Government Agents, budgetary allocation to establish an information-clearing house was not a priority.

5.3.1.6.2 Non Governmental Organizations

The Aronga Mana, in the form of the House of Ariki and Koutu Nui, have made public statements on issues but no attempt as yet has been made to measure the effectiveness of their responses.

With the exception of the TCA, REAP is the only Environmental NGO that have negotiated extensively with private businesses and AID organisations to finance itself and the production of informational materials that are used by schools and the public. However, the problem is that none of the materials is specific to any of the areas of concern.

Island Friends, a private company registered with the Environment Service, has also publicised environmental messages information in the form of children’s books.

³² Mr. Atatoa Herman

TCA has opened its gates to school groups and other people from uniformed organisations who are interested in nature appreciation. However, as with most efforts of this kind, to measure their effectiveness is very difficult.

5.4 Invasive and Alien Species

Not yet implemented.

5.5 Population Decrease

Population of the outer islands is still on the decline. The population of Rarotonga is still on the increase.

Outer Islands

5.6 Climatic variability

PICCAP – Not measured.

DMU – No data available.

5.7 Ignoring of traditional knowledge

TEMs – in progress.

Chapter 6 Future Initiatives

6.1 Improvement on Government policies & implementation

These are issues relevant to land degradation in the Cook Islands.

6.2.1 Economic Policies

Economic policies must include social cohesion, economic sustainability and good governance against a backdrop of sound fiscal management, public consultation, a national strategic development plan and political commitment.

A sound economic policy environment requires the following ingredients:

- ✓ Allocation of resources to promote economic and social development within sound fiscal management and responsibility.
- ✓ Prioritisation of needs and wants within the budget process noting the special circumstances of the Outer Islands
- ✓ There is an urgent need to prepare and develop a 3 year National Strategic Development to underpin the yearly Budget Policy Statement.

To improve the process of translating political philosophy to national outcomes and the allocation of resources within the national budget it was suggested there be:

- ✓ Public Consultation
- ✓ A National Strategic Development Plan
- ✓ Political Commitment

6.2.2 Budget process:

Qualified public servants who have the know-how to budget, bid and spend within limitations approved should carry through the budget process. The budget process should also promote economic and social development; based on sound fiscal management and responsibility with prioritized key policy issues. These issues being:

- ✓ Budget process should promote economic and social development
- ✓ Budget process should be based on sound fiscal management and responsibility
- ✓ Key policy decisions have to be identified and prioritised, and be sympathetic to but not controlled by, political manifestations.
- ✓ The Cook Islands needs a national strategic development plan based on either a 3 or 5-year period.
- ✓ Surpluses should go towards debt repayment, reserves, maintenance programs of infrastructure and capital items and growth projects
- ✓ Strengthen and train HOMs in the budget preparations and negotiation process.
- ✓ Develop clear transparent policies in line with the MFEM Act.

6.3 Improving Land Management

6.3.1 Land Commission Report of 1995

In recognising the challenges regarding land management in conjunction with the land tenure, it is strongly recommended that further analysis of the Land Commission report of 1995 should be undertaken with the view to reviewing the key recommendations and how to implement them. These recommendations are:

- ✓ Realigning land laws and land decisions with Maori Custom
- ✓ Establishing a Cook Islands land Court.
- ✓ Localisation of Land Court judges
- ✓ Introducing the concept of freehold land
- ✓ Provision of legal professional services to the public
- ✓ Restructuring the operations of the land division of the Ministry of Justice

6.3.2 Land Tenure

In reviewing the above (Section 6.3.1) and in view of the challenges described in this report, the following considerations must be of the highest regard:

- ✓ Explore and reach a decision on how to overcome difficulties on multiple ownership and the fragmentation of land interest.
- ✓ Explore and reach some sort of balance between the extremes of customary ways and western materialism
- ✓ Establish an accessible and affordable valuation system in the country.
- ✓ Education and awareness of legal implications where information must be written in the vernacular language to ensure understanding.

6.4 Sound land development practices

6.4.1 Environmental Legislation

The current environmental legislation only applies to Rarotonga. The Rarotonga Environment Act 1994-95 adequately covers the land degradation issues on the island. It is in the areas of compliance and monitoring that weakness have been identified, there is plenty of room for improvement there. The Rarotonga Environment Act 1994-95 have a number of important issues requiring attention and these are new initiatives in this report. These are:

- ✓ Capacity building in the areas of compliance, education and awareness, and monitoring.
- ✓ Regulating of the ESD form for impact significance determination required under its project application and approval by consent provisions.
- ✓ Data compilation on applications and consultations for monitoring purposes
- ✓ Environmental indicator monitoring

There is an urgent need to pass the current National Environment Bill so that land degradation issues in the outer islands may also be addressed. The current draft has the following important components:

- ✓ The Act only applies up to the reef of each island.

- ✓ If the Island Council agrees to, certain provisions of the Act that are appropriate to the island will be applied.
- ✓ If there are no appropriate provisions to that island, the Island Council may create an environmental bylaw to address land degradation challenges and then if they so wish have the bylaw adopted under the National Environment Act.
- ✓ If the Act, or parts of it are applied to an island, an Environment Council will be established on the island to make decisions under the Environment Act.
- ✓ The Environment Service for each island has the power to work with any Government Agencies, and non-governmental organization.

6.4.2 Monitoring

Section 6.4.1 expresses that monitoring of activities approved is one of the weaknesses of the enforcing agencies of the various related laws (such as the Building Inspectors, the Health Inspectors and the Environment services). Having addressed these challenges through capacity building within the Ministries concerned, the collecting of data on environmental indicators becomes very important to monitor the performance of the environment and detect any changes due to increased development. In this respect the following environmental indicators require monitoring:

- ✓ Water quality (fresh and salt water)
- ✓ Coral and fish surveys as these are affected by land base activities such as earth removal, the use of chemicals on the land, and the discharge from septic tanks and treatment plants that contaminate the soil and pollute the water.
- ✓ Capacity building within Government organizations and information sharing with other ministries.

6.4.3 Guidelines & Standards

Although the public Health and building inspectors have specific guidelines for constructions, there are no specific guidelines for the construction of a road, protective structures, and so on that may degrade the sloping land areas, wetland areas, foreshore areas or makatea land areas.

At the present time, the Environment Service is about to adopt its policies on the sloping land areas, wetland areas, and foreshore areas of Rarotonga. The policies are the first step to preparing guidelines for activities. It is a new initiative under this report that guidelines be prepared based on the EIA and engineering reports submitted to the Environment Council for approval. It is a general consensus amongst Cook Islanders that this should be done using local people and not expatriate workers who tend to lack depth and have no feel for the Cook Islands Environment and people.

Guidelines and standards include those for the following activities:

- ✓ Construction
- ✓ Excavation
- ✓ Clearing
- ✓ Planting
- ✓ Reclaiming

For such needs as:

- ✓ Accessways
- ✓ Roads
- ✓ Residential houses
- ✓ Retaining walls
- ✓ Protective structures
- ✓ Commercial buildings
- ✓ Waste treatments
- ✓ Infrastructure

6.4.2 Use of Traditional Knowledge

It is believed a lot of the old knowledge still exists but is scattered due to lack of usage. Having made this statement and mindful of the importance of traditional knowledge as discussed in the various parts of this report, it is a new initiative of this report that efforts be made to do the following:

- ✓ Collect traditional knowledge on the various islands that may assist in the implementation of major activities on the land;
- ✓ All such knowledge to be collected in the vernacular language and used in schools and the information should be published as public information.
- ✓ It is also noted here, with special reference to the Nassau and Pukapuka resource management system, that this information is best disseminated by using this system.

Having mentioned the Nassau and Pukapuka resource management system, it is important, as the only traditional system that is currently working in the Cook Islands; practice of this system throughout the Cook Islands is highly recommended.

6.5 Support measures for preventing the spread of invasive and alien species

6.5.1 Eradication initiatives

The eradication of invasive and alien species must be a community and a national cooperative effort. For these reasons the following initiatives are recommended for implementation:

- ✓ Develop a programme involving all islands to survey invasive species in natural ecosystems and in the agro-ecosystem;
- ✓ Develop a community based programme to eradicate those invasive weeds and animal pests that are not yet widespread on particular islands;
- ✓ Develop national programmes to assist with the control of the more serious invasive weeds and animal pests in both natural and man-modified ecosystems;
- ✓ Undertake a multi-sectoral review of the control of trans-boundary and inter-island movement of terrestrial and marine plants and animals, and of LMOs/GMOs (Living Modified Organisms/Genetically Modified Organisms), with a view to establishing an independent Bio-security Agency.

6.5.2 Ecosystem management

In terms of ecosystem management aimed at protecting special species from the effects of invasive and alien species the following should be pursued:

- ✓ Develop a programme to select areas to establish a national system of community-based protected areas to protect important terrestrial ecosystems;

6.6 Social and economic incentive for local people

As described in this report, the population is an important component for the mitigating of the challenges of land degradation. Challenges occur where people have concentrated their activities and therefore should also be a point of focus for mitigation measures. When planning and making Policy Government must consider:

- ✓ For government to be aware of the country's population structure, population processes and socio-economic characteristics in order to plan for an adequate standard of living, and for a proper provision and distribution of goods and services
- ✓ Good governance and proper management of human resources should be a top priority of the government to minimize undesired negative impacts on the environment.
- ✓ Educational planning should take into account the range and level of future workforce skill requirements.
- ✓ Incorporating population consideration into the planning process is at the very heart of planning and development since population factors are such an important component of development.

Capacity building also becomes important for providing an efficient service. As described above, the ability to provide a service whether it be landscaping, road making, construction of a structure, providing technical advice on septic tanks, or advising politicians on how to transform their visions into workable programs, all still important aspects to combat land degradation. The HRD's new initiatives supports capacity building as required for improved services and recommends the following:

- ✓ To conduct a survey of training needs to determine the training requirements of the Cook Islands especially at post secondary level. This action will assist in the development of a strategic plan that will provide clear direction on the training needs for post secondary education and development needs within the various sectors and mechanisms for effective and efficient delivery.
- ✓ Pursue relevant qualification accreditation at post secondary level in order to acquire recognised qualifications.
- ✓ Strengthen technical, vocational education and training (TVET) in the Cook Islands
- ✓ Facilitate discussions and identify mechanisms of pooling resources and working together in partnerships to strengthen and enhance post secondary education and skills training in the Cook Islands.
- ✓ Promote the mobilisation of new and additional resources for financing post secondary education and training.
- ✓ Promote partnerships at the national, regional and international levels geared towards provision of financial and technical assistance.
- ✓ Encourage cost sharing initiatives where necessary.

- ✓ Encourage and source national and donor support for the establishment of a technical and trade facility for post secondary education and training that is relevant for the Cook Islands.
- ✓ Promote partnerships for a national post secondary education and training initiative that would be delivered through recognised accredited institutions to respond to both the immediate and long-term needs of the Cook Islands.

As also described in this report people often leave to look for opportunities that best suit their abilities and potentials. Although Government has increased the non-taxable income base more has to be done in the labor sector. The writers of his report also recognize that development strategies must be compatible to culture and tradition; improve worker and employer relationship through guidelines and legislation to protect both worker and employer; retain of the local skilled and trained labor force; and that the wage structure must not remain stagnant. This sector therefore recommends the following new initiatives:

- ✓ Review of the minimum wage order from \$4.00 to \$6.00 per hour.
- ✓ In-country training in technical and vocational areas
- ✓ More investment into the private sector development.
- ✓ Review legislation to include social empowerment for women – maternity protection.
- ✓ Strategy to increase population, for example by suspending the family planning program implemented in the 60's.
- ✓ Improvement of clarity and attitude across the board.

6.7 Support preparedness activities in anticipation of changes as a result of global and regional climate changes

Island's Vulnerability and Risk Management

- ✓ Gaining commitment by national government to strengthen disaster reduction and risk management capabilities
- ✓ Linking disaster reduction and risk management activities to national development planning
- ✓ Recognition that the initial costs of prevention is an investment towards medium to long term economic savings
- ✓ Improving current disaster management planning arrangements
- ✓ Strengthening current NDMO (national disaster management organisation) capabilities through the allocation of increased resources
- ✓ Improving existing or introducing new legislation
- ✓ Locating the NDMO in an appropriate Ministry
- ✓ Building a case for donors support to implement national risk reduction strategies.

PICCAP

- ✓ The institutionalisation of climate change as part of the Government Process,
- ✓ Institutionalisation of a Climate Change Country Team as part of the National Environment /Sustainable Development Task Force,
- ✓ The development of a Climate Change policy and
- ✓ National Implementation Strategy, capacity building initiative.
- ✓ To increase community awareness,
- ✓ Begin data collection and analysis for vulnerability assessments
- ✓ Implement capacity building

Climate Change issues to be recognized and, where possible, addressed:

- ✓ The Cook Islands are small islands with large oceans barely 5 metres above the mean sea level; Hydrological cycle; variability of rainfall; El Nino/Southern Oscillation Cycle; Severe weather phenomenon, traditional knowledge and data availability.
- ✓ Identified need to document traditional knowledge in the local language that is unique or specific to each islands as well as observable phenomenon to be used to foretell changes in weather conditions.
- ✓ Issues identified: monitoring; early warning; international property rights; action plans for disaster reduction; sustainable technology; database for economic development; and efficiency.
- ✓ Capacity Building: summarise existing capacity i.e. professional staff; restricted skills; technology i.e. communications; prediction models; too modernised for SIS initiatives; standardisation.
- ✓ Education and Awareness: integration with other government departments; incorporate into the education system; media coverage if available private sector contribution; document historical events; community participation; government support.
- ✓ Attention Areas: monopolistic approach; budgetary constraints; non-core service of a ministry; to cover land, ocean and atmosphere; public awareness; language constraints.

6.8 Recognize, recording of traditional knowledge and practices on the environment in the local language.

Culture

- ✓ Establishment of a National Marae to serve as a physical symbol of national unity and a place of learning valuable traditions and information.
- ✓ Greater participation of traditional leaders in the process of parliamentary decision-making through legislative interventions that will extend vetoing powers to the House of Ariki and the Koutu Nui
- ✓ Establish a Language Institute or Academy to maintain Cook Islands language being taught formally in schools and also as a venue for other courses touching on the many aspects of our cultural heritage.
- ✓ Make Cook Islands History and Politics compulsory in our schools and Teacher's College.
- ✓ Facilitate training for Cook Islands writers and artists in key areas such as publishing, gallery curators, theatre and other company administration.
- ✓ Set up on-going training for archivists, curators and librarians to access and publish written resources for public consumption.
- ✓ Continued financial assistance for national writers in the writing and publishing of printed, video and audio materials, for use in schools, in both Maori and English versions.

Biodiversity

- ✓ A body should be established to review access to, and the processing of, knowledge on biodiversity and its use;
- ✓ The programme of the Natural Heritage Project, to be a Maori program, to record all Cook Islands biodiversity with related scientific and traditional information should continue, and it should make such information available to the general public.
- ✓ Working group to be established to investigate ways to ensure that knowledge of biodiversity and its uses is adequately available to students and the general public;

- ✓ NGOs should be encouraged to include the recording of knowledge of biodiversity, where they can.

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