National Action Plan to Combat Land Degradation and Drought

TUVALU

July 2006

Department of Environment

Government of Tuvalu

Executive Summary

Tuvalu acceded to the United Nation Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD) in September 1998 because of its concern regarding degradation of its habitats and current predicted shortages of water connected with increasing population and the effects of climate change. As a Party to the UNCCD, Tuvalu is obliged to follow Section 9 and 10 of the Convention in preparing a National Action Plan.

Tuvalu is a small atoll nation with a population of approximately 10, 000. The country is characterised by high dispersion, with a total of just 26km² of land area spreading over a sea area of 1.3 million km². Its smallness and remoteness makes this nation extremely vulnerable to climatic events and human impacts. Although it has a mean annual rainfall of 3000 – 4000mm, drought a serious problem experienced in the country from time to time, particularly the northern islands.

NAP is one of the key instruments in the implementation of the Convention. National Action Programmes are developed in the framework of a participative approach involving the local communities and they spell out the practical steps and measures to be taken to combat desertification in specific ecosystems. NAP addresses the underlying causes of land degradation and drought, and identifies measures to prevent and rehabilitate it.

This NAP is considered as the focus of actions, consolidation of projects and activities identified for an integrated solution to combating land degradation in Tuvalu. The NAP endeavours to bring together stakeholders, both government organisations (GOs), non-government organisations (NGOs) and local communities in a joint effort to achieve sustainable land management. Implementation of the NAP will involve partners including government organisations, NGOs, private sectors and local communities.

Foreword

According to the provision of the United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD), affected Country Parties either suffering from desertification or land degradation, are obliged to prepare their NAP to combat desertification and land degradation.

Desertification and land degradation are complex environmental and socio-economic phenomena which occur in many parts of the world, impeding socio-economic development and challenging human survival. The impacts of the phenomena were recognised by the global community thus the birth of the UNCCD in 1994. Parties to the Convention reveal the convention as an important tool and powerful instrument of the global community to put the problem under effective control. Tuvalu acceded to the UNCCD in September 1998 because of its concern regarding degradation of its habitats and current predicted shortages of water connected with increasing population and the effects of climate change.

The Department of Environment (DoE) in its capacity and authority to prevent and address land degradation in the country has been designated by the Office of the Prime Minister to serve as a focal point for the Convention and ensure preparation of this National Action Plan to Combat Land Degradation.

The Tuvalu NAP has been prepared with the valuable financial and technical support of the UNCCD Secretariat and the Global Mechanism for UNCCD.

As Minister responsible for the Environment, it gives me great pleasure to present this Tuvalu National Action Plan to the UNCCD Secretariat for submission to the Conference of the Parties (COP).

Hon. Tavau Teii
Deputy Prime Minister & Minister for Environment

Acronyms

CBD	Convention on Biological Diversity
COP	Conference of the Parties
DoE	Department of Environment
ENSO	El- Nino Southern Oscillation
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse gas
GOs	Government Organisations
IWP	International Water Programme
KP	Kyoto Protocol
LDC	Least Developed Countries
MDGs	Millennium Development Goals
MEAs	Multilateral Environment Agreements
NAP	National Action Plan
NGOs	Non-governmental organisation
NSDS	National Sustainable Development Strategy
NSSD	National Summit on Sustainable Development
SIDS	Small Island Developing States
SIS	Small Island States
TCTC	Tuvalu Coconut Trading Cooperatives
TMTI	Tuvalu Maritime Training Institute
UNCCD	United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNFCCC	United Nation Framework Convention on Climate Change
WMP	Waste Management Project
WHO	World Health Organisation
WSSD	World Summit on Sustainable Development

Table of Content

1. Introduction

1.1 Background Information on UNCCD

The international community has long recognized that desertification and land degradation are major economic, social and environmental problems of concern to many countries in all regions of the world. In 1991 the United Nation Environment Programme (UNEP) concluded that the problem of land degradation in arid, semi-arid, and dry sub-humid areas had intensified. As a result the United Nations Conference on Environment and Development (UNCED) supported a new integrated approach to the problem emphasizing action to promote sustainable development at the community level. The United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD), was adopted on 17 June 1994. The Convention was then opened for signature on 14 – 15 October 1994 and it entered into force on 26 December 1996.

Tuvalu ratified the UNCCD on 14th September 1998, because of its concerns regarding degradation of its habitats and current and predicted shortages of water connected with increasing population and the effects of climate change. As a Party to the Convention, Tuvalu submitted its first National Communication and its second Report to the Convention in 2000 and 2002 respectively.

Land degradation imposes an important constraint in achieving sustainable development. The World Summit on Sustainable Development (WSSD) in 2002 reaffirmed land degradation as one of the major global environment and sustainable development challenges of the 21st century. It called for action to "….address causes of desertification and land degradation in order to restore land and to address poverty resulting from land degradation." Addressing land degradation also contributes significantly to the Millennium Development Goal (MDG) of reducing by half the proportion of people in poverty by 2015 and ensuring environmentally sustainability.

By taking into account and realizing the importance of preventing desertification through land rehabilitation measures and sustainable land management practices and noting that these concerns were critical, the UNCCD expanded its programme to encompass activities to combat land degradation by making land degradation a Global Environment Facility (GEF) Focal Area. The Second Assembly of the GEF in October 2002, designated land degradation, primarily desertification and deforestation, as a new focal area for the purposes of supporting the implementation of UNCCD.

Fragile ecosystems are important ecosystems, with unique features and resources. Fragile ecosystems include deserts, semi-arid lands, mountains, wetlands, small islands and certain coastal areas. Most of these ecosystems are regional in scope, as they transcend national boundaries. For Small Island States these fragile ecosystems may encompass the entire nation. Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by international communities of the UN Systems, governments, and major groups in every area in which human's impact on their environment. Chapter 12 of Agenda 21, which addresses

‘managing of fragile ecosystems: combating desertification, land degradation and drought, lists seven specific program areas that countries can address to combat such problems. Of the seven programmes, three areas are relevant to Tuvalu:

1) B. Combating land degradation through, *inter alia*, intensified soil conservation, afforestation and reforestation activities;

2) E. Developing comprehensive drought preparedness and drought-relief schemes, including self-help arrangements, for drought–prone areas and designing programmes to cope with environmental refugees;

3) F. Encouraging and promoting popular participation and environmental education, focusing on land degradation control and management of the effects of drought.

This NAP addresses the underlying causes of land degradation and drought, and identifies measures to prevent and rehabilitate degraded land. Therefore the NAP strives to bring together relevant stakeholders, which include government organisations, non-government organisations (NGO), and local communities in a joint effort to achieve sustainable land management.

1.2 Basic Country Profile

Tuvalu is a small and fragmented land that is made up of nine small islands, with a total land area of only 26 sq km. This makes Tuvalu the fourth smallest country in the world in terms of land area. The highest elevation is no greater than 4 metres and on average the land is less than 1 metre above sea level. It covers an ocean area of some 900,000 sq km. The island group is geologically very young, with most of its islands having poorly developed, infertile, sandy or gravel coralline soils.

Of the nine island groups that make up Tuvalu, five are considered true atolls (Nanumea, Nui, Nukufetau, Nukulaelae and Funafuti), three are table reef islands (Nanumaga, Niutao and Niulakita) while Vaitupu has a composite characteristics of an atoll and a table reef island. Total population of approximately 10, 000 people inhabit all nine islands of Tuvalu. The whole island group of islands are susceptible to damage caused by land degradation.

The marine environments of Tuvalu are comprised of six major ecosystem types (oceanic, outer reef, lagoonal backreef, lagoon floor, bommies or patch reefs and natural channels between the ocean and lagoon). These ecosystems produce the sediment required for island building and maintenance and support communities of corals, other invertebrates, algae, plankton, fish and marine mammals and reptiles. For example, approximately 30 common species of corals and over 350 species of fish characterize the marine ecosystems of the country. On land, indigenous plants are rare because of habitat modifications such as the extensive planting of coconuts and other food plants. There are probably 200 plant species in Tuvalu, 50 of which are possibly indigenous (Lane, 1993) and none of which are endemic. There are probably no indigenous land mammals, though there are indigenous birds (28 species), a few species of lizards, insects and land crabs.

1.2.1 Climate

Tuvalu's climate is tropical-marine being influenced by the south-east Pacific trade wind belt with a wet Westerly and a dry Easterly Season. The wet months are November to April and the drier months from May to October. The mean annual rainfall for Funafuti is 3000mm, but can go as high as 4000mm per annum. Dry periods are more severe in the northern islands of Tuvalu, notably in the months of August to October. Drier years are associated with a positive Southern Oscillation Index (SOI), with drier than average years occurring in 1950, 1964, 1975, 1976, 1988 and 1999.

The mean air temperature is 28°C, with a mean maximum of 31°C and a mean minimum of 25°C. The mean annual rainfall ranges from 2,300 to 3,700 mm. Rainfall variability is moderate, but more significant in the northern islands with occasional dry spells and droughts. Countries such as Tuvalu already face significant threats from existing climate conditions. The added risk of climate change due to global warming merely serves to highlight the urgent need to act to minimize these current risks.

Drinking water and other household water supply is mainly from external tanks catching rainfall from corrugated iron roofs. The traditional thatched roof houses on the outer islands are not very suitable for this form of water catchment. Assured water supplies are consistently ranked as one of the major risks in Tuvalu. Increased incidence of drought due to climate change or persistent El Niño conditions, without intervening La Niña periods, is a major risk.

1.2.2 Vegetation

The soil of Tuvalu is generally of poor quality, and only supports a limited variety of flora. The table below summarizes the main vegetation cover in Tuvalu.

Indigenous plants are rare because of habitat modifications such as the extensive planting of coconuts and other food plants by early settlers. There are probably 200 plant species in Tuvalu, 50 of which are possibly indigenous (Lane, 1993) and none of which are endemic. The main vegetation communities consist of coconut woodlands in stands varying in age and condition.

Table 1: Vegetation by class in Tuvalu and percentage of land covered,c1998

Type of vegetation	Area (ha)	Percentage
Coconut woodland	1, 619	53.9
Broadleaf woodland	122	4.1
Coconut & broadleaf woodland	51	1.7
Scrub	419	13.9
Pandanus	10	0.3
Mangroves	515	17.1
Pulaka pits & pulaka basin	65	2.2
Village, buildings	172	5.7
Others (i.e. low ground cover)	33	1.1
Total	3, 006	100

(Land discrepancies)
Sources: McLean & Hosking (1991) and Seluka et al (1998)

Previously Tuvalu exported copra to Fiji, providing an income for local communities in the outer islands. Copra exportation to Fiji was stopped a few years ago due to a loss of preferential trade arrangements with the EU and financial difficulties faced by the Tuvalu Coconut Trading Cooperatives (TCTC). Other vegetation communities include coastal strand vegetation, limited areas of coastal marsh vegetation, some small remaining indigenous inland broad-leaf woodland, often represented by a few individuals standing together. Although vegetation communities are of mixed quality and the remaining indigenous vegetation is extensively disturbed, these plants are of critical importance to Tuvalu. The importance of vegetation in the protection of soils and foreshores, and its usefulness as a source of food and for a wide range of utilitarian purposes, makes the retention and enhancement of vegetation a priority issue.

1.2.3 Water resources

There are no surface freshwater rivers or lakes in Tuvalu. Ground water is found in underground lenses though this water source has been significantly contaminated by animal, human and commercial waste filtering through to the lenses as well as from sea water infiltration from sea level rise especially on some of the islands. Reports from the Health Department have also confirmed that ground water on Funafuti are now unfit for human consumptions. The Waste Management Project (WMP) together with the International Water Programme (IWP) carried out two water quality testings on Funafuti as part of the AusAID thru TAFE GLOBAL in-country training programme and confirmed that all ground water sources on Funafuti are highly contaminated with biological contaminants. However ground water in the outer islands have not all been tested but believed to be not as badly contaminated as those on Funafuti. Potable freshwater for consumption is commonly stored in limited storage cisterns or tanks. Southern islands of the group have an average annual rainfall of 3500mm, but irregular short periods of drought persist. The Northern islands of the group have an average annual rainfall of 2700mm. Therefore increasing storage capacity for water is a priority for Tuvalu in order to alleviate water shortages. The 1999 El Nino event severely affected the entire nation especially in the northern islands. This resulted in the importation of desalination plant from Japan, which relieved the burden of public and household water needs. Tuvalu has a low resilience to freshwater shortage as seen during the 1999 El Nino event.

Drinking water and other household water supply is mainly from external tanks catching rainfall from corrugated iron roofs, water from desalination plants and potential of groundwater use in outer islands as practiced under a brought back up project. The traditional thatched roof houses on the outer islands are not very suitable for this form of water catchment. Assured water supplies are consistently ranked as one of the major risks in Tuvalu. Increased incidence of drought due to climate change or persistent El Niño conditions, without intervening La Niña periods, is a major risk.

1.2.4 Energy consumption

Tuvalu imports all its fuel (petroleum, diesel, kerosene, etc) from Fiji for the purpose of electricity production and transportation (land, air and sea). The cost of imported fuel is extremely high and is among the highest in the world. Tuvalu is mindful of the consequences of having relied heavily on imported fossil fuels. The impact of global warming as a result of

unrestricted burning of fossil fuels is a phenomenon that all Tuvaluans are familiar with. Tuvaluans are very aware of the concern that their country could be one of the first in the Pacific region to be inundated should there be an increase in sea level rise. It is with this thought in mind that prompted planners and decision makers to explore the introduction of renewable energy programmes.

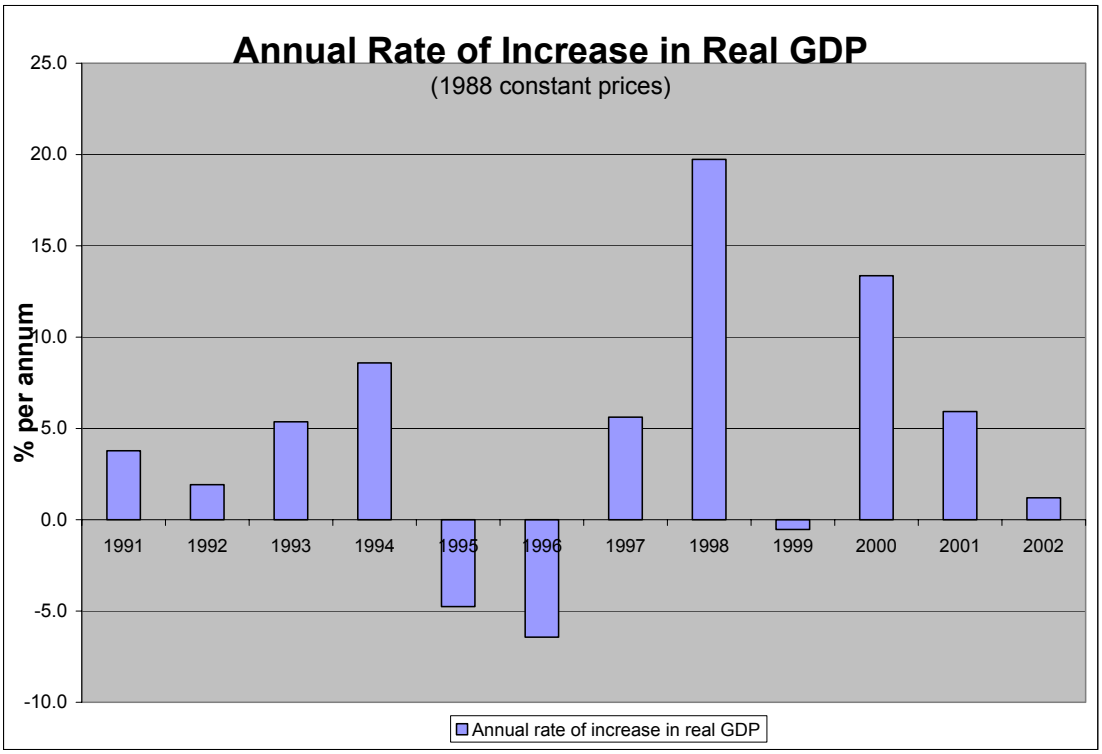
With a high cost of imported fuel, water generated by desalination plants is extremely expensive and has to be subsidised by the government. The indigenous source of energy in the country is wood which is mainly used for cooking. This is mainly practiced in outer islands, where income level is low. Consequently a minimal number of trees is cut down for this purpose as people are commonly used dry firewood for cooking.

1.2.5 People and Economy

The 1991 population census enumerated a total population of 9, 043, in which 47% are male and 53% are female. After 11 years, another population census was carried out on all islands of Tuvalu. The result shows a total de facto population of 9, 561, which include 202 short term visitors. The total resident population enumerated in 2002 is 9,359 compared to 8,750 residents' population enumerated in 1991. A 47% of the 2002 total enumerated population are settled on Funafuti (capital of Tuvalu). Funafuti has a total land area of 2.80 sq. km, making a population density (total enumerated population) on Funafuti of 1, 610persons/ sq. km. Most importantly, Fongafale (the main settlement area) itself has a land area of about 1.9 sq. km and has a total enumerated population of 4, 418. This represents a population density of 2, 325 persons/ sq. km. The remaining population is scattered on other areas of Funafuti. This data directly shows that Funafuti, especially Fongafale is overcrowded. The average annual total population rate growth from 1991 – 2002 is 0.51% while resident population has an average annual population rate of growth of .48%.

The isolation of the island from markets, its limited land mass and a narrow resource base are major constraints that have restricted Tuvalu's economy. Despite these economics disadvantages, the government is funded through: revenues collected from direct taxes, custom duties, philatelic sales, licensing fees for foreign fishing vessels, remittances from Tuvaluan seamen working on overseas ships, overseas development assistance and revenue generated from the Tuvalu Provident Fund.

Between 1996 and 2002 annual real growth in GDP averaged 5.6% per annum; however this figure hides wide year to year variations: from highs of 19.4% and 13.7% in 1998 and 2000 respectively, to lows of - 6.4% and - 0.5% in 1996 and 1999 respectively. For the latest two years, 2001 and 2002 growth rates were 5.9% and 1.2% respectively. Underpinning recent economic performance has been the average annual increase in government's contribution to GDP of 11.3% per annum. This has increased the government's share of GDP from 24% in 1996 to 30% in 2002.



1.2.6 Human development

The Tuvalu National Sustainable Development Strategy (NSDS) noted that 'human resource development is fundamental to achieving an improved quality of life' and 'a well-educated and trained labour force is critical for enabling future economic growth'. Tuvalu is classified by the United Nations as a Least Developed Country. This is well demonstrated by data collated in the Tuvalu 2002 Population and Housing Census. Educational attainment of the resident population aged 15 and above showed 55% attained primary education, 14% attained secondary education, and only 8% attained tertiary education. About 22% of the population has had no education.

The government of Tuvalu also established Tuvalu maritime training institute (TMTI) in 1979 with the purpose of providing preservice and inservice training for merchant seaman. Skilled Tuvaluan seafarers are in demand on the international market and their contribution to national income is significant. As of to date TMTI has produced a total of more than 1, 000 qualified seaman and estimates that 75% of earnings are returned to Tuvalu as remittances.

1.3 National Focal Point

Implementation of Tuvalu's obligations under the UNCCD is carried out by the Department of Environment. The Department of Environment is under the Office of the Prime Minister and it is the focal point for the three Rio conventions, which UNCCD is one of them. Below is a complete contact address for the responsible institution:

Department of Environment
Office of the Prime Minister
Government of Tuvalu
Private Mail Bag
Funafuti
TUVALU
Ph: (688) 20 179
Fax: (688) 20 113/ 20 114
Email: enviro@tuvalu.tv

1.4 Development of NAP

1.4.1 Methodology

Preparations for the development of the National Action Programme (NAP) commenced with an island communities' consultation in the third quarter of year 2004. The main objectives of the consultation were to review the status of land use, land degradation, drought, and its environmental and socio-economic impacts and to develop and prioritise strategies and programs to combat land degradation. The first draft of the NAP was circulated to all relevant stakeholders whom are also members of UNCCD Country Team for their comments and validation of information. Inputs from stakeholders were considered and incorporated into the NAP. The complete NAP was submitted to Cabinet for final approval before submission to the UNCCD Secretariat.

1.4.2 Linkages and Synergies with other Environmental Conventions

Better coordination between Multilateral Environment Agreements (MEAs) can provide practical advantages, particularly in the area of capacity development. Coordinating and integrating MEAs into national development plans is a challenge for most Small Island Developing States (SIDS) and least developing countries (LDCs). Therefore within Tuvalu this process is encouraged and emphasised so as to increase the significant benefits associated with this process.

The three Rio conventions, which include UNCCD, Convention on Biological Diversity (CBD), and the United Nation Framework Convention on Climate Change (UNFCCC) are all relevant to the prevention and control of land degradation. The Tuvalu focal point for the three Rio conventions is the Department of Environment. The CBD recognises the importance of addressing land degradation for the conservation and sustainable use of biodiversity. Furthermore, the relationship between climate change and land degradation is also recognised. Climate change contributes to desertification and deforestation though changes in temperatures which in turn adversely affects the respiration rate of vegetation. Furthermore human created deforestation releases carbon dioxide to the atmosphere and the loss of sequestered carbon in biomass and soils, further contributing to greenhouse gases in the atmosphere. The work programme of the UNFCCC, therefore, emphasises the role of conservation and sustainable management of forests and woodland in carbon sequestration and reducing carbon dioxide emissions. The UNFCCC also recognises the need to develop strategies to adapt to the impacts

of climate change. Many of these adaptation strategies are linked to combating land degradation and drought.

Joint work programmes for the three Rio conventions are now starting to achieve multiple global benefits, such as poverty alleviation, sustainable ecosystems and minimising greenhouse gas emissions. Since all of the Rio conventions are closely linked to each other, consolidating the policy and planning work required to carry out the responsibilities of the conventions allows for maximum efficiency and synergy in planning. Thus, the need for UNCCD strategies and priorities to align with the National Biodiversity Strategy and Action Plan (NBSAP), the Initial Communication to the UNFCCC, and the National Adaptation Plan of Action. Other programmatic linkages include the Barbados Programme of Action +10 (BPoA+10), and World Summit on Sustainable Development (WSSD).

2. Land degradation, its Causes and Consequences

2.1 Definition

The definition of **"land degradation"** under Article 1 of the UNCCD is the reduction or loss, in arid, semi-arid and dry sub-arid areas, of the biological or economic productivity and complexity of rain fed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land use or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as:

(i) soil erosion caused by wind and/or water;
(ii) deterioration of the physical, chemical and biological or economic properties of soil; and
(iii) long-term loss of natural vegetation.

The GEF Operational Programme 15 (GEF OP-15) definition of "land degradation" is any form of deterioration of the natural potential of land that affects ecosystem integrity either in terms of reducing its sustainable ecological productivity or in terms of its native biological richness and maintenance of resilience.

For the purpose of this NAP, land degradation includes both the UNCCD and the GEF definitions and also includes land degraded by pollution, land affected by periodic inundation by sea water and land that has been damaged by general misuse making it less suitable for future generations.

The UNCCD definition of **"drought"** is the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems. Tuvalu suffers from drought periods, particularly during El Niño events.

2.2 State of Land Resources

The land resources of Tuvalu are extremely limited, and this is mostly a product of its geology and very limited available land area together with a very large ratio of foreshore to overall land area. Other natural characteristics also limit the ability of Tuvalu to rely on its land resources:

- soils are coarse, poorly developed and generally have low fertility;
- agricultural potential is limited in terms of species that can be grown and the volume of product able to be produced;
- very limited water supplies are available from ground or surface resources;
- mineral development prospects on land do not exist;
- long lengths of coastline are susceptible to erosion.

The most serious long-term environmental, socio-economic and physical threat to Tuvalu land resources is the impact of climate change (which is causing sea level rise, drought and severe weather events. Nevertheless, land degradation is also a great threat to the nation. Rapid increases in development, such as infrastructure and population growth contribute to land degradation.

It is a common practice in Tuvalu for landowners to clear undergrowth bushes and shrubs on their land on a regular basis. These cuttings become dry and prone to fire. When property owners burn their dried vegetation, fires often spread over a wider area of land than expected, thus damaging terrestrial ecosystems and exposing land to degradation. Many incidents of this kind have been seen in the past.

2.3 Major causes of land degradation

2.3.1 Lack of land use planning (road project)

The government has recently completed a multi-million dollar Road Project on Funafuti, the capital city of Tuvalu. The project involved widening and tar sealing the road to give more stability to unconsolidated soil particles, thus minimizing poor road conditions. Unfortunately, the road project has had a number of significant environmental impacts. The widening of the road has resulted in the destruction of roadside vegetation, hence increasing vulnerable lands to soil erosion and degradation. A significant ancillary environmental impact associated with the road is the increase inland clearing due to easier access to remote areas on the island of Funafuti. Several landowners have cleared their lands for their private development as a result of the new road. Neither the government nor the *Kaupule* (island council) has a national land-use plan in place. Therefore there are limited restrictions on what landowners can do to their land. The need to establish land-use and management planning and legislation is urgently needed in order to minimize land degradation in Tuvalu.

2.3.2 Sea level rise

Sea level rise is a significant threat to the nation. Tuvalu is vulnerable to the global projected sea level rise of 20 to 40cm by 2050. In recent times land has become subject to inundation and saltwater intrusion during Spring tide events. Sea level rise degrades coastal areas including

nearby vegetation. Inland vegetation is also affected as the sea water percolates up through the ground and forms large pools of saltwater on the land.

Pulaka, *Cyrtosperma chamissonis* (a type of rootcrop) is a traditionally and socially important crop in Tuvalu. It is traditionally grown close to the water-table in pits. Pulaka pits cover a total land area of approximately 0.34 sq. km of the entire land area of the country. It is being adversely affected by sea water intrusion. This is due to the upwelling of saline water through blowholes and saltwater intrusion into the pulaka plantation pits. Sea level rise not only affects pulaka plantations, it also affects groundwater. The biotic component of the watershed depends on groundwater. People use groundwater as a secondary source of water for consumption especially in times of drought, where rainwater collected in cisterns and tanks is extremely limited. Intrusion of salt water into groundwater is a problem that has been identified on all islands of Tuvalu. Furthermore groundwater is adversely affected by human and animal waste. Therefore effective control of pollution is needed to sustainably maintain ecosystems on Tuvalu.

2.3.3 Drought and Bush fires

The aftermath of the 1999 El Niño drought caused damage to water supply, food security systems and the degradation of terrestrial ecosystems. The event had a significant effect on the pulaka pits making them salty and unsuitable for pulaka growth. There is an urgent need to find more salt resistant varieties, rather than introducing new crop species that may lead to more land converted to agriculture.

The average temperature is 28°C with a mostly hot and humid surface air. During the 1999 El Niño event, several islands reported uncontrollable bush fires on a number of occasions. Bush fires expose an area to degradation, devastation of the natural ecosystems and vegetation loss. Even though they small in size, if compared to the total land area of Tuvalu, a significant area of land is exposed to this type of degradation.

2.3.4 Unsustainable agricultural practices

Approximately 18km² (1, 800 ha), can be regarded as agricultural land. This area is unequally divided among islands of Tuvalu. The infertile nature of Tuvalu soils has lead to an increase in the use of agricultural chemicals. Both fertilizers and pesticides have been used to enhance agricultural productivity. While higher crop yields have been gained from regular and intensive uses of these chemicals, they have also caused problems. Overuse of chemicals has caused land to become unsuitable for agriculture through changes in the physical and bio-chemical composition of the soil. Consequently farmers have abandoned their land and moved to new locations for their crops. This excessive use of agricultural chemicals is hence another major cause of land degradation seen in the country.

2.3.5 Unsustainable development activities (seawall and boat ramps)

Natural erosion from heavy seas and storm surges is made worse in some areas of Tuvalu through poor management practices, including incorrect use of sea walls and boat ramps, removal of sand and aggregates for construction purposes and tree felling along the shoreline.

Some time back, the government constructed a series of boat ramps to facilitate easy loading and off-loading of cargo from ships. Unfortunately the design of the ramps is causing severe coastal erosion on the islands where they are located. Some ramps have been destroyed by the strong force of the sea and waves from storm surges. These islands have submitted requests to the government through the Department of Environment and the Public Works Division to find a more suitable and appropriate type of ramp that can minimize the problem of coastal erosion.

Seawalls have been constructed on some of the islands in an effort to reduce erosion. This was undertaken by the government few years back for the purpose of reducing coastal erosion and protecting island foreshore and coastal environments. While the walls have been reasonably effective in normal conditions, they were not designed to withstand cyclone force waves. In fact they have exacerbated coastal erosion under these extreme conditions. Seawater that has washed over the walls during cyclonic weather is trapped by the walls. The inundated land is subsequently contaminated by the seawater causing serious vegetation die-off and land degradation.

2.3.6 Unsustainable use of Watershed (watershed degradation)

A watershed is a dynamic and unique place consisting of a complex web of natural resources such as soil, water, air, plants and animals. Yet everyday activities can impact these resources, and ultimately our well-being and economic livelihood. Groundwater resources are polluted by impacts of sea level rise and human pollution. A report published by World Health Organization (WHO) after intensive research on the islands, has stated that groundwater is no longer healthy for human consumption. The biotic component of the watershed depends on groundwater, therefore effective control of pollution is needed to maintain sustainable ecosystems.

The uncontrolled extraction of earth material (rock, gravel and sand) from foreshore areas has left some areas of the islands more vulnerable to the forces of the ocean and less able to combat the threats caused by climate change, including severe weather events. Increased infrastructure development is leading to a growing demand for earth material. The removal of this material is leading to accelerated coastal erosion and considerable loss of land. This is a crucial matter that warrants urgent attention, especially on the island of Funafuti. Funafuti is experiencing a rapid population growth and increasing need from government and public infrastructure developments. Consequently the Kaupule (Island Council) of Funafuti has put in place several bylaws that prohibit the mining of earth materials. However, the government needs to establish a policy that helps prevent our foreshore environment from erosion and other threats associated with climate change.

2.3.7 Uncontrolled waste disposal

Overpopulation and overcrowding on Funafuti has contributed to the problem of solid and liquid waste disposal. The population on Funafuti has long exceeded the natural carrying capacity of the area and is putting severe pressure on the limited available resources of the country. Given that the island is now serviced with a tar-sealed road, the number of vehicles been imported into the country has increased dramatically. However, due to the effect of salt spray, the total lifespan of most vehicles in the country is only about 5 years. There is no proper

waste management policy in place that takes care of the disposal of solid waste especially these bulky (cars, trucks, shipping containers, drums, etc) wastes. People tend to dump their waste in a place convenient to them, not taking into consideration the environment impacts associated with their actions. This is a very common practice exercised by people on Funafuti, and it also seen on outer islands. Thus there is a need to establish a solid waste management plan. Waste management legislation is also highly recommended.

3. Strategies within the framework of sustainable development

3.1 Vision of National Sustainable Development Strategy

The principal objective of the Government's national development policies and strategies is to promote improvements in the standard of living of all the people of Tuvalu. To this end a Vision Statement for the future of Tuvalu was unanimously endorsed at the National Summit for Sustainable Development. The Vision Statement says:

> *We*, the representatives at the Tuvalu National Summit for Sustainable Development; comprising all island Head Chiefs and Presidents of Island Councils, Cabinet Ministers and Members of Parliament, representatives of the civil society and private sector, government ministries and departments, development partners and Tuvalu expatriates;
>
> *Recognise* the importance of sustainable development – development without compromising the ability of future generations to meet their needs - and *endorse* the Vision of *"By 2015, guided by strong spiritual values enshrined in its motto – 'Tuvalu mote Atua' – we will have achieved a healthy, educated, peaceful and prosperous Tuvalu*".

Every segment of Tuvalu society has a role to play in transforming this vision into reality. There must be genuine cooperation and participation between the public sector, the private sector, and those who represent civil society. With the right commitment by each individual, and the community each represents, together the standard of living in Tuvalu can be raised, especially for those who are at the greatest disadvantage. To reach our vision, strategic directions were chosen by consensus at the National Summit for Sustainable Development (NSSD), as were the areas of development priority. These areas include better governance; more employment; more economic opportunity; better health and education; better basic infrastructure; and lastly, maintaining social stability. Making headway in each priority area will help to improve the standard of living in Tuvalu as a whole. The analogy is a rising tide which lifts all boats, even those boats lowest in the water, or those most disadvantaged. This will result in a healthier, more educated, peaceful and prosperous Tuvalu.

The vision for this NAP is to be consistent with the country vision statement. Therefore the vision for this NAP is to achieve sustainable development and all activities will be oriented to strengthen efficiency of sustainable land management and utilisation of natural resources to meet the demands of social development at an appropriate level.

3.2 Integration of National Action Programmes into other development policies.

Reversing land degradation and alleviating poverty go hand in hand. Both involve improving food security, educating and training people, strengthening the capacity of local communities, and mobilizing non-governmental organizations. Similarly, because land degradation affects and is affected by environmental concerns such as loss of biological diversity and the effect of climate change, the NAP needs to have a great potential to promote synergies with other programmes dealing with such issues. However, improved data at the country level and stronger recognition of the NAP have yet to manifest this potential fully through concrete initiatives.

This is a challenge which needs to be overcome. Previous international meetings of the UNCCD highlighted the urgent need for inter-ministerial cooperation and for the mainstreaming of action programmes into development strategies in order to address the problem in a comprehensive manner and to avoid duplication. Given that the NAP cuts across many development sectors such as agriculture, forestry and water management, the NAP is likely to encourage inter-ministerial cooperation and focused attention to address inappropriate land tenure or inappropriate trade practices not conducive to sustainable land use.

3.3 Strategy

Tuvalu has identified the following strategies as means of addressing land degradation under the UNCCD framework.

- Developing a partnership with local institutions and communities and non-governmental organisations for an effective implementation of land degradation control

- Coordinating the implementation of UNCCD, CBD and UNFCCC activities to ensure synergy and effectiveness

- Strengthening cooperation with related regional institutions, regional CCD Thematic Programme Networks and international organisations

- Establishing priorities and developing action plans though active involvement in the decision-making by local communities in the implementation, monitoring and evaluation

- Awareness raising about ensuring a good quality environment and sustainable land management

- Ensuring that the activities are holistically concerned about the unique characteristics of the community in the respective degraded land (integrated and sites special projects)

4. Priority Programme Activities

Since the problems leading to land degradation are complex and affect both the socio-economic context and the natural environment, responses in terms of sustainable land management must be all encompassing.

Tuvalu will prioritise projects that focus on meeting its sustainable development goals. Projects which meet these goals include:

4.1 Providing enabling activities

- review existing legislation related to land degradation, sustainable land management and drought at the national and local level;
- strengthen existing legislation to support the programme and/or enacting new laws to support implementation of the programme if necessary;
- conduct studies/research to collect and provide baseline information on Tuvalu's ecosystems to enhance sustainable land management efforts;
- strengthen institutional capacity of institutions and organisations to effectively address land degradation and sustainable development;
- promote public awareness aiming at all related stakeholders, on the importance of the programme and how they can contribute to the programme;

4.2 Land Degradation Inventory and Monitoring

- monitoring of soil erosion and sedimentation;
- inventory and mapping of degraded land using GIS and hazard maps);
- management of land degradation data;
- identify root causes and impacts of land degradation on socio-economic and socio-culture conditions.

4.3 Prevention of Land Degradation

- establish guidelines and standards for soil conservation techniques;
- promote soil conservation and its benefits, and the dangers of land degradation through trainings and awareness workshops;
- encourage and strengthen local participation in land degradation prevention projects;
- promoting urban and community greenspace activities;
- promote and support proper solid waste management practices;
- encourage and support full integration of a nationwide network of protected areas with sustainable land management activities.

4.4 Rehabilitation of Degraded Land

- review completed and ongoing projects of land rehabilitation carried out in the country;

- rehabilitate degraded lands;
- rehabilitate improper solid waste disposal sites;
- develop coastal erosion mitigation action plans;
- strengthen local participation in reforestation and afforestation programs.

4.5 Establishment of Sustainable Land Management Plans

- provide assistance and capacity building to government and private organizations, island communities, traditional leaders, as well as individual landowners, on the benefits and techniques of development of sustainable land use plans;
- develop sustainable land management plans.

4.6 Monitoring and Mitigating the Impact of Drought

- develop drought contingency plans;
- establish and improve early warning systems;
- monitor water availability;
- monitor climate change impacts;
- encourage and strengthen research activities in attaining drought-resistant (and salt resistant) crops.

4.7 Integrating of traditional knowledge into modern ways

- collate traditional knowledge from island elders and leaders and incorporate into sustainable land management practices

5. Project Profiles

5.1 Water Management

1. Project Title: **Northern Islands (Namumea, Nanumaga, Niutao and Nui) Rainwater Catchment Enhancement Project**

***2. Background*:** The northern islands of Tuvalu have the lowest rainfall and are likely to suffer significantly from drought conditions. Due to extremely limited water capture opportunities, the vulnerability of these islands to water shortages is extremely high. This situation is exacerbated by rising sea levels that are adversely affecting underground water lenses.

To improve access to freshwater supplies to meet basic needs of the people in the northern islands, the project will provide improved water storage and water capture systems suitable to the housing designs of the islands. Due to contamination of groundwater supplies, freshwater for drinking must be gained from water tanks or cisterns attached to houses. Ostensibly the project will provide guttering and freshwater tanks for households and community buildings.

The improvement in the supply of freshwater is a fundamental sustainable development requirement for the islands of Namumea, Nanumaga, Niutao and Nui, which are the most prone to drought conditions.

3. Objectives:

- To improve the supply of freshwater for households on the islands of Namumea, Nanumaga, Niutao and Niu.
- To build community cooperation and cohesion through the rainwater catchment enhancement project

***4. Priority Addressed*:** 4.6 Monitoring and Mitigating the Impact of Drought

***5. Location*:** Namumea, Nanumaga, Niutao and Niu

***6. Duration*:** 2 years (October 2006 to October 2008)

7. Activities:

- Establish community water cooperatives through the Kaupule (local community council) on each of the islands to oversee the design and implementation of the project;
- Identify most appropriate water tanks to meet criteria of ease of transport, longevity, availability of materials, appropriate level of hygiene, and protection from mosquitoes.
- Identify most appropriate material for guttering and piping.
- Training in the installation of water tanks and guttering
- Installation of tanks and guttering
- Ongoing monitoring of demand for freshwater

***8. Implementing Organizations*:**

- Public Works Division in collaboration with Department of Environment

- Kaupules

9. Cost Estimates	**(USD)**
Community consultation and establishment of water cooperatives 4 islands at 5,000 ea	$20,000
Consultancy to assist in selection of tanks, guttering and piping	$40,000
Purchase of tanks, guttering and piping	$800,000
Shipment of tanks, guttering and piping	$40,000
Training in installation of tanks, guttering and piping	$10,000
Installation of tanks, guttering and piping	$10,000
Monitoring of installations and Assessment of water use and demand (2 years at 10,000 p.a.)	$20,000
TOTAL	**$940,000**

***Expected Outcomes*:**

- Improved supply of freshwater for households on the islands of Namumea, Nanumaga, Niutao and Niu
- Community cooperative established to coordinate supply of freshwater particularly in times of drought

5.2 Community Tree Care

1. ***Project Title***: Tuvalu Community Tree Care Project

***2. Background*:**

Ever since Polynesians first inhabited the islands of Tuvalu, they have used timber and wood for a variety of purposes. These include building materials for houses and furniture, boat and canoe building, food and oil crops, medicines, firewood, and shelter and shade. Trees also provide protection against sea erosion and land degradation. They protect terrestrial biodiversity which are important for ecosystem stability as well as providing utilitarian uses such as food (pigeons, land crabs, etc) Different tree species have different uses. Some trees are important for the main body of canoes, while others provide the necessary flotation in the outriggers. Other tree species are important for house building while others are used for carving. Some important tree species have been over-exploited and are now rare.

The project will develop a community-based tree care programme which will involve the collection of seeds and the establishment of nurseries on each of the Tuvalu islands. Communities will establish tree planting days for species grown from the community nurseries. A system of community carers will be established to ensure that there is an ongoing care and maintenance of the planted trees. Schools will be encouraged to participate in the project so that students can develop an understanding of ecological processes associated with tree care and can develop a sense of community cooperation and participation.

Areas of degraded land or lagoons with degraded mangrove forests will be particularly selected for replanting activities.

***3. Objectives*:**

- To protect degraded lands from further erosion and degradation processes through the planting of trees
- To re-grow important cultural tree species for sustainable use
- To build local capacity in the collection of seeds and the maintenance of nurseries for important tree species
- To engender a spirit of community cooperation in the protection and re-establishment of important tree species
- To develop school curricula based around tree conservation and the protection of degraded lands
- To limit further land degradation through developing a community understanding of the importance of trees and their role in ecosystem stability

***4. Priority addressed*:**

4.1 Providing Enabling Activities
4.3 Prevention of Land Degradation
4.4 Rehabilitation of Degraded Land

***5. Location*:**

Each of the nine inhabited islands of Tuvalu (Namumea, Nanumaga, Niutao, Nui, Vaitupu, Nukufetau, Funafuti, Nukulaelae and Niulakita)

***6. Duration*:**

The nature of a tree planting project is that it is a long term commitment. The initial phase of the project will last for 5 years (November 2006 – November 2011)

7. Activities

- Establishment and maintenance of community nurseries on each of the island
- Seed collection and identification
- Identification of degraded lands suitable for tree planting
- Development of a community guidebook of the tree species of Tuvalu and the traditional uses for each species
- Tree planting on degraded lands and lands providing protection against sources of land degradation (e.g. storm damage from severe weather events)
- Development of school curricula based on the value of trees and their role in an ecological community

- National tree days and awards and prizes for best community projects and best school projects

***8. Implementing Organizations*:**

- Department of Agriculture in collaboration with Department of Environment
- Department of Education
- Island Care (Tuvaluan environmental NGO)
- Schools
- Kaupule

9. Cost Estimates	**$USD**
Establishment and maintenance of community nurseries on each of the island	180,000
Seed collection and identification	10,000
Identification of degraded lands suitable for tree planting	20,000
Development of a community guidebook of the tree species of Tuvalu and the traditional uses for each species	20,000
Tree planting on degraded lands and lands providing protection against sources of land degradation (e.g. storm damage from severe weather events)	90,000
Development of school curricula based on the value of trees and their role in an ecological community	50,000
National tree days and awards and prizes for best community projects and best school projects	20,000
TOTAL	**390,000**

***10. Expected Outcomes*:**

- Restoration of degraded lands of each of the nine inhabited islands of Tuvalu
- Establishment of self-sustaining nurseries for the growing of culturally important tree species
- Development of a community guidebook on important tree species
- Development of school curricula based around the importance of trees
- Ongoing community support for the protection of planted trees

5.3 Developing National Environmental Protection Legislation

1. Project Title: Development of National Environmental Protection Act with provisions for environmental impact assessment and regulations related to sustainable land management.

***2. Background*:**
In 1994, the South Pacific Regional Environment Programme in collaboration with the UNDP, the Asian Development Bank and the Australian International Development Assistance Bureau undertook a review of the environmental legislation in Tuvalu. The report made a number of conclusions and recommendations regarding environmental legislation in Tuvalu. These included:

- Even where adequate environmental laws are in place, there is evidence of significant regulatory failure, and strategies need to be developed in order to ensure an adequate level of enforcement.

- Consideration of environmental impact should become as much a part of Government decision-making processes as social and economic benefit

- Although detailed land use planning functions should rest with local authorities, it is essential that the overall responsibility for land use and physical planning policies remain with the national Government

- Land use planning provisions are currently contained in a number of pieces of legislation, and it is suggested that consideration be given to consolidating planning functions into new physical planning or land planning legislation. This should contain provisions for heritage protection and environmental assessment of particular development proposals.

- The various pieces of legislation dealing with agricultural activities should be reviewed for the purpose of including provisions relating to the protection of the environment where appropriate. Soil conservation measures and research to improve the agricultural information base, taking into account the needs and aspirations of farmers, would be valuable when it comes to minimising the adverse impact of agricultural activities on the land and devising agricultural strategies.

- Environmental impact assessment should be required as an integral part of the decision-making process relating to application under the Foreshore and Land Reclamation Act for approval to remove sand, coral and rocks from designated foreshore. In light of the severe problems of coastal erosion faced by Tuvalu, consideration should be given to whether decision-making responsibility should be transferred from Local Councils to the Government.

- Environmental impact assessment should be required as an integral part of the decision-making process relating to applications for licences to search for and extract minerals.

- There are serious problems with regard to allocation of responsibility in the area of water supply and sewerage, particularly in relation to the siting of wells, and provision and siting of toilets. There are a number of authorities with related functions but not adequate provision for co-ordination, and grey areas when it comes to regulatory responsibility. Councils appear to carry most of the responsibility, but they must be

provided with adequate resources and effectively supervised by the Government. There should be a single body, such as the Public Health Unit, or a Water Resources Board, with overall responsibility for water supply and sewerage.

- Tuvalu should develop comprehensive legislation dealing with waste minimisation and the disposal of waste on land, including hazardous waste.

While this report was written in 1994, most of what the report suggests is still relevant. The national government still lacks overall environmental protection legislation. This project will undertake public consultations to find the right legislative framework to ensure sustainable land management and to avert any further land degradation on the islands.

The legislation will be developed as three components:

1. National Environmental Legislation: The will be omnibus legislation that will establish an Environment Ministry and National Environmental Protection Department. It will establish the authority of the Minister and the department and their role and functions. A national environmental advisory committee is likely to be established under this legislation.

2. Environmental Assessment Regulations: As an adjunct to the national environmental legislation, environmental assessment regulations will be developed, so that certain activities will be subject to environmental assessment procedures. The purpose of developing regulations rather than distinct legislation is to suit parliamentary procedures in Tuvalu.

3. Sustainable Land Management Regulation: These regulations will establish procedures for ensuring sustainable land management on all the islands. It is likely that the legislation will establish local committees to oversee sustainable land management practices on all the islands. It will prohibit certain acts that may lead to land degradation (.e.g. unlawful tree felling, mining of gravel, waste dumping etc.)

***3. Objectives*:**

- To develop a public awareness and support for national legislation to ensure the sustainable management of land areas in Tuvalu

- To develop effective environmental legislation that is consistent with cultural practices as a means of ensuring sustainable land management and to avert land degradation practices by requiring environmental assessments of projects that are likely to degrade the environment.

***4. Priority Addressed*:**
4.1 Providing Enabling Activities
4.3 Prevention of Land Degradation
4.5 Establishment of Sustainable Land Management Plans
4.7 Integrating of Traditional Knowledge into Modern Ways

***5. Location*:**
The project will develop nationally based legislation to cover all islands.

***6. Duration*:**
The process of public consultation and drafting of legislation will take 18 months. The establishment of an Environment Assessment Officer in the Department of Environment will be funded initially for a period of 3 years with an extension of this time through internal government funding.

7. Activities

- Undertake public consultations on all the islands to seek views on the best legislative arrangements
- Review of environmental legislation in other Pacific Island countries
- Preparation of information leaflet on new legislation
- Drafting legislation and circulation of draft for public comment
- Review of public comments on draft legislation
- Revision of draft legislation based on public comment
- Preparation of Cabinet Brief and submission of final legislation to Parliament
- Restructuring of Department of Environment to encompass new legislation
- Employment of Environmental Assessment Officer in the Department of the Environment

8 Implementing Organizations:

- The Department of Environment in collaboration with Department of Lands & Survey, Attorney General's Office and island Kaupule.
- Public consultations undertaken in collaboration with the Tuvaluan Association of Non Government Organisations (TANGO)

9. Cost Estimates	$USD
Undertake public consultations on all the islands to seek views on the best legislative arrangements	$10,000
Review of environmental legislation in other Pacific Island countries	$5,000
Preparation of information leaflet on new legislation	$5,000
Drafting legislation and circulation of draft for public comment	$20,000
Review of public comments on draft legislation	$5,000
Revision of draft legislation based on public comment	$5,000
Preparation of Cabinet Brief and submission of final legislation to Parliament	$500
Restructuring of the Department of Environment to encompass new legislation	$5,000

Employment of Environmental Assessment Officer in the Department of the Environment (3 years)	$75,000
TOTAL	**$120,000**

***10. Expected Outcomes*:**

- Greater public awareness of land degradation issues and a willingness to support national legislation
- The development of effective legislation at the national level which will mesh with local council initiatives to protect land resources from degradation

5.4 Water Catchment Development - Funafuti

***1. Project Title*: Funafuti Airstrip Water Catchment Development Project**

***2. Background*:**

Tuvalu being a series of coral atolls, the search for a sustainable supply of freshwater is an ongoing problem. There are no rivers or dams. The provision of freshwater on the island of Funafuti (the capitol of Tuvalu) is becoming a significant problem. Groundwater lenses have been contaminated by human and animal waste as well as sea water intrusion. Freshwater is used for a variety of purposes, including for drinking and washing as well as for irrigation of taro (pulaka) crops and other agricultural products.

The migration of people from the outer islands to Funafuti in search of employment has meant that the island can no longer provide sufficient freshwater from traditional tanks and cisterns. A water desalination plant has been established to meet the growing needs for freshwater however this plant is expensive to run and energy intensive making it of limited value to the community at large.

The project will aim to convert the tar-sealed airstrip on Funafuti into a water catchment. Runoff from the airstrip will be collected in specially designed drains and then pumped into storage tanks for use for agriculture. The quality of the water captured by the airstrip is unlikely to be of sufficient quality for drinking but it may be used for irrigating pulaka and other crops and for cleaning pig pens used for the production of methane.

A pig pen methane digester was recently installed beside Funafuti but the project failed to produce methane because the pens were flushed out with sea water. The micro-organisms used to break down the pig waste and produce methane were killed by the saltwater. A more reliable supply of freshwater would alleviate this problem. Furthermore the airstrip water would divert current demands for freshwater.

The design of the water catchment would need to be consistent with international aviation regulations and would need to be able to withstand inundation from seawater during high spring tides and severe weather events when sea water may wash across parts of the island.

The international airstrip in the Marshall Islands (another coral atoll nation) is used as a water catchment. Funafuti project could learn from the experience gained from the Marshall Islands though there would be notable differences due to public access issues on Funafuti.

***3. Objectives*:**
To provide a new supply of freshwater at a quality suitable for agriculture and animal husbandry standards through the use of rainwater captured by the Funafuti airstrip.

***4. Priorities Addressed*:**
4.3 Prevention of Land Degradation
4.6 Monitoring and Mitigating the Impact of Drought

***5. Location*:**
Funafuti International Airport

6. Duration
18 months

7. Activities
- Undertake study of water catchment facility in the Marshall Islands
- Review international civil aviations standards for airstrips
- Undertake community consultation to find suitable design requirements for water supply and design limitations due to other activities associated with the airstrip (e.g. sporting activities, access etc.)
- Develop design for water capture and storage based on airstrip
- Construct water capture and storage facilities
- Construct water distribution system

8. Implementing Organizations
Public Works Division in collaboration with the Department of Environment

9. Cost Estimates	**$USD**
Undertake study of water catchment facility in the Marshall Islands	$4,000
Review international civil aviations standards for airstrips	$1,000
Undertake community consultation to find suitable design requirements for water supply and design limitations due to other activities associated with the airstrip (e.g. sporting activities, access etc.)	$6,000
Develop design for water capture and storage based on airstrip	$10,000

Construct water capture and storage facilities	$1,500,000
Construction of Header Tanks	$60,000
Civil Works materials (pumps, pipes, timbers, cement)	$250,000
Construction Equipments	$120,000
Transportation Cost	$65,000
Construct water distribution system (Reticulate system)	$200,000
TOTAL	**$2,216,000**

10. Expected Outcomes

- The development of a new sustainable freshwater supply for the island of Funafuti based on water captured from runoff from the airstrip.
- The provision of freshwater for cleaning pig pens that will allow the production of methane from the pigpens and hence provide a renewable energy source for cooking on the island of Funafuti
- Reduced demand for freshwater taken from household water tanks, thereby increasing the availability of drinking water in times of drought

5.5 Protected Area Survey

***1. Project Title*:** Tuvalu Land-Based Protected Area Survey Project

***2. Background*:**
Land degradation is a growing problem on all the islands of Tuvalu. Currently there are no land-based protected areas to help protect land from degradation and to protect important species and habitats from extinction or degradation. Some land is protected by traditional *Kaupule* laws and other traditional practices, however this system is being eroded as the population on islands grows. New areas are continuing to be cleared of vegetation as a means of identifying ownership. These practices are leading to land degradation.

The project will survey each of the islands and identify key areas for protection. Land areas around lagoons, isolated islets, and other important habitats will be selected. The community will be consulted and encouraged to nominate areas for protection. A major component of the project will be a community and school education programme on the value of protecting important habitats. Elders from each of the island communities will be engaged to seek their support and endorsement of the project.

A follow-up phase to the project will be to develop specific legislation to ensuring that land identified as a protected area can be properly protected. Once the legislation is enacted, selected high priority areas will be designated as protected areas. Community protected area committees

will be established to ensure that communities are supportive of the establishment and maintenance of these protected areas. A protected area unit will be established with the Environment Division to oversee the selection and maintenance of these areas.

3. Objectives

- To undertake a survey of all islands and identify key areas subject to existing or potential land degradation which could be established as protected areas under community-based management.
- To develop community and school education programmes to engender public support for the development of protected areas.

4. Priorities Addressed

4.1 Providing Enabling Activities
4.2 Land Degradation Inventory and Monitoring
4.3 Prevention of Land Degradation
4.4 Rehabilitation of Degraded Land

5. Location

All islands of Tuvalu

6. Duration

2 years

7. Activities

- Undertake a remote assessment of suitable sites for potential protected areas
- Develop community and school education materials on the importance of protected areas
- Undertake field surveys of all lands identified in the remote assessment
- Map all identified lands and carry out land ownership survey
- Assess possible compensation mechanisms for land owners whose land has been identified as potential protected areas
- (Move to second phase of project subject to available finances- legislation, designation of protected areas and employment of compensation mechanisms for affected land owners)

8. Implementing Organizations

Department of Environment in collaboration with Department of Lands and Survey and *Kaupule* in each of the islands
Island Care (NGO)
WWF Pacific
Conservation International

9. Cost Estimates	**$USD**
Undertake a remote assessment of suitable sites for potential protected areas	$10,000

Develop community and school education materials on the importance of protected areas	$10,000
Undertake field surveys of all lands identified in the remote assessment	$20,000
Map all identified lands and carry out land ownership survey	$10,000
Assess possible compensation mechanisms for land owners whose land has been identified as potential protected areas	$5,000
TOTAL	**$55,000**

10. Expected Outcomes

- The identification of land suitable for the establishment of protected areas
- Public support and understanding of the need to protect areas from land degradation

5.6 Integrated Solid Waste Management

1. Project Title: Integrated Solid Waste Management Project - Funafuti

***2. Background*:**
Increasing population growth on Tuvalu's capital, Funafuti, coupled with changes in consumer patterns has created a significant solid waste management problem on the island. Traditionally most consumer goods used by Tuvaluans were biodegradeable and were disposed of as compost or through burning. Today however, the ever increasing presence of plastic bags and bottles, tin cans, and other household products is a growing problem.

Some wastes present special problems for Tuvalu because of the lack of any viable recycling or disposal options. These include but not limited to; car bodies, tyres, domestic whitegoods, computers, low-grade scrap metal, dry– and wet–cell batteries, non-recyclable plastics, and disposable nappies.

The generation and disposal of wastes has direct and indirect impacts on Tuvalu's sustainable development. Wastes materials cause significant pollution problems with runoff from solid waste disposal sites creating nutrient inflows into Vaiaku Lagoon marine ecosystem which in turn creates a build up of algae, killing off vital coral reefs and sea grass beds. Runoff from waste is also linked to ciguatera poisoning and other human health issues.

On Funafuti old gravel extraction pits created by the US in World War II to build the airstrip on Funafuti have become the sites for solid waste disposal. These pits often fill with sea water during high tides leaving large pools of putrid water. Children playing in or near these pits are subject to a variety of skin disease problems and health risks. They also create breeding grounds for mosquitoes which are carriers of various diseases including dengue.

Waste management was identified as a strategic issue for the sustainable development of Small Island Developing States including Pacific Islands, at the UN General Assembly Special Session on the Sustainable Development of SIDS held in September 1999 in New York and was again identified as a strategic issue for addressing in the Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States (SIDS) in January 2005.

The availability of suitable landfill sites is a major problem for an atoll nation like Tuvalu. Integrated solid waste management strategies need to be employed to address this ever increasing problem. Developing a solid waste management strategy on a small atoll requires a fully integrated approach. This must be based on the principle of the four "R's"

Reduce: reduction of waste at the source by for example, the purchase and use of bulk goods rather than those with a high packaging content;
Reuse: repeated use of a product in the same, similar or different ways, for example the reuse of glass drink bottles and used tyres;
Recover: refers to the use of waste materials so as to recover some residual value, for example the use of waste oil as a supplementary fuel, and composting of green waste
Recycle: this is done with materials such as aluminium cans, lead from wet-cell batteries, cupboards and paper and glass, which can be reprocessed, back to their original form

***3. Objectives*:**

- To create an integrated solid waste management system on the island of Funafuti as a means of reducing human and environmental health and land degradation problems associated with poor waste management.
- To create greater public awareness of the need to reduce waste production and the participate in recycling programmes

4. Priorities Addressed
4.1 Providing Enabling Activities
4.3 Prevention of Land Degradation
4.4 Rehabilitation of Degraded Land

5. Location
Funafuti

6. Duration
3 years

7. Activities
The development of an integrated solid waste management project has four components associated with the four "Rs"

Reduce:

- Development of waste reduction regulations to prohibit the import and use of certain goods such as plastic bags, used cars over a certain age and products with high levels of packaging

Reuse:

- Waste separation and reuse scheme through the establishment of a waste transfer depot. Waste products would be collected from households in Funafuti using a specially designed truck then delivered to the transfer depot where the waste would be separated according to its type. Tyres and other products which could be separated
- Small enterprises would be encouraged to develop products based on the use of re-useable products such as tyres
- Glass can be removed and crushed to make fine particle sand for land reclamation activities

Recover:

- At the waste transfer depot plant and vegetative matter would be placed in a composting bin for soil production
- Waste oil and other recoverable products would be collected. Toxic chemicals, paints, white goods containing ozone depleting substances, etc would be put aside for proper storage and management.

Recycle:

- Aluminium cans, scrap copper, lead from wet-cell batteries would be collected in shipping containers and shipped overseas for sale.
- The government will develop container deposit legislation that will place a deposit price on container goods so that they can be returned once used and used again where appropriate or placed in recycle bins. Shop owners would pay returnees the deposit on the containers.

Residuals:

- The residual material left over from the reduce, reuse, recover and recycle transfer depot would then be sent to selected gravel pits where it would be compacted by a bulldozer. All efforts need to be made that waste is sufficiently compacted to stop the creation of breeding sites for mosquitoes and to prohibit contaminated runoff to flow into the lagoon

8. Implementing Organizations

Waste management section of the Department of Environment in collaboration with the Funafuti Kaupule

9. Cost Estimates	**$USD**
Development of waste reduction regulations	$5,000
Enforcement of waste regulations by Customs	$15,000
Establishment of waste transfer depot	$40,000

Collection truck for waste	$80,000
Government support for small recycling Enterprises	$50,000
Glass crusher	$40,000
Composting bins	$50,000
Waste oil and paint containers	$50,000
Containers for recyclable products	$40,000
Development of container deposit legislation	$30,000
Bulldozer for waste compaction	$200,000
TOTAL	**$590,000**

10. Expected Outcomes

- Reduced land degradation through indiscriminate waste disposal
- Development of small enterprises based on product recycling
- Improved health from reduction of disease vectors and contact with waste
- Improved visual amenity by efficient waste management
- Reduced waste production and reduced need to find additional landfill sites
- Reduced nutrient inflow into the Fongafale Lagoon
- Improved recovery of ozone depleting substances
- Reduced likelihood of ciguatera poisoning
- Production of enriched soil from composting

6. References

Abbott D., Pollard S (2004). "Hardship and Poverty in the Pacific – Pacific Studies Series" (ADB).

Asian Development Bank, 2003. "Priorities of the People: Hardship in Tuvalu". Asian Development Bank, December 2003.

Asian Development Bank, 2003. "Tuvalu Poverty Discussion Paper". Government of Tuvalu & Asian Development Bank, August 2003.

Central Statistics Division, Government of Tuvalu, 1991.TUVALU 1991 Population Census.

Fairbairn, Te'o Ian. 1993. *Tuvalu: Economic Situation and Development Prospects*. Australian International Development Assistance Bureau (AIDAB), Canberra, Australia.

Government of Tuvalu, 1999. "Tuvalu Initial Communication to United Nations Framework Convention on Climate Change", Report to UNFCCC, October 1999.

GOT (Government of Tuvalu,). 2000. "First National Report of Tuvalu to United Nations Convention to Combat Desertification (UNCCD), April 2000.

GOT (Government of Tuvalu,). 2002. "Second National report of Tuvalu to the United Nations Convention to Combat Desertification (UNCCD), April 2002.

Government of Tuvalu, 2002 Population and Housing Census

Government of Tuvalu, 2004, "Kakeega II o Tuvalu 2005 - 2015: National Strategies for Sustainable Development", Government of Tuvalu, August 2004.

International Water Programme, 2004. "IWP Funafuti Community Baseline Assessement Report". Government of Tuvalu.

Knapman, Bruce, Malcolm Ponton, and Colin Hunt. 2002. *Tuvalu 2002 Economic and Public Sector Review*. ADB, Manila, Philippines.

Lane, J. 1993. Tuvalu State of the Environment Report (SOE). Report for SPREP.
McLean R F., Hosking P L., (1991). Tuvalu Land Resources Survey – Country Report (FAO) AG; TUV/80/011

Secretariat of the Pacific Community. 2005. Tuvalu 2002: Population and Housing Census. Administrative report and Basic tables. Noumea, New Caledonia: Secretariat of the Pacific Community.

Secretariat of the Pacific Community. 2005. Tuvalu 2002: Population and Housing Census. Volume 1. Analytical report. Noumea, New Caledonia: Secretariat of the Pacific Community.

Secretariat of the Pacific Community. 2005. Tuvalu 2002: Population and Housing Census. Volume 2. Demographic profile, 1991 – 2002. Noumea, New Caledonia: Secretariat of the Pacific Community.

Seluka S., Panapa T., Maluofenua S., Samisoni, Tebano T., (1998). "A preliminary listing of Tuvalu Plants, Fishes, Birds, and Insects" by The Atoll Research Programme, University of the South Pacific, Tarawa, Kiribati.

SPREP, 1997. Tuvalu National Environment Management Strategy (NEMS). Grano, S, Sharp, R, and Henson, B (eds), SPREP Report.