Annex 1

Climate Risk Profile for Samoa

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Report Prepared by

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Summary

The likelihood (i.e. probability) components of climate-related risks in Samoa are evaluated for both present day and future conditions. Changes over time reflect the influence of global warming.

The risks evaluated are extreme rainfall events (both six-hourly and daily), drought, high sea levels, extreme winds and extreme high air and water temperatures.

Projections of future climate-related risk are based on the output of global climate models, for given emission scenarios. All the likelihood components of the climate-related risks show increases as a result of global warming, though for some the increases are small relative to the uncertainties.

Best estimates of long term, systematic changes in the average climate for Samoa indicate that by 2050 sea level is likely to have increased by 36 cm, rainfall by 1.2%, extreme wind gusts by 7% and maximum temperatures by 0.7 C.

The observed long term trend in relative sea level for Apia is 5.2 mm/yr. But maximum hourly sea level is increasing by approximately 8 mm/yr, a rate far in excess of the observed local and global trends in mean sea level. For Apia an hourly sea level of 1.8 m above mean sea level is currently a 100-year event. It will likely be at least a four-year event by 2025.

No significant long term trends are evident in the observed daily, monthly, annual or maximum daily rainfall. Currently a daily rainfall of at least 300 mm is a relatively rare event at Apia, with a return period of 14 yr. There is large uncertainty in the rainfall projections, with two models suggesting substantial increases in rainfall, one model suggesting only small increases, and one model indicating a large decrease in rainfall into the future. An extreme daily rainfall of 400 mm is currently a 60-year event. It will likely be a 40-year event by 2050. An extreme six-hourly rainfall of 200 mm is currently a 30-year event. It will likely become a 20-year event by around 2050.

A monthly rainfall below the ten percentile is used as an indicator of drought. Drought frequency is strongly linked to the occurrence of El Niño events. Six global climate models that were best out of 19 at simulating present day ENSO conditions show no significant changes toward El Niño-like conditions in the latter part of the current century. Therefore it is not yet possible to make any predictions about the future nature of El Niño events and the implications for the frequency, duration and intensity of droughts in Samoa.

Currently an extreme wind gust of 70 kt at Apia has a return period of 75 years. This will reduce to approximately 40 years by 2050.

There is relatively high confidence in projections of maximum air temperature. A maximum air temperature of 34 C is currently well in excess of a 100-year event. By 2050 it will likely have a return period of 40 years

Introduction

Formally, risk is the product of the likelihood (i.e. probability) of an event or happening, normally referred to as a “hazard”, and the consequence of that hazard.

While the consequence component of a climate-related risk will be site or sector specific, in general the likelihood component of a climate-related risk will be applicable over a larger geographical area, and to many sectors. This is due to the spatial scale and pervasive nature of weather and climate. Thus the likelihood of, say, an extreme climate event or anomaly, is

often evaluated for a country, state, small island or similar geographical unit. While the likelihood may well vary within a given unit, there is often insufficient information to assess this spatial variability, or the variations are judged to be of low practical significance.

This climate risk profile (CRP) is based on observed data for Apia (Latitude 13 50 S; Longitude 172 00 E). The cooperation and assistance of the staff of the Meteorology Division, Ministry of Natural Resources, Environment and Meteorology, Government of Samoa, and of the National Tidal Centre, Australian Bureau of Meteorology is acknowledged with gratitude. While data for Apia cannot characterize the climate conditions for all of Samoa, they do provide a general indication of current climate risks facing the country. The CRP can also be extended by analysing data from other locations in Samoa.

Future changes in climate are based on the output of GCMs, and are for a grid square covering a large portion of Upolu and adjacent areas. The climate projections are therefore more reflective of changes for the country as a whole, rather than just the Apia area.

The following hazards are considered to be among the potential sources of climate-related risk:

- extreme high rainfall events;
- drought;
- high sea levels;
- damaging winds; and
- extreme high air temperatures.

Methods

Preparation of a CRP for a given geographical unit involves an evaluation of current likelihoods of all relevant climate-related risks, based on observed and other pertinent data.

Future changes in risk are estimated using the outputs of selected GCMs[1] run for a range of greenhouse gas emission scenarios (Figure 1). Table 1 lists the combination of models and emission scenarios on which the CRP is based.

Differences in the climate projections give rise to uncertainties in the estimated values of future climate risks. There are numerous sources of uncertainty in projections of the likelihood components of climate-related risks. These include uncertainties in greenhouse gas emissions as well as in modelling the complex interactions and responses of the atmospheric and ocean systems. Policy and decision makers need to be cognizant of uncertainties in projections of the likelihood components of extreme events.

Best estimates of future risk levels are based on an average of the estimates using a multi model and emission scenario ensemble. The range in uncertainty is determined using a model and emission scenario combination that produces the maximum and minimum rate of change in future risk levels.

Estimates of future changes in the frequency of drought use the daily data generated by the Canadian Climate Centre GCM (CGCM).

[1] Hadley Centre (United Kingdom) , Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO), Japan's National Institute for Environmental Science (NIES), the Canadian Climate Centre GCM (CGCM) and the Goddard Fluid Dynamics Laboratory (GFDL).

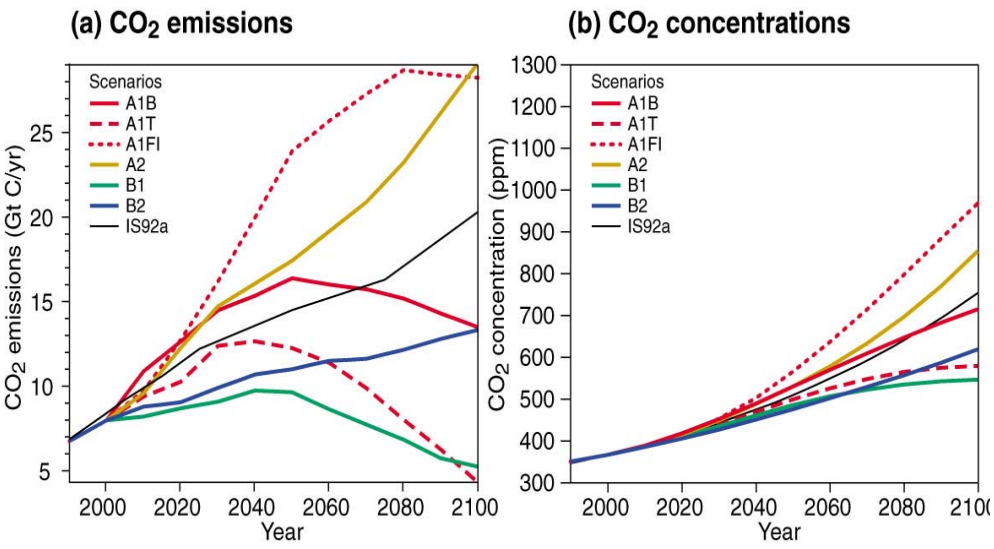

Figure 1 Scenarios of CO_2 gas emissions and consequential atmospheric concentrations of CO_2 (from IPCC, 2001).

Table 1

Available Combinations of Global Climate Models and Emission Scenarios[1]

	CGCM[2]	CSIRO	Hadley	NIES	GFDL	See Text
A1B	T, P, S	T, P, S	T, P, S	T, P	S	W
A1F	T, P, S	T, P, S	T, P, S	T, P	S	W
A1T	T, P, S	T, P, S	T, P, S	T, P	S	W
A2	T, P, S	T, P, S	T, P, S	T, P	S	W
B1	T, P, S	T, P, S	T, P, S	T, P	S	W
B2	T, P, S	T, P, S	T, P, S	T, P	S	W

[1] T = temperature, P = precipitation, S = sea level, W = wind
[2] In addition to monthly data, daily data are available for this model, but for the A2 and B2 emissions scenarios only.

Data Specifications and Terminology

The *return period* (sometimes referred to as the *recurrence interval*) is used as a measure of the likelihood of an extreme event. The *return period* is a statistical estimate of how often an extreme event of a given magnitude is likely to be equalled or exceeded. Thus the "hundred-year event" is one which will, on average, be equalled or exceeded once in any hundred-year period. It does not mean that that the event occurs every hundred years. In fact, in every year there is a 1 percent chance that an event with a 100 year return period will occur.

Sea Level

a) Current Risks Levels

Figure 2 shows daily mean values of sea level for Apia, relative to mean sea level. There are large interannual variability and extremes (both high and low) in sea level, as well as a long term trend of increasing sea level. The observed long term trend in sea level for Apia is 5.2 mm/yr. This is greater than the estimated range of global sea-level rise over the past century, namely 1 to 2 mm/yr.

The National Tidal Centre, Australian Bureau of Meteorology reports a 3.7 mm/yr increase in relative sea level at Apia for the period of record, after vertical movements in the observing platform and the inverted barometric pressure effect have been taken into account.

Even more extreme high sea levels are evident in the mean hourly sea level data. Figure 3 presents the maximum mean hourly sea level, by year, for Apia. Such exceptionally high sea levels are associated with flooding, accelerated coastal erosion and salt water intrusion into groundwater. Extreme high sea levels associated with El Niño events are clearly evident. The long term trend in the extreme hourly sea levels is 8.2 mm/yr. This is substantially greater than the trend for the daily mean sea level.

An hourly sea level of 1.7 m above mean sea level is a relatively rare event for Apia, with a return period of approximately 40 yr (Figure 4 and Table 2).

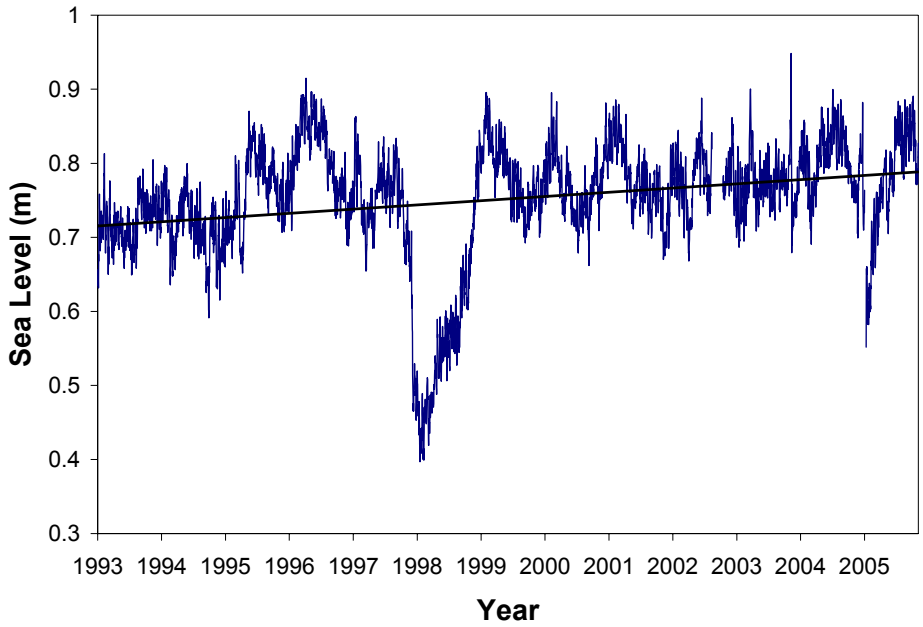

Figure 2 Daily sea level for Apia (1993 to 2005), relative to mean sea level. Also shown is the linear trend in sea level over the same period (5.2 mm/yr).

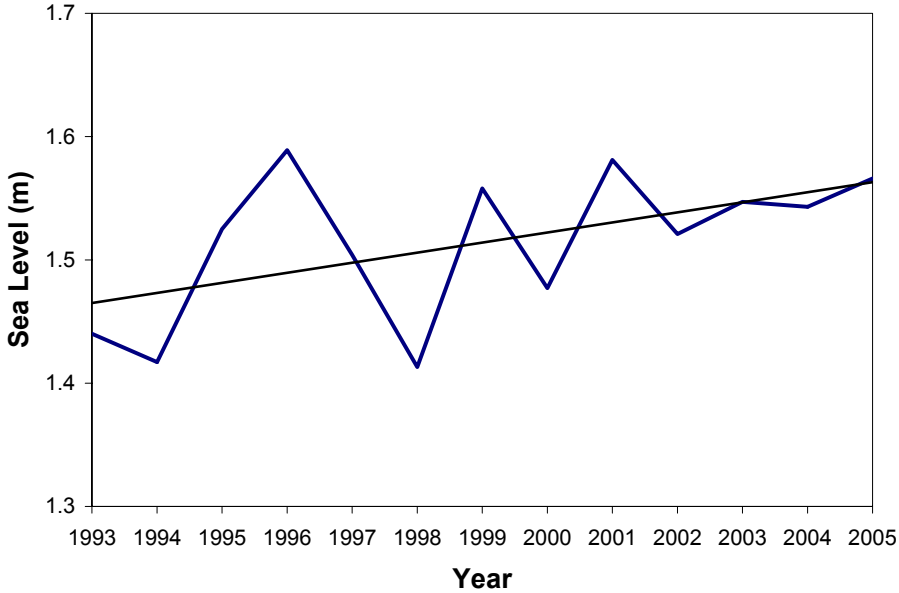

Figure 3 Maximum hourly sea level, by year, for Apia (1993 to 2005). Also shown is the linear trend in sea level over the same period (8.2 mm/yr).

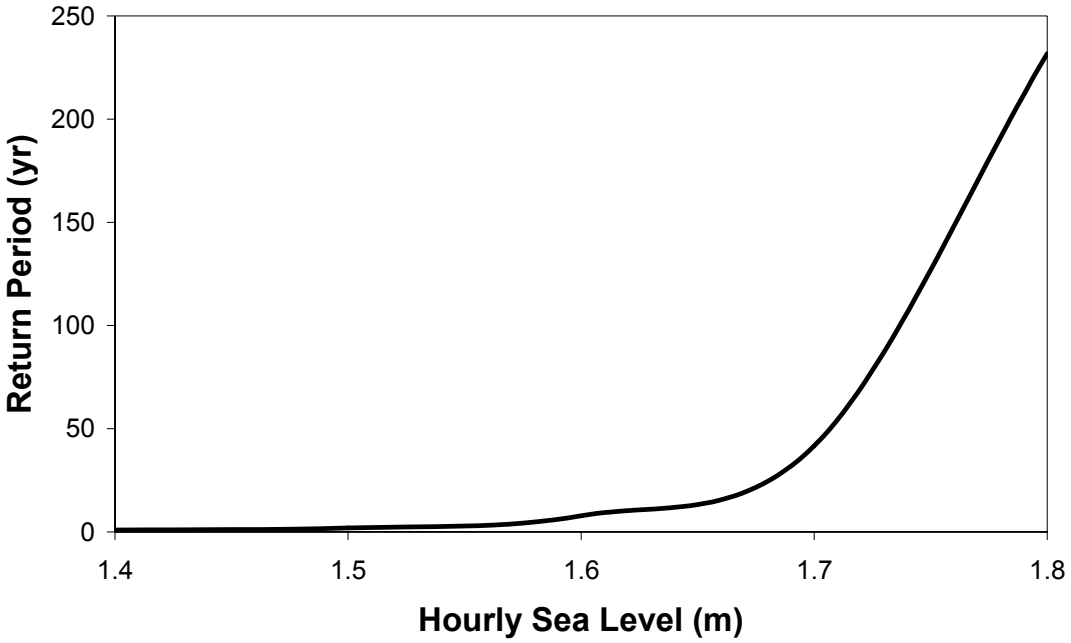

Figure 4 Relationship between hourly sea level and return period for Apia, based on observed hourly sea level for 1993 to 2005.

Table 2

Return Periods (yr), for Hourly Sea Level (m) at Apia

Sea Level (m) of at Least	Observed	2025	2050	2075	2100
1.4	1	1	1	1	1
1.5	1.9	1	1	1	1
1.6	7.8	1	1	1	1
1.7	42	2	1	1	1
1.8	232	8.6	1.1	1	1
1.9	1300	46	3	1	1
2.0	7300	254	14	1.2	1

b) Projected Risk Levels

Best estimates of future sea-level rise are based on an average of the estimates using a multi model and emission scenario ensemble (see Table 1). Figure 5 shows the best estimate of mean sea level out to 2100, as well as the band of extreme uncertainty. The latter is estimated using the highest and lowest estimates of sea-level rise for all model and emission scenario combinations.

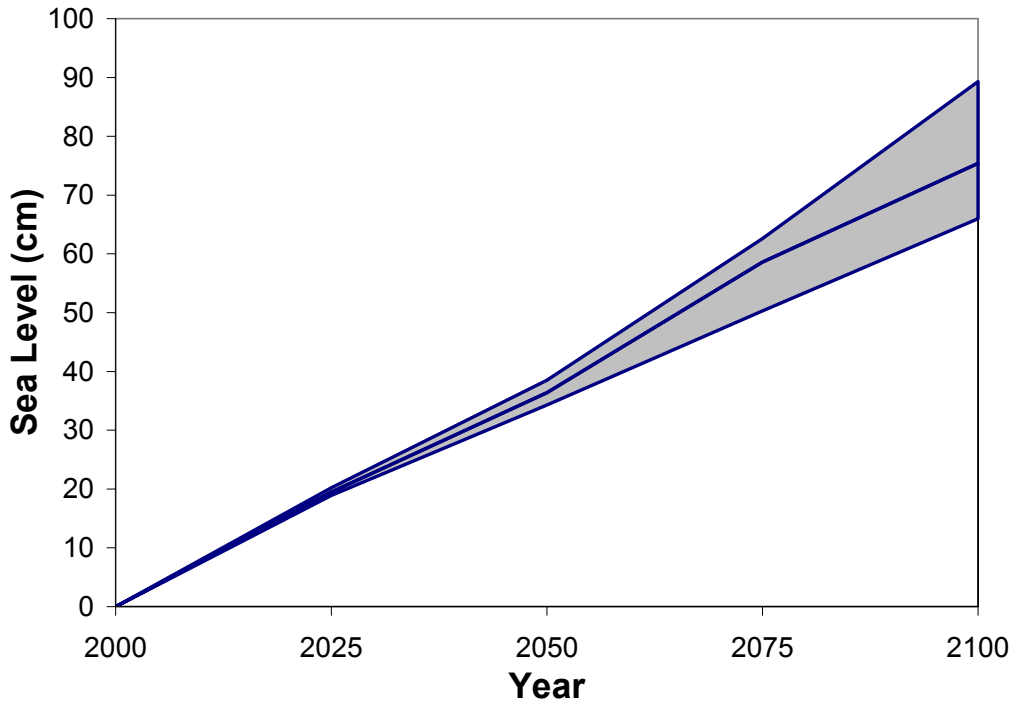

Figure 5 Best estimate of projected increase in mean sea level for Apia, along with the uncertainty envelope as given by the maximum and minimum estimates using all possible combinations of the available global climate models and emission scenarios.

As indicated in Figure 6 and Table 2, global warming will also have a significant impact on the return periods of extreme high sea levels that persist for at least an hour. For example a sea level 175 cm is currently a 100-year event. It will likely be a 4-year event by 2025. Figure 6 also shows the low level of uncertainty in future projections of sea level extremes.

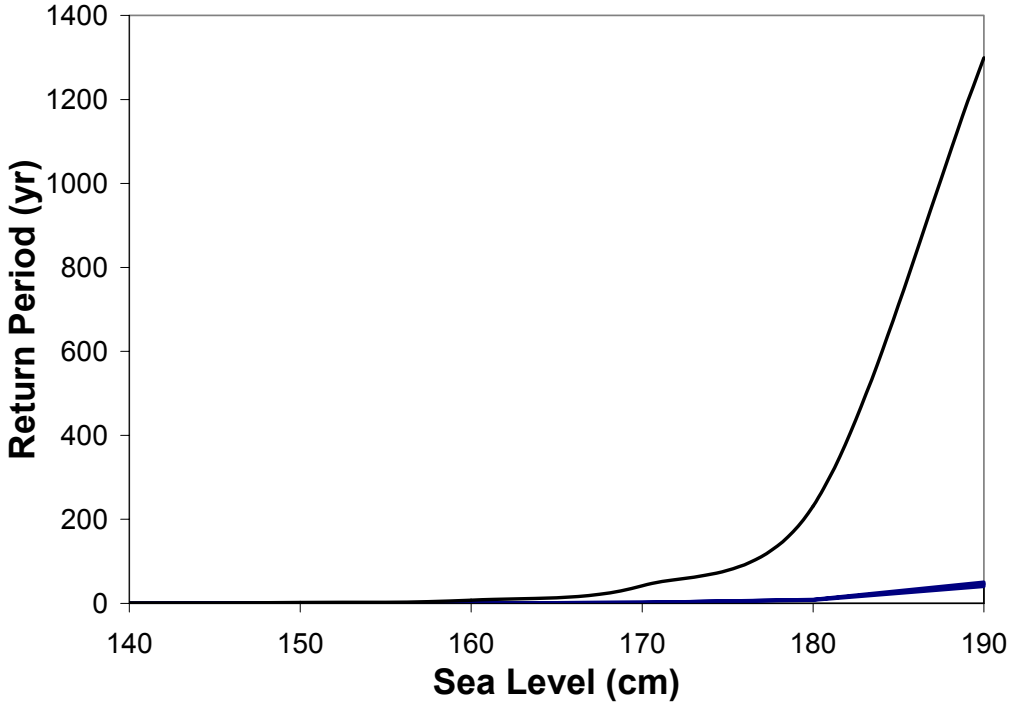

Figure 6 Relationship between hourly sea level and return period for Apia, for present day (black line) and 2025 (blue lines). The uncertainty envelope shows the maximum and minimum estimates of return periods for 2025, based on all possible combinations of the available global climate models and emission scenarios.

Daily Rainfall

a) Current Risks Levels

Figure 7 shows daily rainfall for Apia. High variability, including extremes, is readily apparent. This is also the case for the longer term monthly and annual rainfall data (Figures 8 and 9, respectively). No significant long term trends are evident in any of the three time series.

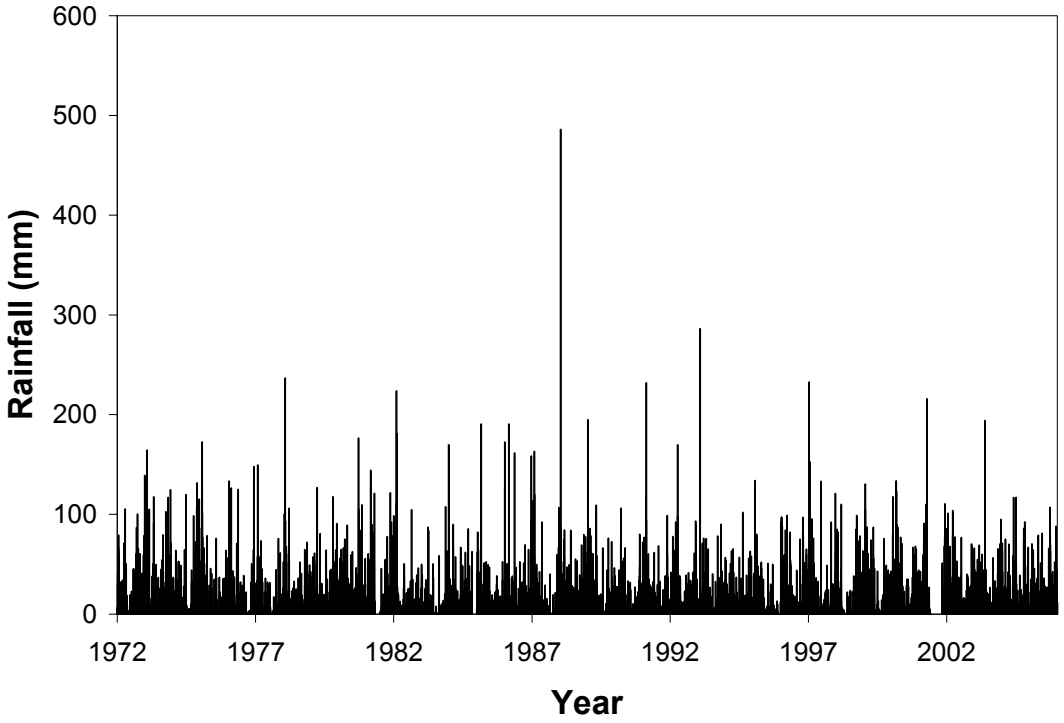

Figure 7 Daily rainfall for Apia (1972 to 2005).

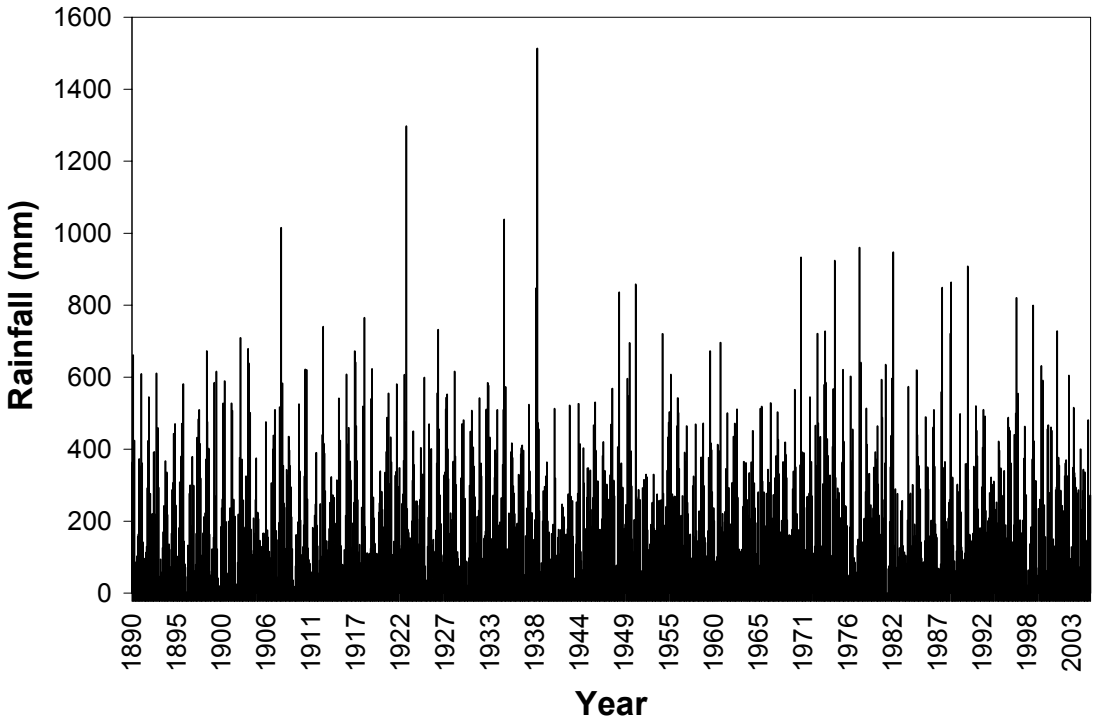

Figure 8 Total monthly rainfall for Apia (1890 to 2005).

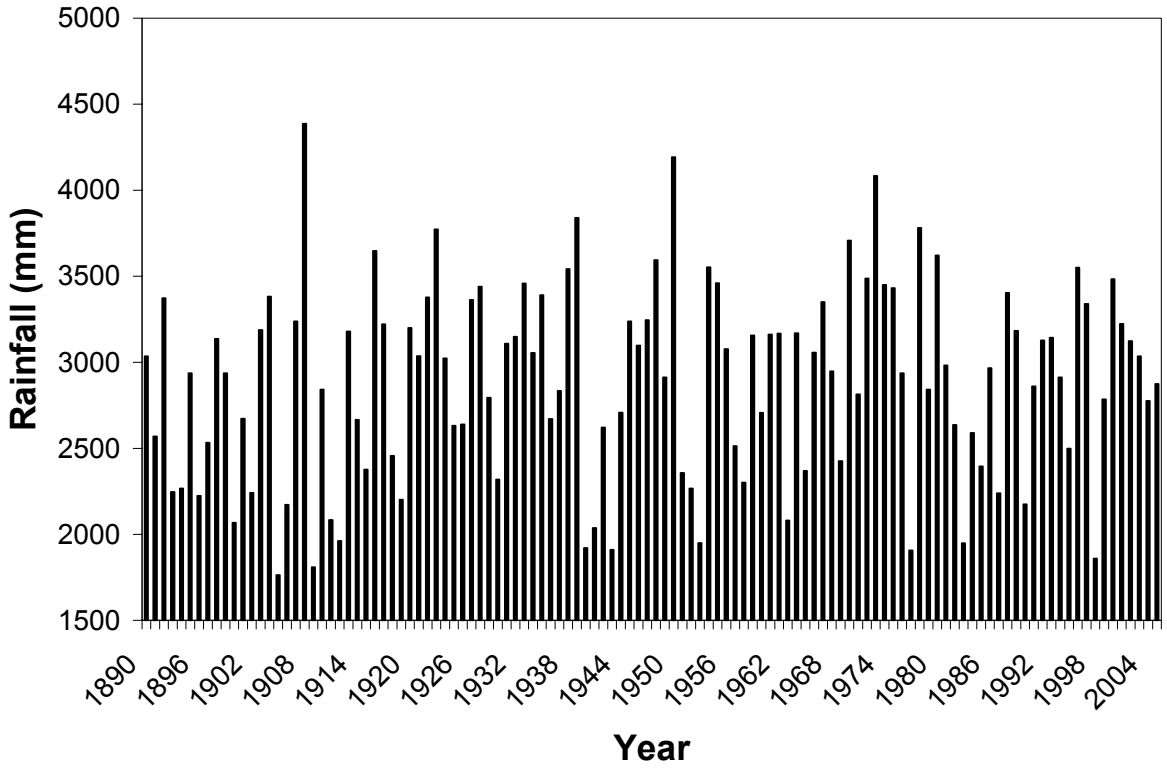

Figure 9 Total annual rainfall for Apia (1890 to 2005).

Figure 10 presents the annual maximum daily rainfall for Apia. Again, considerable interannual variability in extreme rainfall occurrences is evident. A daily rainfall of at least 300 mm is a relatively rare event at Apia, with a return period of approximately 14 yr (Figure 11 and Table 3).

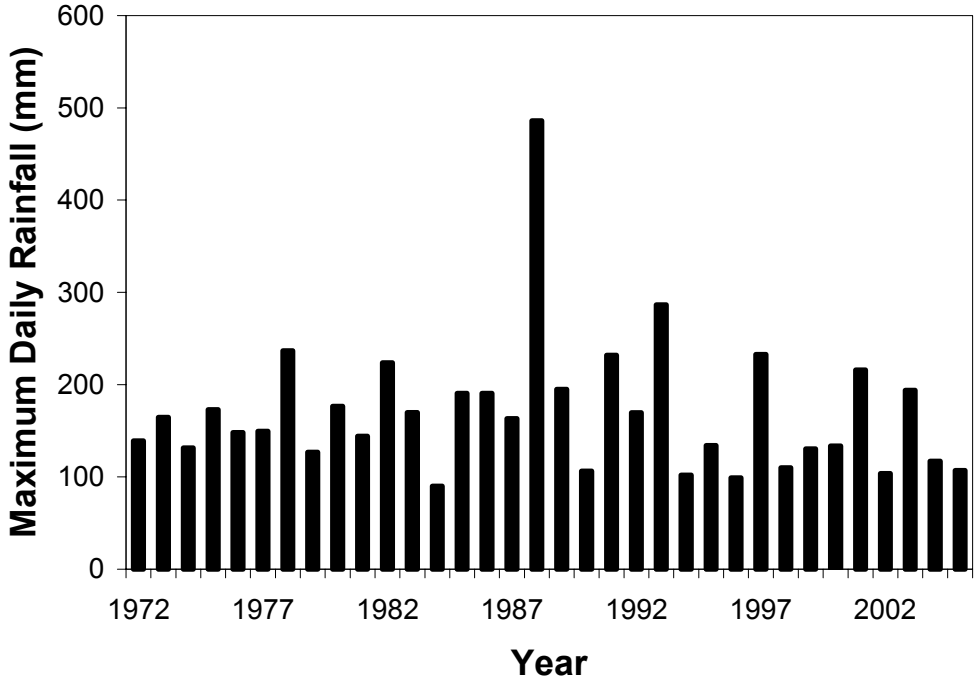

Figure 10 Maximum daily rainfall, by year, for Apia (1972 to 2005).

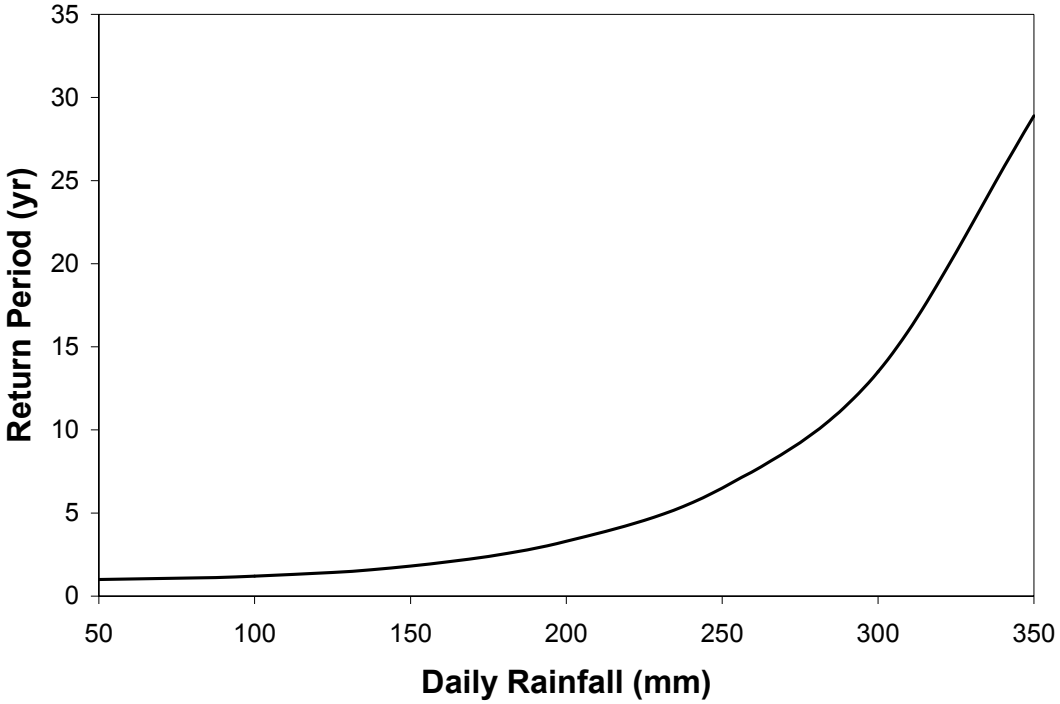

Figure 11 Relationship between daily rainfall and return period for Apia, based on observed daily rainfall for 1972 to 2005.

Table 3

Return Periods (yr), for Daily Rainfall (mm) at Apia

Daily Rainfall (mm) of at Least	1942-2005	2025	2050	2075	2100
175	2.4	2.3	2.3	2.2	2.2
200	3.5	3.1	3.0	2.9	2.7
225	4.6	4.3	4.0	3.8	3.6
250	6.5	6.0	5.5	5.1	4.7
275	9.3	8.4	7.6	6.9	6.3
300	14	12	11	9.4	8.4
325	20	17	15	13	11
350	29	25	21	18	16
375	42	35	30	25	21
400	62	51	42	35	29

b) Projected Risk Levels

Best estimates of changes in daily rainfall are based on an average of the estimates using a multi model and emission scenario ensemble (see Table 1). Figure 12 shows the best estimate of mean annual rainfall out to 2100, as well as the band of extreme uncertainty. The latter is estimated using the highest and lowest estimates of daily rainfall, for all model and emission scenario combinations. It is clear that there is large uncertainty in the rainfall projections, with two models suggesting substantial increases in rainfall, one model suggesting only small increases, and one model indicating a large decrease in rainfall into the future.

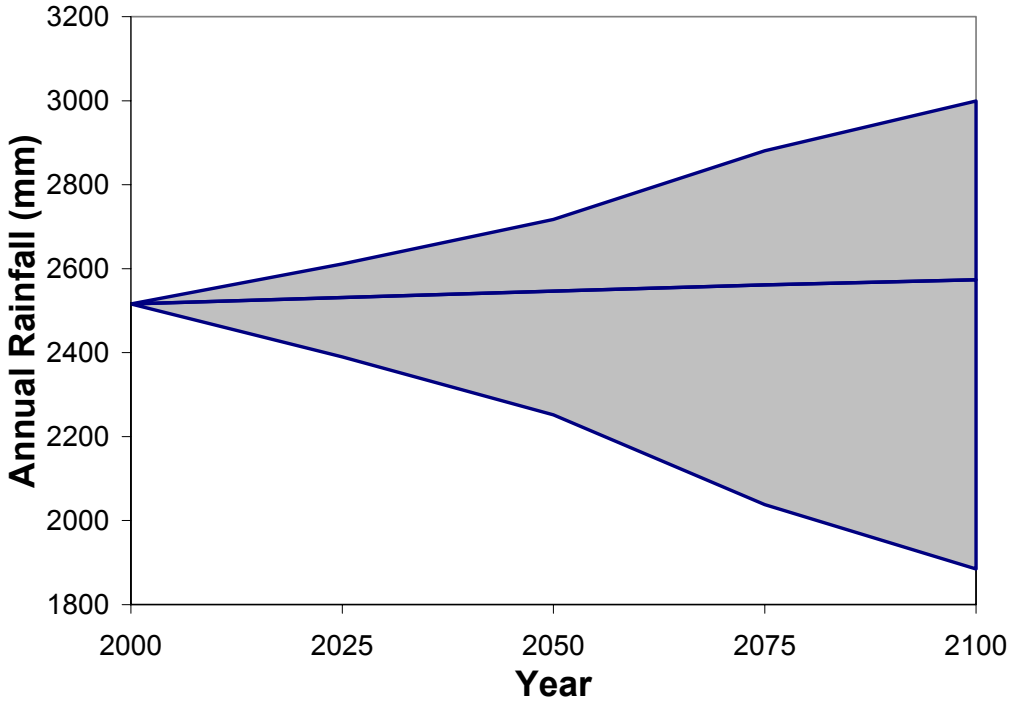

Figure 12 Best estimate of projected change in mean annual rainfall for Apia, along with the uncertainty envelope as given by the maximum and minimum estimates using all possible combinations of the available global climate models and emission scenarios.

As indicated in Table 3 and Figure 13, global warming will likely reduce the return periods of extreme daily rainfall events, despite the small change anticipated for the mean rainfall. But Figure 13 also shows that again there is large uncertainty.

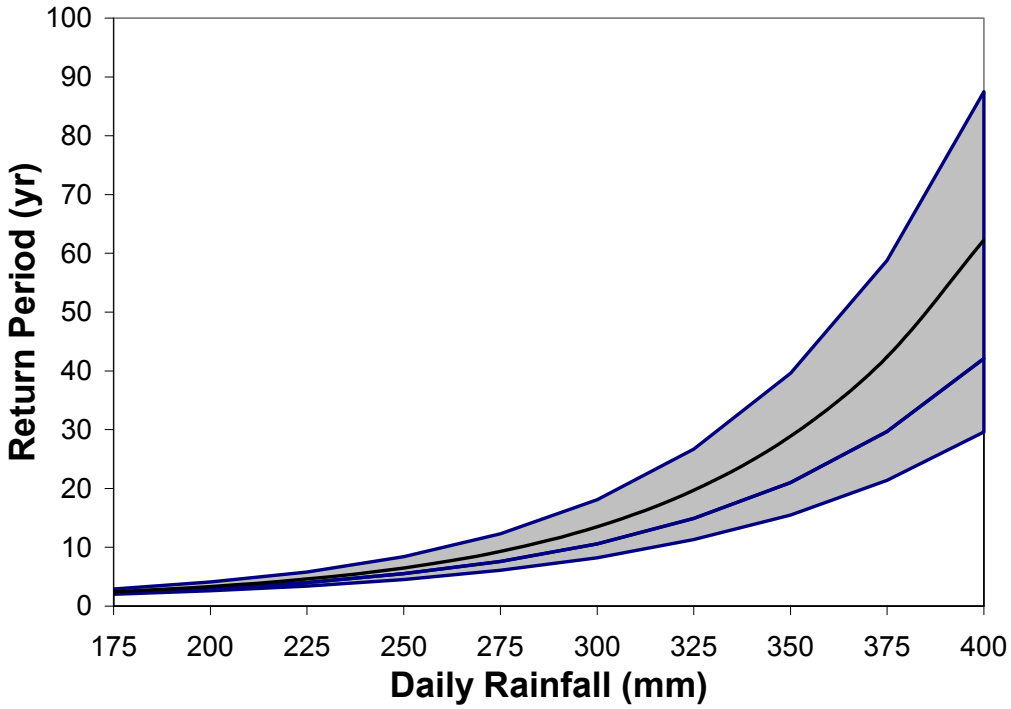

Figure 13 Relationship between daily rainfall and return period for Apia, for present day (black line) and 2050 (blue lines). The uncertainty envelope shows the maximum and minimum estimates of return periods for 2050, based on all possible combinations of the available global climate models and emission scenarios.

Six-hourly Rainfall

a) Current Risks Levels

Figure 14 presents the annual maximum six-hour rainfall for Apia. The data covers the period 199 to 2005, but with a large break between 1975 and 1990. Substantial interannual variability in extreme six-hourly rainfall occurrences is evident. A six-hour rainfall of at least 200 mm is a relatively rare event at Apia, with a return period of approximately 30 yr (Figure 15 and Table 4).

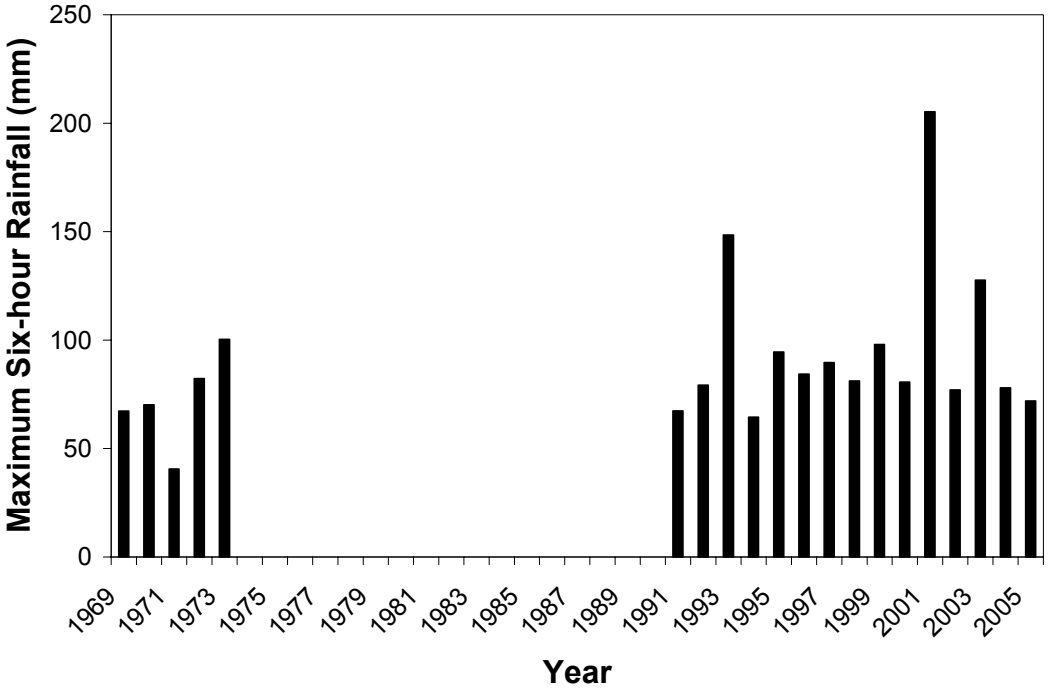

Figure 14 Maximum six-hourly rainfall, by year, for Apia (1969 to 1974 and 1991 to 2005).

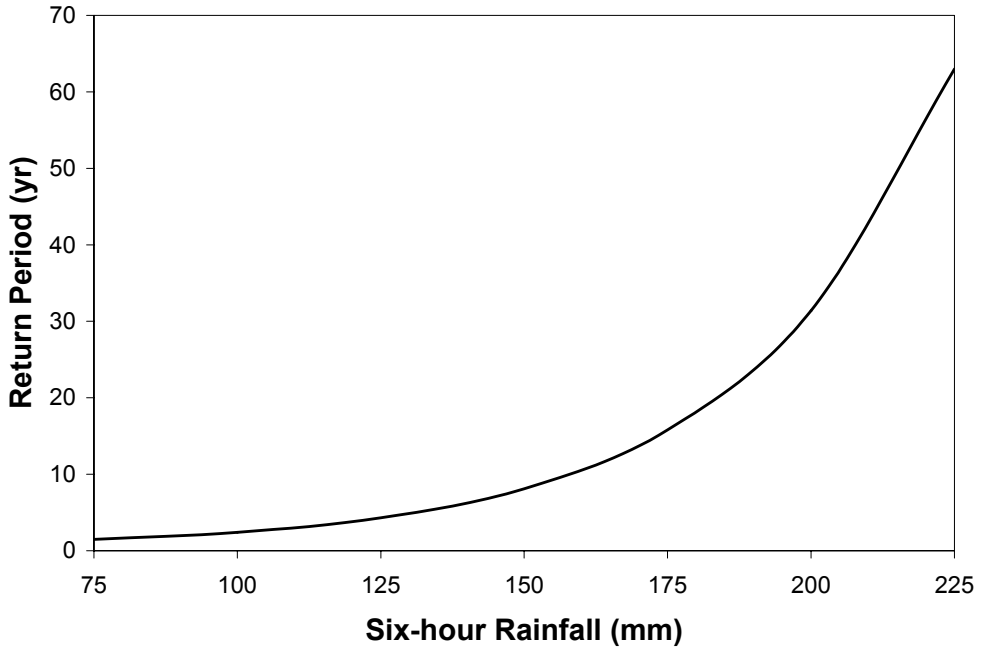

Figure 15 Relationship between six-hour rainfall and return period for Apia, based on observed six-hourly rainfall for 1969 to 1974 and 1991 to 2005.

Table 4

Return Periods (yr), for Six-hourly Rainfall (mm) at Apia

Daily Rainfall (mm) of at Least	1969-1974 & 1991-2005	2025	2050	2075	2100
75	1.5	1.5	1.5	1.5	1.5
100	2.4	2.3	2.3	2.2	2.1
125	4.3	4.0	3.8	3.5	3.4
150	8.1	7.3	6.7	6.1	5.6
175	16	14	12	11	9.5
200	31	27	23	19	17
225	63	52	43	35	29

b) Projected Risk Levels

Best estimates of changes in six-hour rainfall extremes are based on an average of the estimates using a multi model and emission scenario ensemble (see Table 1). As indicated in Table 4 and Figure 16, global warming will likely reduce the return periods of extreme hourly rainfall events, although Figure 16 also shows there is considerable uncertainty in the projections.

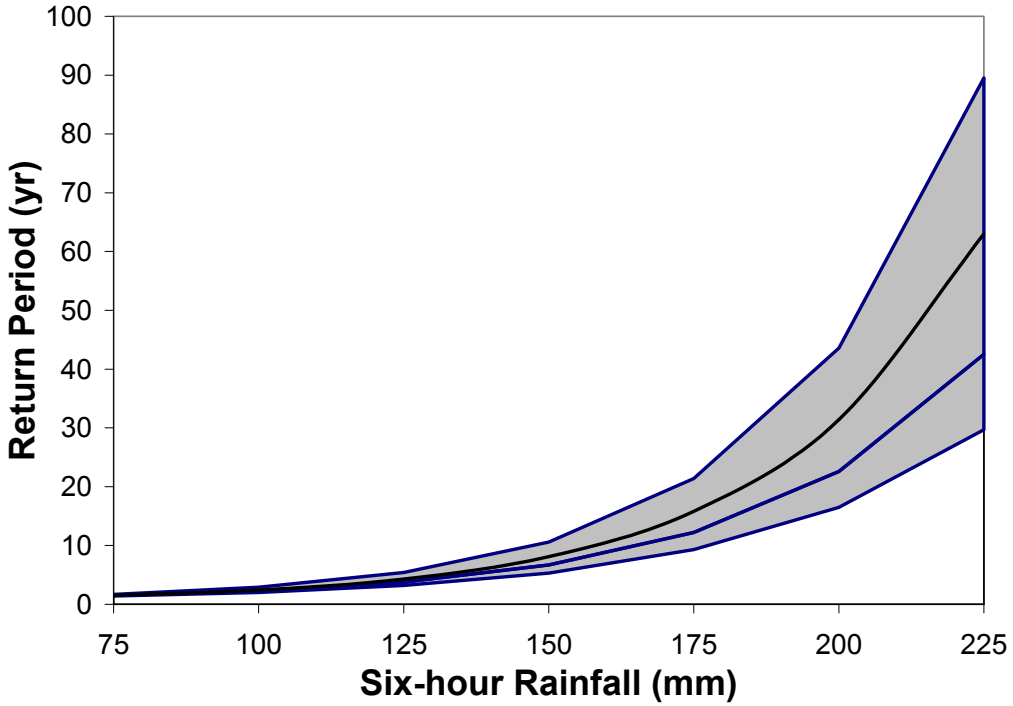

Figure 16 Relationship between six-hour rainfall and return period for Apia, for present day (black line) and 2050 (blue lines). The uncertainty envelope shows the maximum and minimum estimates of return periods for 2050, for all possible combinations of the available global climate models and emission scenarios.

Drought

Figure 17 presents, for Apia, the number of months in each year (1961 to 2005), and each decade, for which the observed precipitation was below the ten percentile. A monthly rainfall below the ten percentile is used here as an indicator of drought.

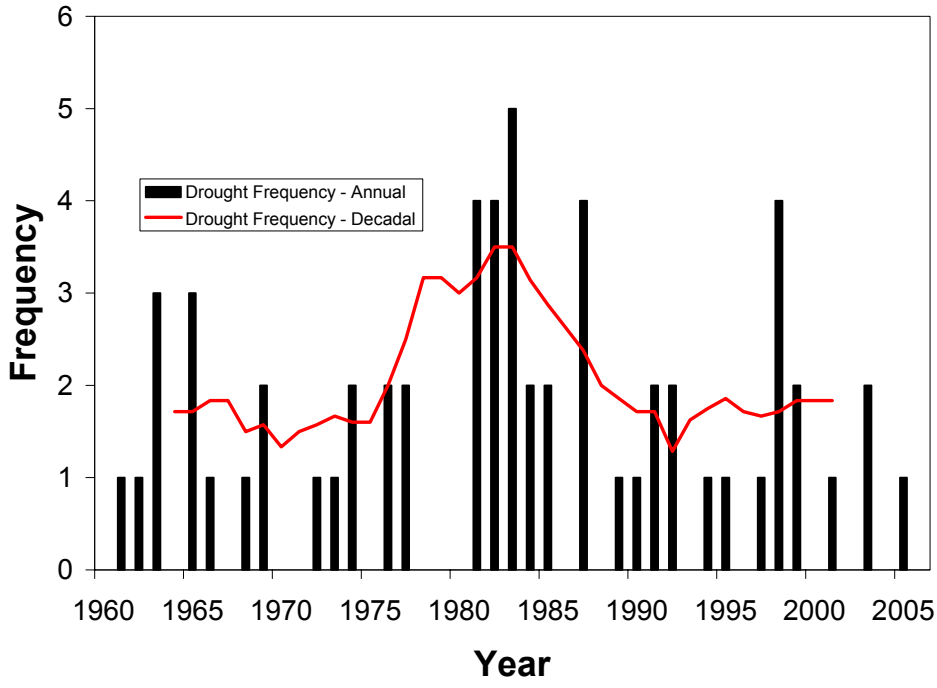

Figure 17 Number of months in each year for which the precipitation was below the ten percentile. Also shown is the average over ten years. Data for Apia (1942 to 2005).

There is considerable inter-annual and inter-decadal variability in this indicator of drought, with no obvious long term trend. However, the droughts associated with the El Niño events of the early and late 1980s and late 1990s are clearly evident.

Figure 18 shows the results of a similar analysis, but for rainfall estimates (1961 to 1990) and projections (1991 to 2100) based on the Canadian GCM and the A2 and B2 emission scenarios. It is clear that the model data does not capture the increased incidence of drought associated with El Niño conditions. More robust results might be obtained using a GCM that is able to simulate El Niño events. Most recent global climate modelling studies (e.g. Yamaguchi and Noda, 2005) indicate that, in a warmer world, the pattern of tropical Pacific sea surface temperatures becomes more El Niño-like – sea surface temperatures in the Easter tropical Pacific increase faster than those in the west, with an associated eastward migration in the tropical Pacific rainfall pattern. But for the six (out of 19 studied) models that were best at simulating present day ENSO conditions, van Oldenborgh and Philip (2005) found no significant changes toward El Niño-like conditions in the latter part of the current century. Therefore it is not yet possible to make any predictions about the future nature of El Niño events, or of the opposite cool event, the La Niña. Figure 18 does indicate that drought frequency is likely to increase in the second half of the present century, under the B2 emissions scenario.

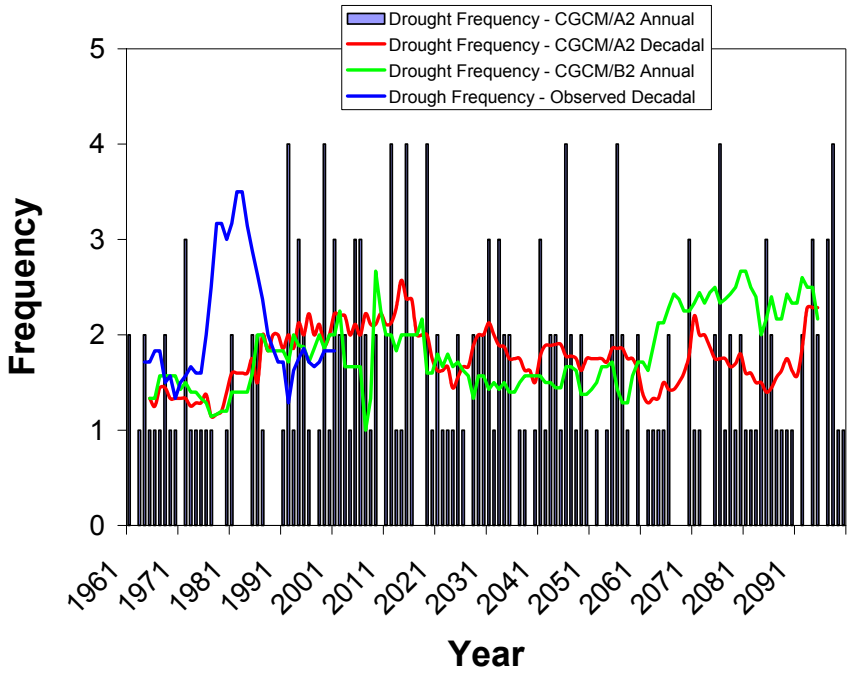

Figure 18 The number of months per year for which the precipitation for Apia is projected to be below the 1961-1999 ten percentile for the relevant month. Also shown are the averages over ten years, based on the observed (1957 to 2005) and modelled (1961 to 2100) data. Modelled data are from the Canadian GCM, with an A2 and B2 emission scenarios and best estimates for GCM sensitivity.

Extreme Winds

a) Current Risk Levels

Figure 19 shows the annual maximum wind gust recorded at Apia over the period 2001 to 2005. There is large interannual variability and no trend in the data. The maximum gust of 61 knots. (31.2 ms^{-1}) was recorded in January 2004, during Cyclone Heta.

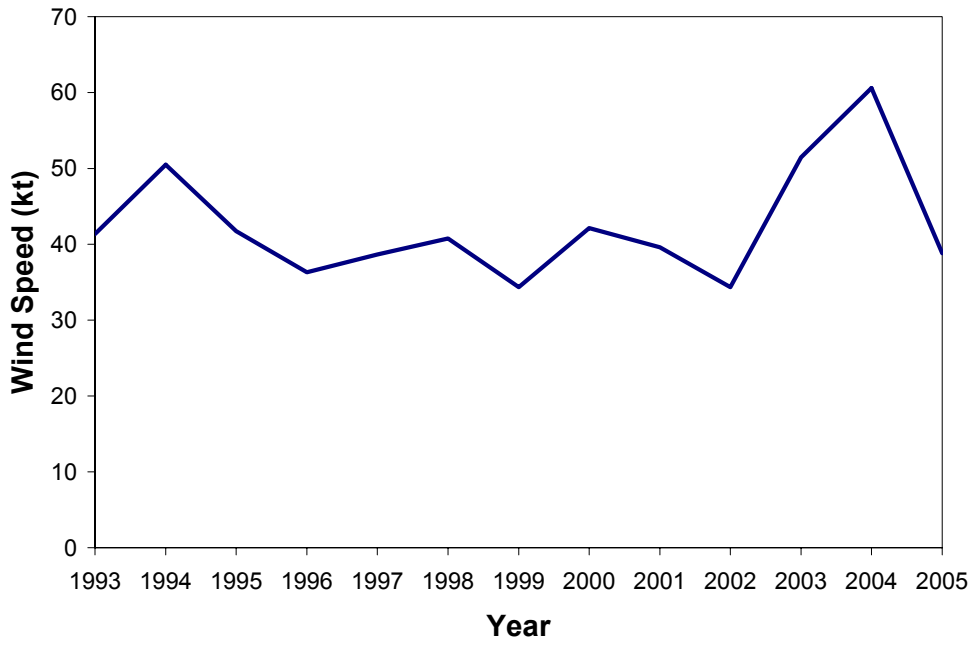

Figure 19 Annual maximum wind gust recorded at Apia for the period from 1993 to 2005.

A peak gust of at least 60 knots can be considered a relatively rare event, with a return period of approximately 19 yr (Table 5 and Figure 20).

Table 5

Return Periods (yr), for Peak Gust (knots) at Apia

Peak Gust of at Least (kt)	Observed	2025	2050	2075	2100
40	1.8	1.6	1.4	1.3	1.3
50	5.3	4.3	3.6	3.0	2.6
60	19	15	12	8.9	7.6
70	75	55	41	30	24
80	295	206	146	101	81

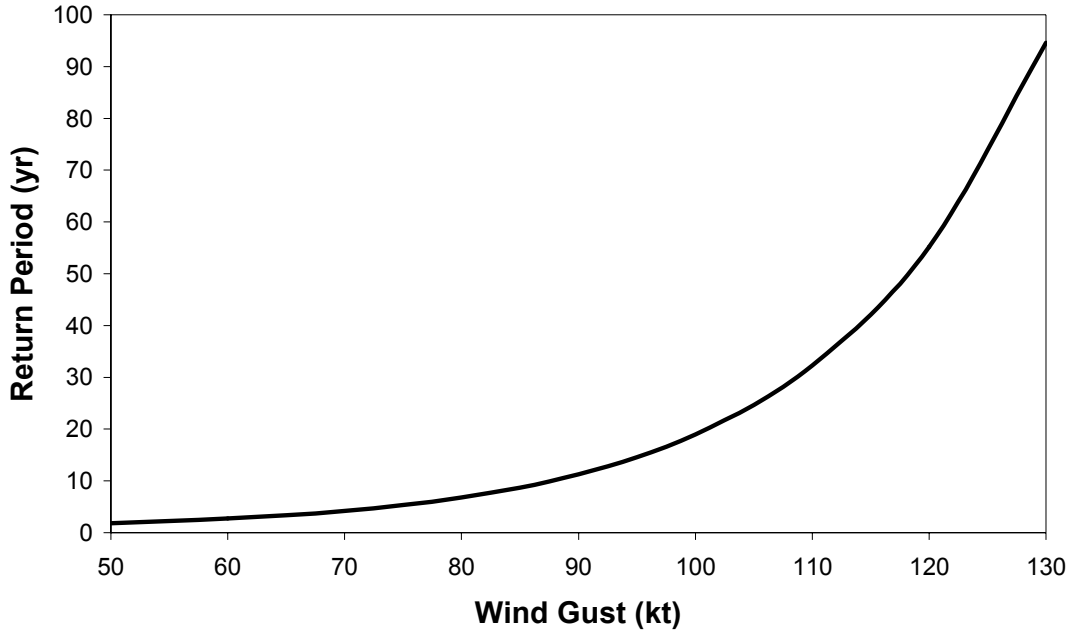

Figure 20 Relationship between maximum wind gust and return period for Apia, based on observed peak gust data for 1962 to 2005.

The maximum wind gusts associated with cyclones occurring in the Fiji area (Fiji Meteorological Service, 2002) have been used in order to compare estimates of return periods for an extreme wind occurring at a specific location and anywhere in the country (Hay, 2006). Figure 21 shows that, as is to be expected, the return periods for all of Fiji are considerably lower than those for Nadi. Based on these findings, the risk of a damaging wind occurring somewhere in Samoa is some three times higher than the estimates derived for a specific location. Thus the return period for an 80 kt gust occurring anywhere in Samoa may be closer to 100 years, rather than the 300 years for Apia alone.

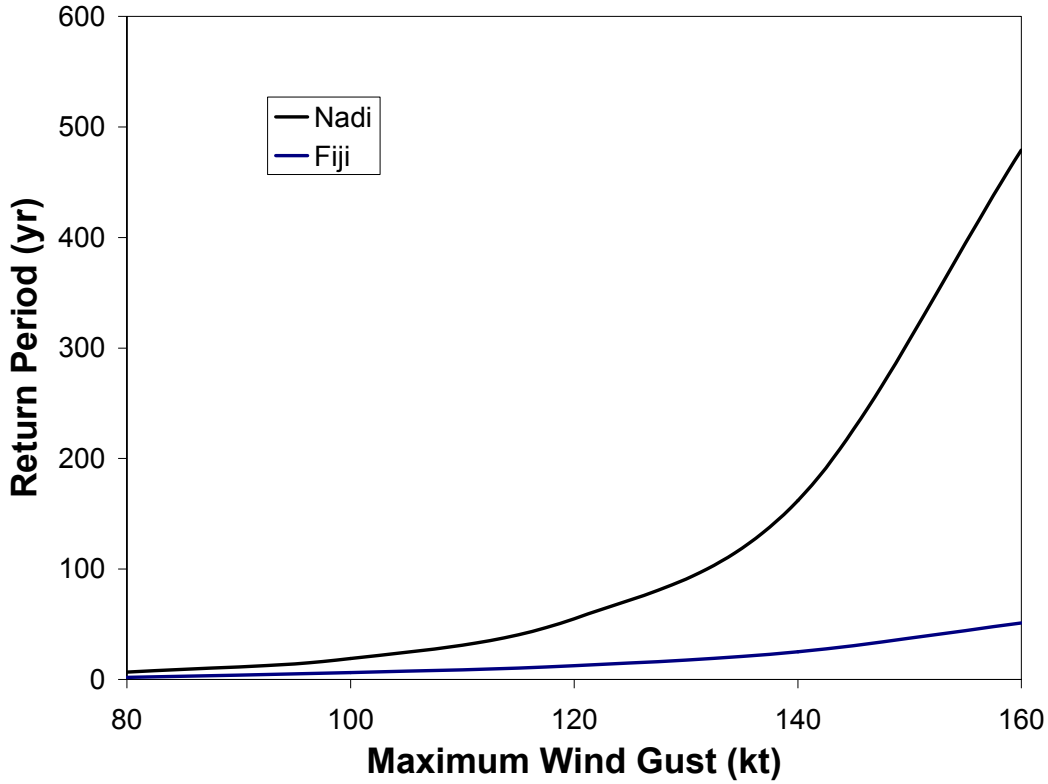

Figure 21 Return periods for extreme wind gusts at Nadi (based on observed data for 1962 to 2005) and for Fiji (based on observed and estimated extreme wind gusts associated with tropical cyclones, 1968 to 2005). Source: Hay (2006).

b) Projected Risk Levels

Estimates of changes in extreme wind gusts are based on the assumption that maximum wind gusts will increase by between 2.5 and 10 per cent per degree of global warming, with a best estimate of 10 per cent. The emission scenarios listed in Table 1 are still explicitly included in the wind gust projections. The best estimate of the increase in extreme wind gusts is determined by averaging the ensemble of estimates for all combinations of percentage increase and emission scenarios.

Figure 22 shows the best estimate of extreme wind gust out to 2100, as well as the band of maximum uncertainty. The latter is estimated using the highest and lowest estimates of extreme wind gust, for all three percentage increases and emission scenario combinations. It is clear that there is substantial uncertainty in the maximum wind gust projections.

As indicated in Table 5 and Figure 23, global warming will influence the return periods of extreme wind gusts. For example, currently an extreme wind gust of 70 kt has a return period of 75 years. This will reduce to approximately 40 years by 2050.

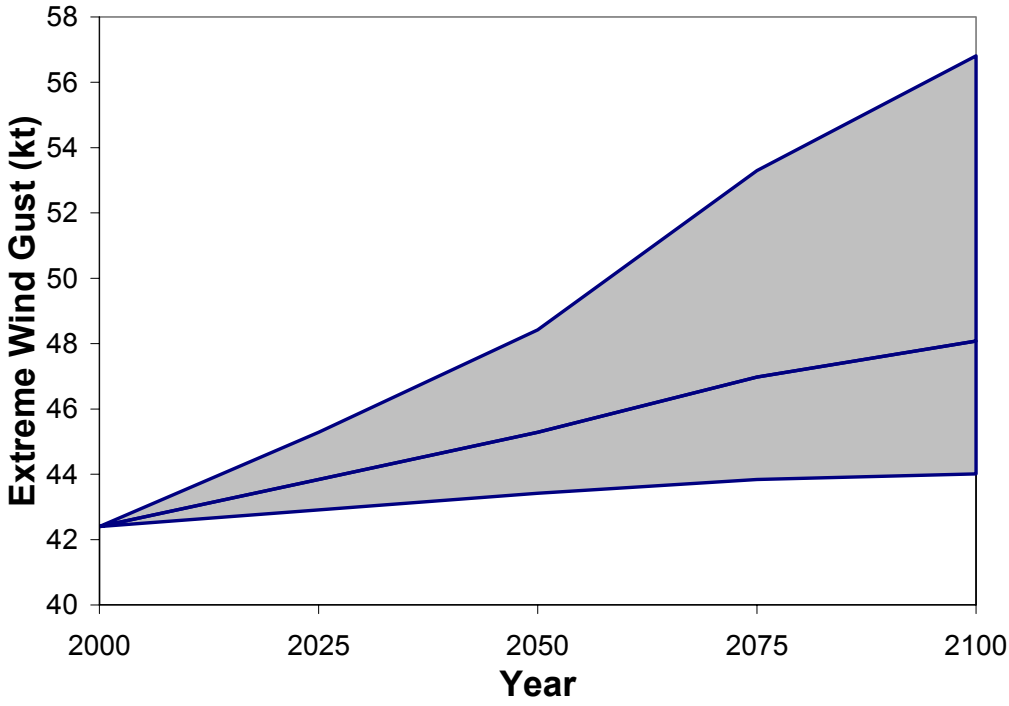

Figure 22 Best estimate of projected increase in extreme wind gust for Apia, along with the uncertainty envelope as given by the maximum and minimum estimates provided by all possible combinations of the percentage increases and the emission scenarios.

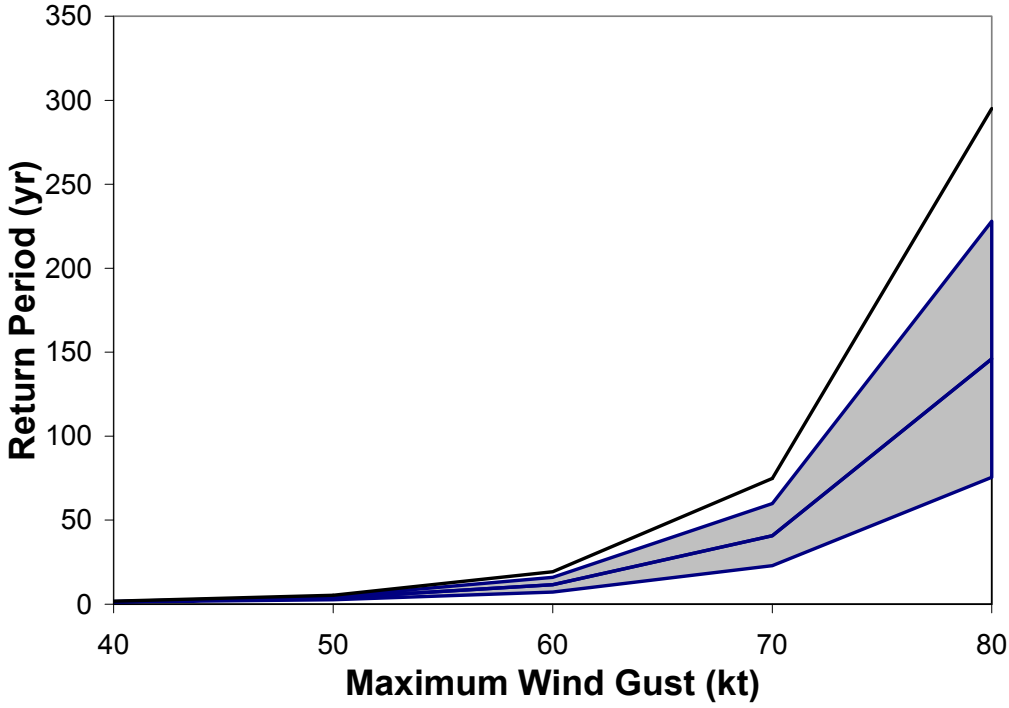

Figure 23 Relationship between peak wind gust and return period for Apia, for present day (black line) and 2050 (blue lines). The uncertainty envelope shows the maximum and minimum estimates of return periods for 2050, based on all possible combinations of the percentage increases and emission scenarios.

Extreme High Air Temperatures

a) Current Risks Levels

Figure 24 presents the annual maximum air temperature for Apia. The data are from the SEAFRAME gauge. Hence the exposure may not be representative. Also, the length of record is short. It is anticipated that a longer record of more representative data may become available in the near future. Considerable interannual variability in the extreme air temperature is evident, and there an indication of a rising trend in the maximum air temperature. A maximum air temperature of at least 32 C is a relatively rare event at Apia, with a return period of approximately 11 yr (Figure 25 and Table 6).

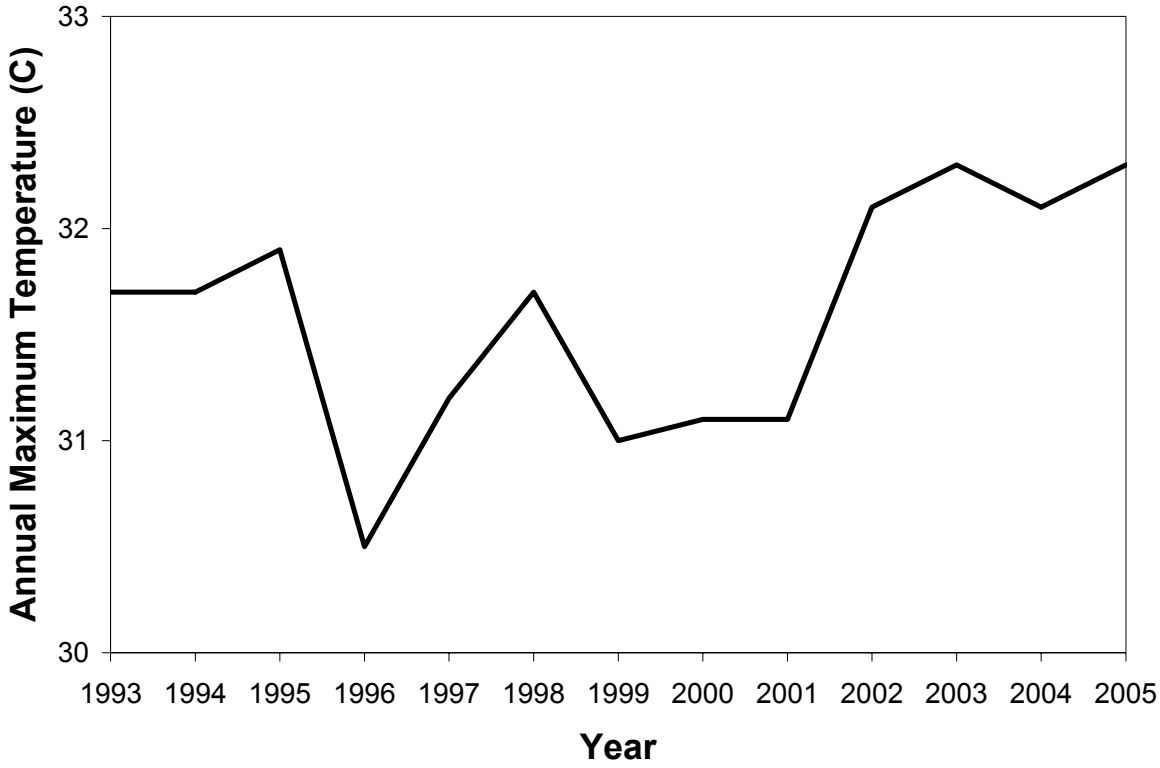

Figure 24 Maximum air temperature, by year, for Apia (1993 to 2005).

b) Projected Risk Levels

Best estimates of changes in maximum air temperature are based on an average of the estimates using a multi model and emission scenario ensemble (see Table 1). Figure 26 shows the best estimate of maximum air temperature out to 2100, as well as the band of extreme uncertainty. The latter is estimated using the highest and lowest estimates of extreme daily rainfall, for all model and emission scenario combinations. It is clear that there is low uncertainty in the maximum temperature projections, at least in an absolute sense.

As indicated in Table 6 and Figure 27, global warming will influence the return periods of maximum air temperatures. For example, a maximum air temperature of 34 C is currently well in excess of a 100-year event. By 2050 it will likely have a return period of 40 years.

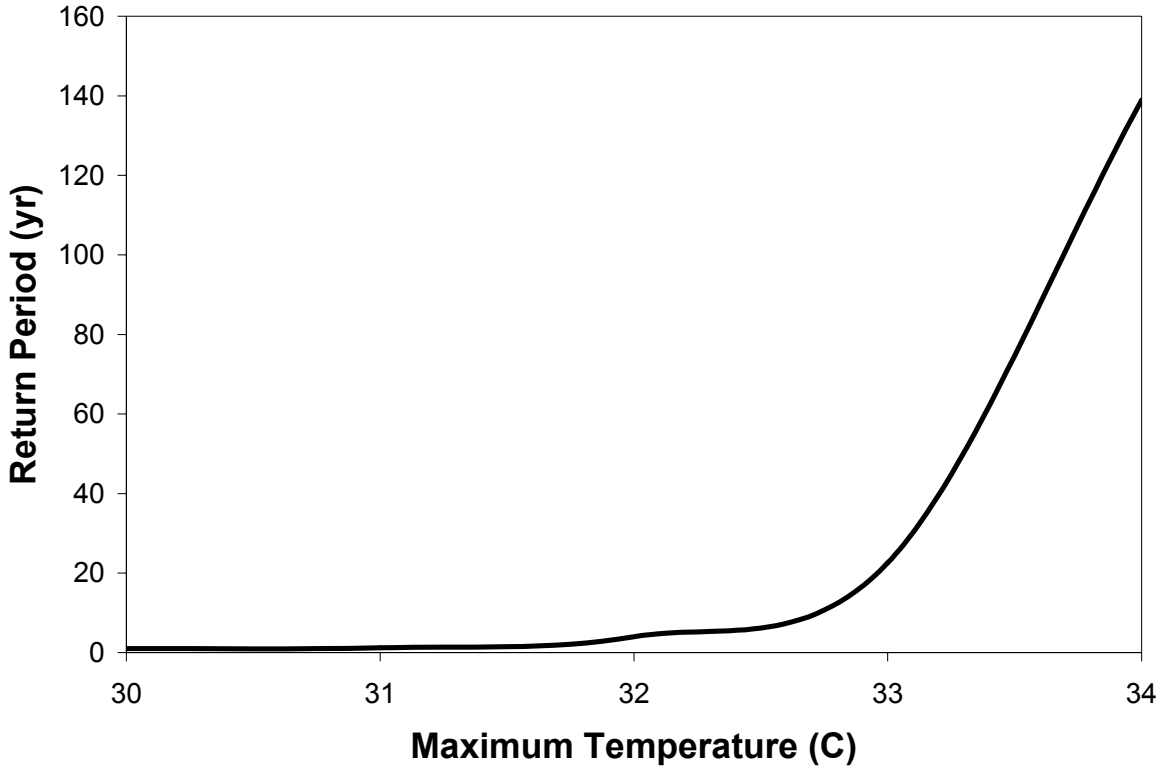

Figure 25 Relationship between maximum air temperature and return period for Apia, based on observed daily maximum temperature for 1993 to 2005.

Table 6

Return Periods (yr), for Maximum Air Temperature (C) at Apia

Maximum Temperature (C) of at Least	Observed	2025	2050	2075	2100
30	1	1	1	1	1
31	1.2	1	1	1	1
32	4	2.5	1.6	1.1	1
33	23	13	6.8	3.6	2.3
34	139	77	40	20	11

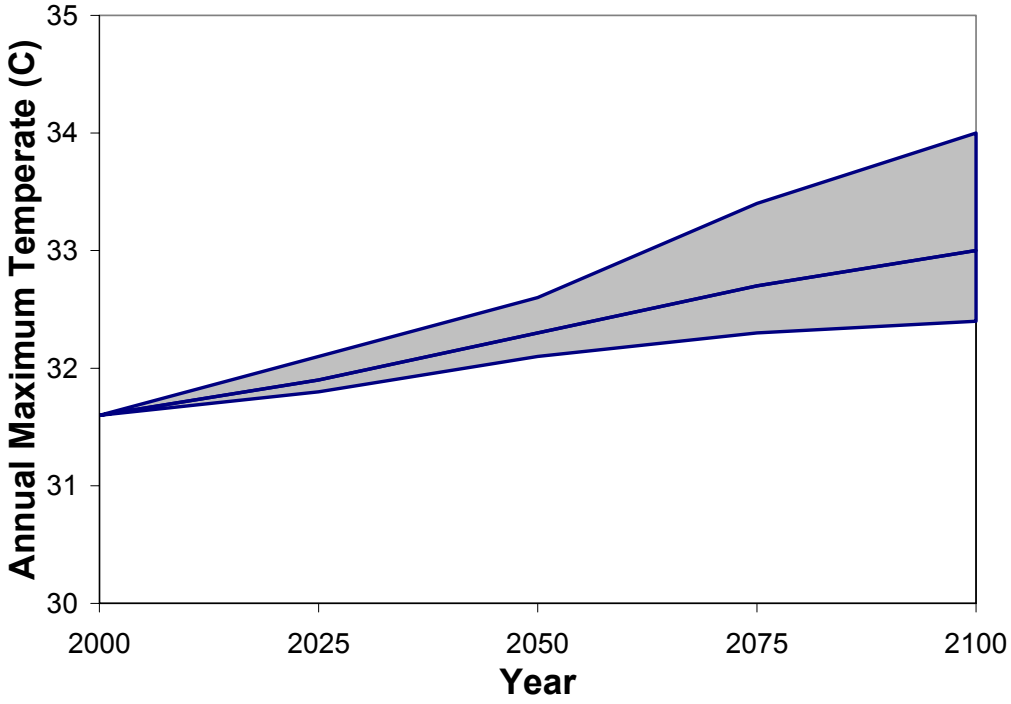

Figure 26 Best estimate of projected increase in annual maximum air temperature for Apia, along with the uncertainty envelope as given by the maximum and minimum estimates provided by all possible combinations of the available global climate models and emission scenarios.

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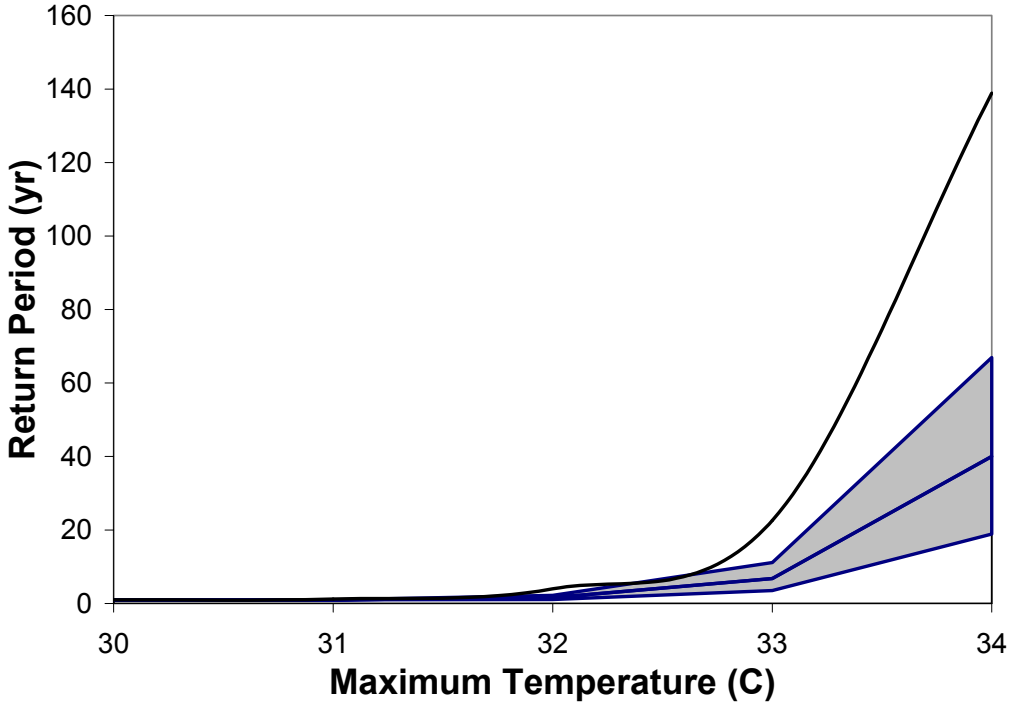

Figure 27 Relationship between maximum air temperature and return period for Apia, for present day (black line) and 2050 (blue lines). The uncertainty envelope shows the maximum and minimum estimates of return periods for 2050, based on all possible combinations of the available global climate models and emission scenarios.

Extreme High Water Temperatures

a) Current Risks Levels

Figure 28 presents the annual maximum water temperature for Apia. The data are from the SEAFRAME gauge and hence the exposure will not be representative of lagoon or open water temperatures. Considerable interannual variability in extreme water temperatures is evident, and there an indication of a rising trend in the maximum water temperature. A maximum temperature of at least 32 C is a relatively rare event at Apia, with a return period of approximately 13 yr (Figure 25 and Table 6).

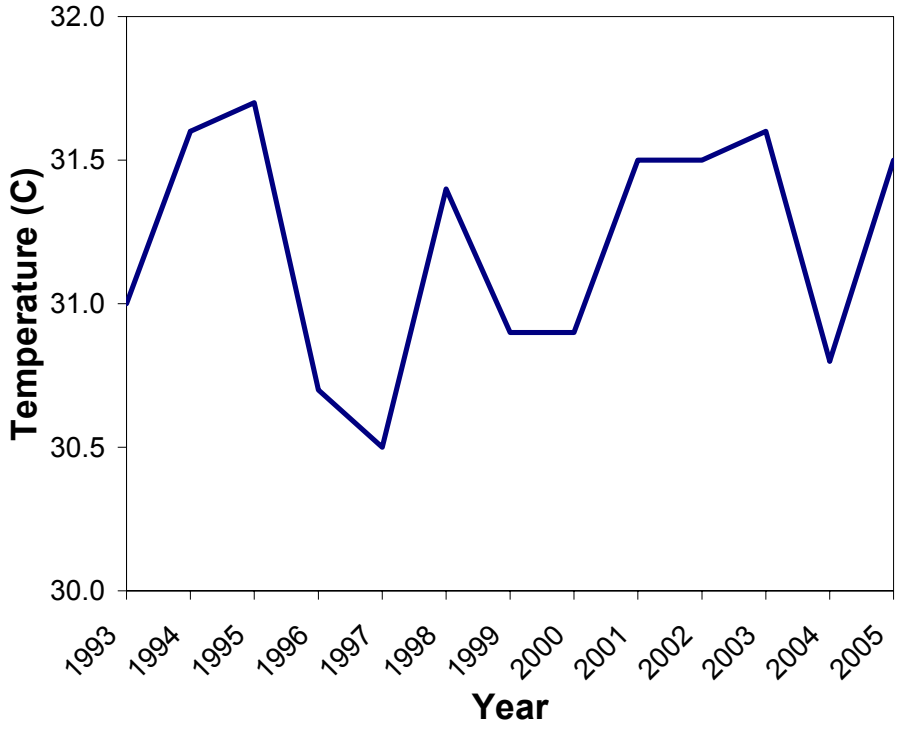

Figure 24 Maximum water temperature, by year, for Apia (1993 to 2005).

Table 6

Return Periods (yr), for Maximum Water Temperature (C) at Apia

Maximum Temperature (C) of at Least	Observed
30	1
31	1.6
32	13
33	162
34	2049

Composite Climate Risk Profile

Figures 27 and 28 summarise the preceding results by presenting a composite climate risk profile for Apia.

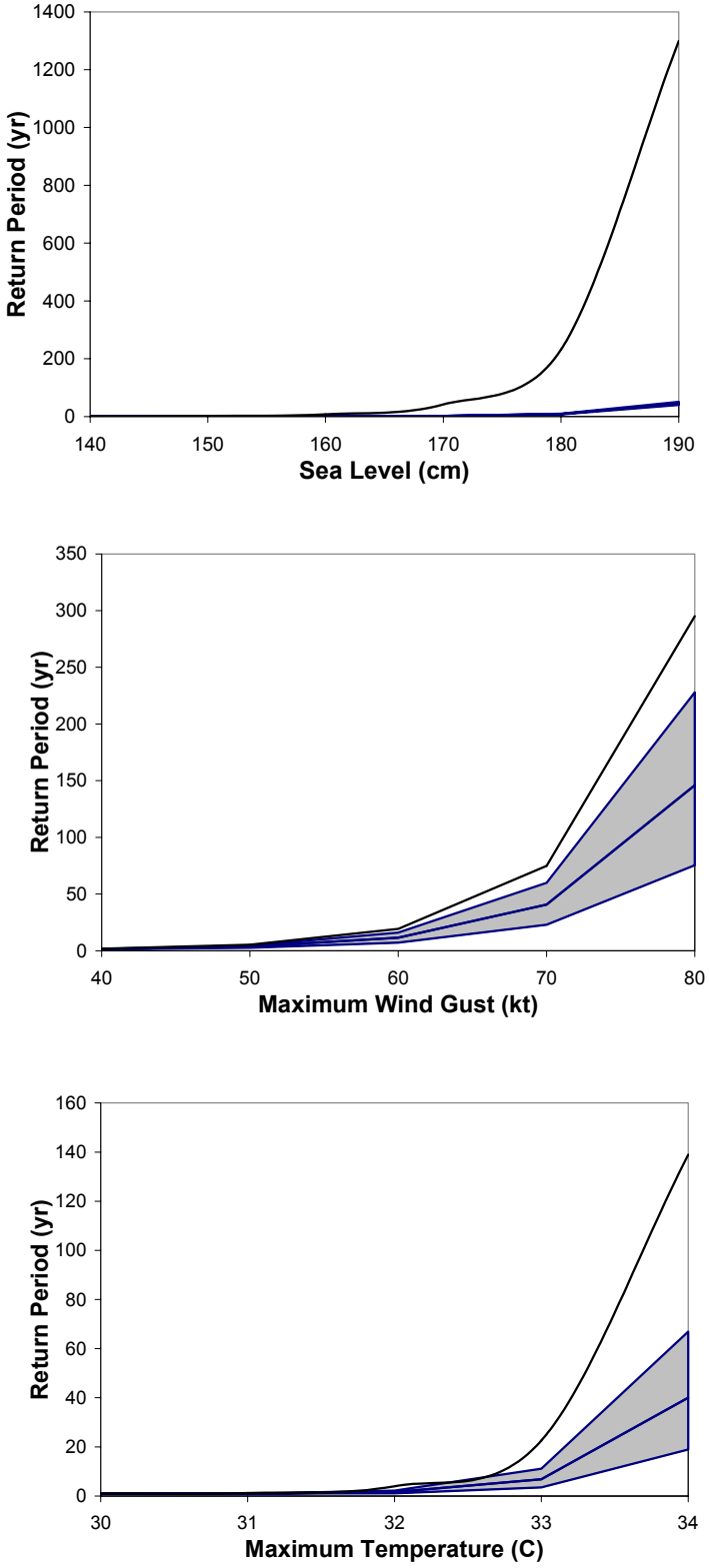

Figure 27 Return periods for given hourly sea levels, wind gusts and maximum air temperatures, based on observed data up to 2005 and on projections out to 2100 using best estimates of changes for an average of the estimates for a multi model and emission scenario ensemble.

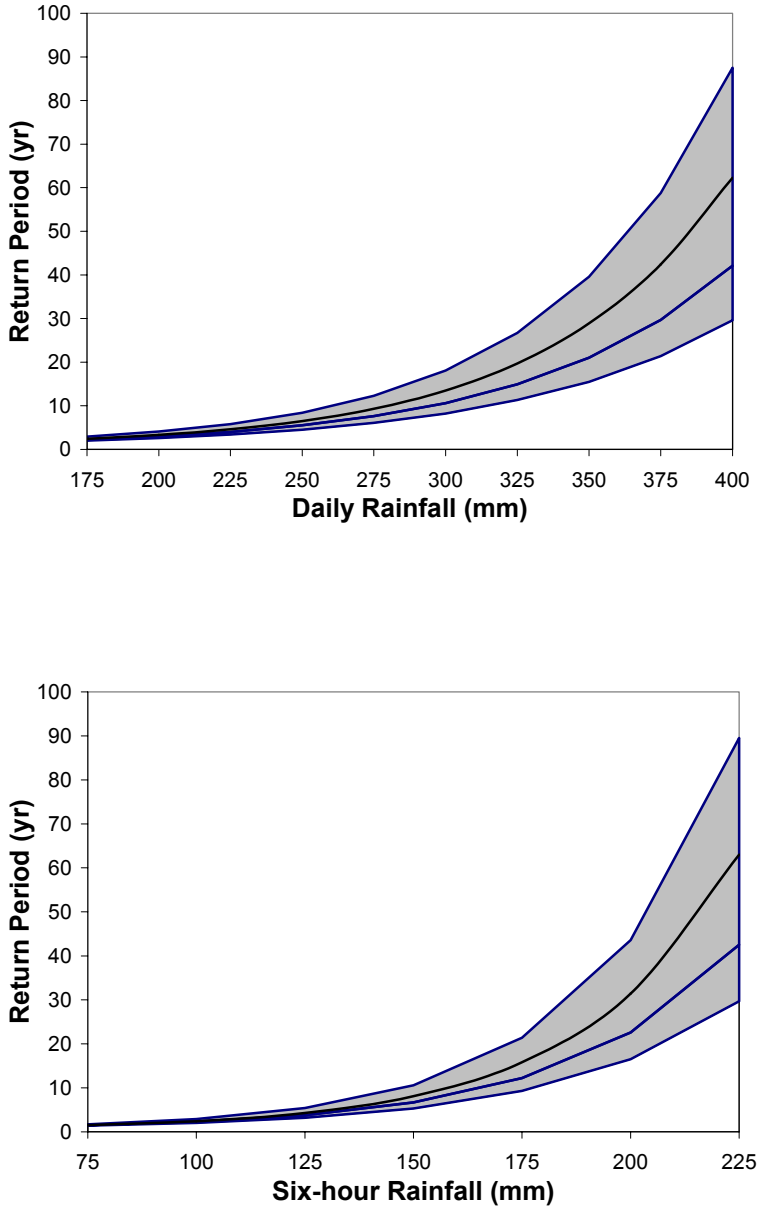

Figure 28 Return periods for given values of daily and hourly rainfall, based on observed data up to 2005 and on projections out to 2100 using best estimates of changes for an average of the estimates for a multi model and emission scenario ensemble.

Figures 27 and 28 convey two key messages: (i) increased occurrences of extreme high sea levels, air temperatures and winds are highly likely in the coming decades; and (ii) no definitive comments can be made about changes in the frequency of intense precipitation events (daily or hourly). This is due to the high uncertainties in the latter projections.

Future Work

The present CRP is the first step in analysing the climate-related risks facing Samoa. Additional data for Apia should be analysed, with both the current and additional data being subjected to rigorous quality control. For example, the rainfall records used in the present analyses had gaps during Cyclones Val and Ofa.

Data for other locations should also be included in a future climate risk profile, as Apia is not representative of the entire country.

A future climate risk profile might also include assessments of the consequence components of the climate-related risks, for relevant sectors and social groups.

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Hay, J.E., 2006. Climate Proofing Power Sector Development Projects in Fiji. ADB TA - 4764 (FIJ) Preparing the Renewable Power Sector Development Project, Asian Development Bank, Manila, 48pp.

van Oldenborgh, G.J., Philip, S., and Collins, M. (2005) El Niño in a changing climate: a multi-model study. Ocean Science, submitted.

Yamaguchi, K., and Noda, A. (2005). Global warming patterns over the North Pacific: ENSO versus AO. J. Meteorological Society of Japan, submitted.

Annex 2

People and Organisations Consulted During the CEA

Name and Designation	Organisation
Mulipola Ausetalia Tititmaea – Assistant Chief Executive Officer Meteorology Reima Leleimalefaga – Principal Climate Officer	Division of Meteorology Ministry of Natural Resources, Environment & Meteorology
Seumanutafa Asuao Malaki Iakopo – Chief Executive Officer	Ministry of Agriculture & Fisheries
Benjamin Pereira – Principal Planning Officer Lae Siliva – Research Officer Abigail Lee Hang – Research Officer Alan Hunt – Research Officer	Economic Planning & Policy Division Ministry of Finance
Aiono Mose Sua – Chief Executive Officer	Ministry of Foreign Affairs and Trade
Tuuu Ieti Taulealo – Chief Executive Officer	Ministry of Natural Resources
Hinauri Petana – Chief Executive Officer	Ministry of Finance
Taule'ale'ausumai Laavasa Malua – Assistant Chief Executive Officer Planning and Urban Management Upuolevavau Amosa Pouoa – Assistant Chief Executive Officer Assets Management Upolu	Ministry of Works, Transport & Infrastructure
Moefa'auo Taputoa Titimaea, Chief Executive Officer	Samoa Water Authority
Muliagatele Iosefatu Reti – Consultant/Director Sam Sesega – Consultant/Director	Pacific Environment Consultants Ltd
Margret Fruen – Assistant Chief Executive Officer Registry Belinda Filo – Senior Investment Promotion & Industry Development Officer Silveria Anderson – Senior Fair Trading Officer Lydon Chu Ling – Principal Investment Promotion & Industry Development Officer	Ministry of Commerce, Industries & Labour
Dr. Walter Vermullen - Executive Director Matatumua Vermullen – Projects Coordinator	Matua i le Oo Environmentl Trust Inc.
Roina Faatauva'a – Chief Executive Officer	Samoa Umbrella of Non-Governmental Organization
Karen Mapusua – Associate Director Paipai Rosalia May – Senior Field Officer	Women in Business

Sala Epa Tuioti, Co-Managing Director	KVA Consultants Ltd
Prof. Alfred C. Ebenebe	School of Agriculture, Alafua Campus The University of the South Pacific
Tagaloa Tuala Sale Tagaloa – President	Lands & Titles Court
Magele Mauiliu Magele -Vice Chancellor, Ioana Chan Mow – Dean of Faculty of Science Faainu Latu – Senior Lecturer Science Jacinta Moreau – Senior Lecturer Chemistry Prof. Leapai Lau Asofou So'o – Deputy Vice Chancellor Faamoetauloa Wood Salele – Dean of Faculty of Commerce Tuiloma Susana Taua'a – Senior Lecturer Geography	National University of Samoa
Noumea Simi – Assistant Chief Executive Officer Aids & Loans	Aids & Loans Management Division Ministry of Finance
Margaret Malua – Director	Small Business Enterprise Centre
Iese Toimoana – Senior Electrical Engineer Sale Faletolu – Environment Coordinator	Electric Power Corporation
Lameko Tesimale – Waste Management Manager	Ministry of Health
Leilani Duffy – National Coordinator	Samoa GEF Small Grants Program UNDP
Easter Galuvao – Assistant Resident Representative	UNDP Samoa
Hisahara Okuda – Acting Resident Representative	Japan International Cooperation Agency
Levaopolo Tupae Esera – Chief Executive Officer	Ministry of Education, Sports & Culture
Amanda Roberts – First Secretary AusAID	Australian High Commission
Philip Hewitt – First Secretary NZAID	New Zealand High Commission
Darel Clark – Acting Attorney General Lalotoa Mulitalo – Parliamentary Counsel	Attorney General's Office
Henry Taiki – Director	WMO Sub-regional Office (Samoa)
Masanami Izumi-Acting Officer In Charge (Fisheries Officer)	Food and Agriculture Organisation
Stephen Terras – Officer In Charge	World Health Organisation Samoa
Mali Voi – Cultural Adviser Hans Dencker Thulstrup – Science Programme Specialist	UNESCO Samoa
Fiu Mataese – Executive Director	O le Siosiomaga Society Inc.
Leaula Tavita Amosa, Assistant Chief Executive Officer Internal Affairs	Ministry of Women, Community & Social Development
Asterio Takesy – Director, Kate Brown – Action Strategy Adviser,	Secretariat for the Pacific Regional Environment Program (SPREP)

Stuart Chape – Island Ecosystem Program, Lui Bell – Marine Species Officer, & Bruce Chapman – Pacific Futures Programme	
Afamasaga Tole'afoa	Private Consultant (Economist)
Papalii Grant Percival – President of Samoa's Association of Manufacturers & Exporters	Natural Foods International

Annex 3

Agenda and List of Participants for the National Dialogue

National Dialogue on
Mainstreaming Environmental Considerations
in Economic and Development Planning Processes in Samoa

Tuesday, May 2, 2006

Conference Room, Level 6, Central Bank of Samoa

A. Agenda

09:00	Welcome (Chair: Afamasaga Toleafoa)
09:05	Opening Prayer (Rev. Nuuausala Siaosi)
09:10	Opening Remarks (Minister of Finance)
09:25	Purpose of Dialogue, Agenda, Dialogue Process (Tepa Suaesi, ADB Consultant)
09:30	*Refreshments*
09:50	The Environment - Opportunities and Constraints for Development: A Government Perspective (Tu'u'u Ieti Taule'alo, CEO, Ministry of Natural Resources, Environment and Meteorology)
10:15	The Environment - Opportunities and Constraints for Development: A Private Sector Perspective (Epa Tuioti, KVA Consult Ltd)
10:40	Key Findings of the Country Environmental Analysis for Samoa (Tepa Suaesi, ADB Consultant)
11:00	Discussion, and Validation of Findings (Chair: Afamasaga Toleafoa)
12:30	*Lunch*
13:15	Proposed Priority Areas and Mainstreaming Initiatives (John Hay, ADB Consultant)
13:35	Discussion, and Consensus on Recommendations (Chair: Afamasaga Toleafoa)
14;00	Closing Remarks (Afamasaga Toleafoa)
14:15	Close of National Dialogue
14:30	*Refreshment*

B. List of Participants

NAME	DESIGNATION	ORGANISATION
Abigail Lee Hang	Research Officer	MOF
Afamasaga Tole'afoa	Economist (Chairman - National Dialogue)	Private Consultant
Aiono Mose P. Sua	Chief Executive Officer	MFAT
Alan Hunt	Research Officer	MOF
Amanda Roberts	First Secretary - AusAID	AHC
Andre Volentras	Technical Adviser	UNDP-GEF
Anne Rasmussen	Climate Change Officer	MNREM
Ben Pereira	Principal Planning Officer	MOF
Easter Galuvao	Assistant Resident	UNDP Samoa
Faainu Latu	Senior Lecturer - Science	NUS
Fiu Elisara	Executive Director	OLSSI
Frances Brebner	Assistant Chief Executive Officer	MOH
Heremoni Suapai Ah Hoy	Energy Officer	MOF
Hisahara Okuda	Project Formulation Adviser	JICA
Hinauri Petana	Chief Executive Officer	MOF
Hon. Niko Lee Hang	Minister of Finance	MOF
Ioana Chan Mow	Dean - Faculty of Science	NUS
Jacinta Moreau	Senior Lecturer - Chemistry	NUS
Lalotoa S.Mulitalo	Parliamentary Counsel	AGO
Leilani Duffy	National Coordinator	GEF-GoS SGP
Leilua Tavas Leota	Senior Program Officer	JICA
Magele L Isaako	Community Development Officer	SUNGO
Mali Voi	Cultural Adviser	UNESCO
Matatumua V Vermullen	Project Coordinator	
Misa Adriamihaja	Programme Officer	UNDP Samoa
Noumea Simi	ACEO Aid/Loans Division	MOF
Papalii G.Percival	President	SAME
Paul Tomane	Assistant FAO Representative	FAO Samoa
Philip Hewitt	First Secretary - NZAID	NZHC
Pipi Peniamina Leavai	Principal Climate Change Officer	MNREM
Prof. John Hay	International Consultant	ADB
Rapa Young	Climate Officer	MNREM
Reverend Nuausala Siaosi	Pastor	CCCS
Sahara Sesega Anae	Environmental Engineer	SWA
Sala Epa Tuioti	Co-Managing Director	KVA
Sam Sesega	Consultant/Director	PECL
Sa'olotoga R. Fasavalu	Disaster Management Officer	MNREM
Seumanutafa M. Iakopo	Chief Executive Officer	MAF
Silia K. Ualesi	National Coordinator - Energy	MOF
Tamasoalii Saivaise	Secondary School Curriculum Officer	MESC
Taule'ale'a A. Tiotio	Manager Engineering	EPC
Tepa Suaesi	Domestic Consultant	ADB
Tu'u'u Ieti Taule'alo	Chief Executive Officer	MNREM
Walter Vermullen	Executive Director	METI
Will McGoldrick	Australian Youth Ambassador	MNREM

Annex 4

Background Context for CEA

A. Country Setting

1. This section provides a brief overview of the setting for activities related to economic development and the management of the environment and natural resources.

2. **Society.** The people of Samoa are Polynesian, living in 330 villages along the coast and, more recently, inland with the development of cross-island roads. The 2001 Population and Housing Census shows a national population total of 174,140. Samoan society is based on the social unit, the aiga or extended family. Each extended family is headed by a matai, or traditional chief, who is appointed by consensus of the aiga. The matai assumes responsibility for the welfare of his/her aiga, including directing the use of family assets such as land. The collective institution of matais constitute the village council, or fono, which controls the affairs of the village, keeps order and provides direction with regard to village development.

3. **Geography.** The islands of Samoa lie between latitudes 13 and 15 degrees south and longitudes 168 and 173 degrees west (Figure 1). Samoa consists of two main islands and 8 smaller islands (Figure 2). The capital Apia is located on the second largest island, Upolu, and has a population of about 40,000 people. Samoa has a total land area of 2,935 km^2. The islands are of volcanic origin, clearly visible in the form of several dormant volcanoes and lava fields. Beyond the narrow coastal plains the mountain ranges rise steeply to 1900 metres on Savaii and 1100 metres on Upolu. They are intersected by fertile valleys. Lush vegetation and rainforest cover the greater part of the country.

4. The two main islands (Savaii and Upolu) are well served by tar sealed ring and cross island roads. The geographically compact nature of the country, and its road and shipping networks, make transport between and within islands relatively easy, thus facilitating access to centralized Government services. There is only one international port. An inter-island ferry service operates between the two main islands and between Samoa and its nearest neighbour, American Samoa. Apia Port is currently being upgraded to cater for more berthing space. A regular inter-island air service serves both main islands and American Samoa as well.

5. **Geology & Geomorphology.** The Samoan Islands are almost wholly composed of basic volcanic rocks, such as olivine basalt, picrite basalt and olivine dolerite of the alkaline basalt suite. The main volcanic formations are Fagaloa; Salani; Mulifanua; Lefaga; Puapua; Aopo; and Vini Volcanics. Most of the soils are formed from basaltic volcanic flows including pahoehoe and aa lava types, scoria, and volcanic ash. Soils are generally clay texture, free draining, porous and relatively shallow.

6. Although Samoa is not well endowed with coral reefs, they surround the islands for nearly half of the coastline, except where there are steep cliffs and where recent volcanic flows have covered large parts of the coastal areas. Coral sands are found along most of the coastline, up to 5 m from sea level. Alluvium is not common, but forms the parent material for the most versatile soils

7. **Climate,** The climate is tropical and marked by distinct wet (November –April) and dry (May – October) seasons. The average annual rainfall is about 3000mm, with about 75% of the precipitation occurring during the wet season. The average monthly temperature ranges between 22^o and 30^o, with little seasonal variation due to Samoa's equatorial location. Storm

patterns affecting Samoa originate from three main sources: tropical easterlies cause winds from the south east, cold fronts from Australian systems cause cold air to flow and rain; and storms from the south west Pacific generate cyclones at the contact zones of the easterlies and westerlies.

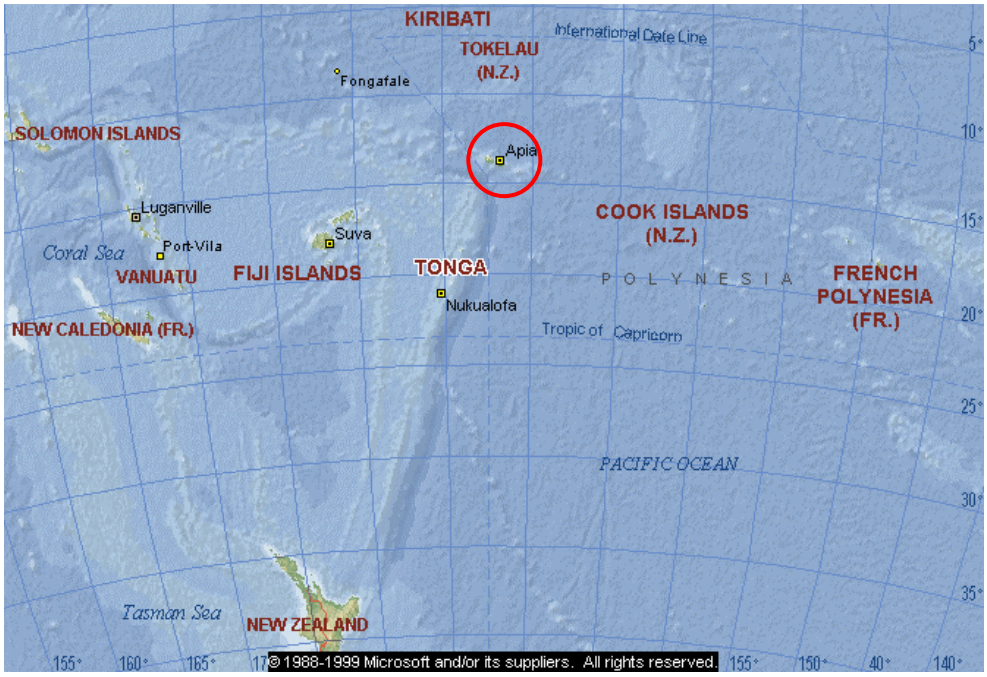


Figure 1. South Pacific and Samoa

Figure 2. Samoa Islands

8. **Land ownership.** The greater proportion of land (81%) is owned by extended families under customary ownership. Alienation of customary land is prohibited by law. Customary land cannot be transferred nor made freehold, although lease arrangements are possible. Eleven percent of the land is Government owned and is used mainly for plantation farming, national reserves, public buildings and infrastructure. Five percent of the land remains under the Samoa Trust Estates for commercial plantations, although more and more is being sold or leased to the public thus increasing the amount of freehold land available. This is particularly the case on the island of Upolu, which accounts for only 3 percent of this land.

9. There is a growing trend towards the individualisation of customary land. This change is significant for two reasons: (i) it shows that the traditional Samoan way of life can and is adapting to changing economic circumstances; and (ii) the security of land rights is increased with the assignment of tenure to individuals who clear the land and the inheritance rights are assigned exclusively to their children. For this reason, the security of tenure is not a significant cause of low productivity in village agriculture but more a result of low economic return to agriculture as compared to other income sources.

10. **Economy**. The economy is relatively small with aggregate GDP, in current prices, of WST 1,130 million (approx. US$390 million) in 2005, implying a per capita income of US$2,250. Economic performance is constrained by distance to markets, a small local market, a skill base that cannot compete with Asian countries in labour intensive production and vulnerability to natural disasters, particularly cyclones.

11. The relatively successful introduction of extensive economic and financial reforms in the second half of the 1990s has made the last decade a historical turning point in the development of Samoa. The reforms included building effective partnerships between the Government and the private sector, overhauling of the revenue structure for the Government based on the introduction of a value added goods and services tax, a reduction and simplification of import tariffs and income taxes, institutional strengthening of Government departments and corporations, corporatisation and privatisation of selected public sector activities, financial sector liberalisation and overall pursuance of good governance principles in the public sector.

B. Governance; Institutional, Policy, Legal and Budgetary Frameworks

12. Samoa was the first small island country in the South West Pacific to become independent. This occurred in 1962. It has a Head of State and a unicameral 49 member legislative assembly. Tenure for the legislative assembly is five years. The Prime Minister, chosen by the majority in the Legislative Assembly, can select up to 12 ministers to form a Cabinet. While all citizens over the age of 21 are eligible to vote, only those that hold chiefly or matai titles are entitled to stand for Parliament.

13. Starting in the 1990s an extra-ordinary effort has been made to formulate, refine and implement national frameworks for guiding social and economic development, including the management of the environment and natural resources, in Samoa.

14. This movement was driven in part by Governmental reforms to improve public sector performance and create more opportunities for private sector development, and in part by rising public concern with environmental issues. The changes were driven by both international pressures and the impacts of major natural and man made disasters such as severe cyclones, wastes pollution, deforestation, droughts and forest fires, and the spread of agricultural pests and diseases.

15. A major approach underpinning the development of these frameworks was the multi-sector stakeholding process in which Governmental, non-governmental, private sector and

community-based organizations undertook a collective stock-take and established the strategies for each framework.

16. This section provides both a historical perspective of the development of the main governing frameworks for social and economic development and environmental management that were developed during this period of time, and also provides a brief analysis of the strengths and weaknesses of these institutional arrangements.

1. Governance

17. The country's supreme law establishes a modern governing order based on an integration of western style democracy and Samoa's traditional governing system. This governing framework was only extensively developed in more recent years with the formulation and enactment of important laws that increased citizen participation in national governing processes[2] and elaborated the legal powers of the local traditional governing system[3].

18. The effectiveness of governing systems depends on three aspects of governance: the quality of the governors; the quality of governing structures and quality of governing processes. Important national policy frameworks were developed which comprehensively address the social and economic needs of two[4] of the three sectors of governors of civil society.

19. In terms of structures and processes, the national governing system is essentially organized and function along western style democratic norms. This is in contrast to local governance, where the traditional authorities and practices of the village council of chiefs, or 'matais', are dominant. This dualism in the country's governing system has critical implications for the social economic development of the country, and the management of natural resources. For instance, since over 80% of the country's resources are under the direct stewardship of the traditional authorities, the national Government is compelled to collaborate with village councils in order to effectively influence the development and management of the country's natural resources.

20. For years after independence the main link between the national and local governments is the network of village mayors[5]. These are the officers appointed by the village council of chiefs and employed by the national Government. They facilitate the exchange of information between the villages and central Government, and assist with the promotion and implementation of national development plans that are intended to benefit the Samoa's grassroots society. In the last two decades other important structures, such as non-governmental organizations, have been establishes. Many also directly address the needs and concerns of the grassroots.

[2] 1991 was the country's plebiscite which approved universal sufferage for 21 male and female citizens to vote in parliamentary elections, although only those with matai or chiefly titles can become candidates. And in the mid-'90s the Department of Women Affairs was established which presently was expanded to a Ministry of Women, Community and Social Development in which gender issues and rights of women in all aspect of Samoan life was formally recognized in the national governing system.

[3] 1996 was the Village Fono Act in which elaborated and confirmed the powers of the Traditional Village Council of Chiefs

[4] Refers to the two national policies, one for the women sector and the other for the youth sector. The other basic sector of governors in Samoan grassroots society are the matais or chiefs. Women traditionally include both adults women and young girls – traditionally and collectively referred to as 'sao tamaitai and aualuma' and young men collectively referred to as the 'aumaga' includes male youth and adult males without chiefly or matai titles and ranks.

[5] The work of village mayors is overseen by the Division of Internal Affairs of MWCSD.

21. The national Government also established another important link with local governments. A network of village women representatives[6]acts and functions similar to the village mayors. The village mayors are extremely male dominated. The women government representatives work mainly for the development of the women sector[7] but also address other basic essential needs of grassroots society.

22. National governance is based on the British parliamentary system of Government with an appointed ceremonial traditional head of state, and a parliament of representatives of the country's population, democratically elected for five year terms. The current head of state's term is for life but the next successive heads of states will be elected by parliament, for five year terms. While universal suffrage has been practiced from the mid-1990s, with the voting age set at 21 years, only those with traditional chiefly or matai titles are eligible for membership in the parliament. The responsibilities of Government are carried out by the prime minister and cabinet ministers. They are elected by the political party or parties with the majority of seats in parliament. Each minister is given a portfolio for guiding the work of one or more of the existing Government ministries, corporations and statutory bodies.

23. Over the last twenty years the Government of Samoa has enjoyed undisturbed political stability and a strong majority leadership by its ruling political party, the Human Rights Protection Party. In all the general elections during this period the ruling party consistently won a considerable majority margin over its opposition, and in the recent (April, 2006) election it won 80% of the parliamentary seats.

24. In terms of economic and environmental governance, two Government institutions play leading roles. The Ministry of Finance oversees economic and development planning processes and the Ministry of Natural Resources, Environment and Meteorology is responsible for overall environmental management processes of the Government.

2. Policy Framework

25. **Economic and Development Planning Frameworks.** Under the economic and financial reforms, and especially the institutional strengthening programmes which started in the mid- '90s[8], the Government of Samoa has established a straight forward and streamlined institutional framework for preparing and implementing economic development strategies. This framework has four major components – (i) the over-arching Strategy for the Development of Samoa (SDS); (ii) sector planning; (iii) project planning; and (iv) performance budgeting. Figure 3 demonstrates the cycle of economic and development planning and implementation, and the relationships between the four components. It is important to note that, with commitment and careful analysis, opportunities can be identified and utilized to incorporate national environmental concerns into these main components of the economic planning and development cycle or process.

26. The following is a brief summary of the economic and development planning process. The main goal of the economic and development planning cycle is to maintain a stable macro economic state of the country, as a pre-condition for achieving a better quality of life for every Samoan. Its driving forces are a healthy private sector growth; an efficient management of revenue generation; and the effective allocation of resources to high priority national development goals[9]. The SDS is formulated through a multi-stakeholder consultation. It sets

[6] Village women representatives were only instituted in 2004. The work of these representatives is managed by the Division of Women of MWCSD.
[7] Village women representatives engage locally with the village women committees and women in general. Their current major concerns are village health and hygiene, women education and family development.
[8] Government of Samoa, National Report to the World Summit on Sustainable Development 2002, p.13 discusses in more detail the various reforms the government undertook to improve the performance of its public sector and create opportunities for the growth of its private sector and development of the wider community.
[9] Government of Samoa, National Report to the World Summit on Sustainable Development 2002, p 16.

out the over-arching vision, goals and objectives for the country's economic development in the next successive three year term, for the benefit of the people, including their wellbeing and security. At the sector planning stage, outputs for implementing these goals are defined in detail in the plans of the various sectors of the economy. Each sector organisation defines the outcomes they will individually set out to achieve. These are the sector plan outputs[10]. At the performance budgeting stage each of the sector organisations negotiate the annual budgetary allocations and other resource allocations for achieving the intended outcomes in each of the three years. The assessment and evaluation of the outcomes, that is the performance of the organizations and especially their impacts on the country's people and society's well-being and security over the three year period, is fed into the formulation of the new SDS.

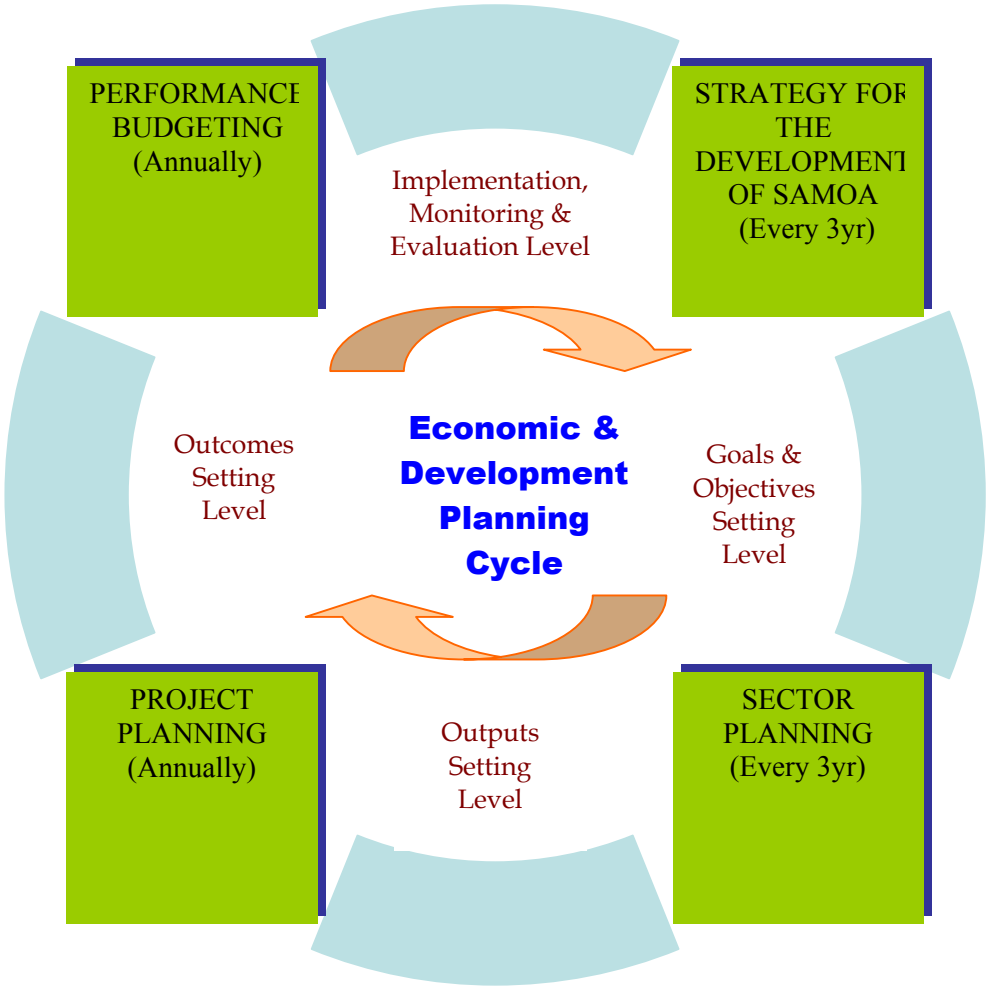


Figure 3. Samoa's current economic and development planning cycle.

27. While the Ministry of Finance has the over-arching coordination and management role for economic and development planning, it works with the other Government, non-governmental, community and private sector organizations who undertake activities related to

[10]These outcomes and as well as the structures and processes for achieving them are defined in the respective organizations' corporate plans, management plans and service charters.

the various economic and development goals and objectives set under this framework. These responsibilities are structured into fourteen economic and development sectors. Table 1 describes the sectors and the respective organizations that are responsible for addressing the sector goals and objectives.

Table 1

Economic and Development Sectors and Responsible Organizations[11]

Sector	Potential Lead Agencies	Other Potential Agencies Involved (Examples)
Economic		
1. Agriculture	MAF	Agriculture Stores Corporation; Samoa Trust Estates Corporation,
2. Manufacturing	MCIL	Samoan Association. Of Manufacturers & Exporters; Samoa Chamber of Commerce.
3. Tourism	STA	Samoa Hotel Association; Ministry of Natural Resources & Environment.
4. Commerce	MCIL/MFAT	Samoa Chamber of Commerce; Women in Business.
5. Finance	CBS	Commercial banks
Social		
6. Education	MESC	Samoa Polytechnic, National University of Samoa.
7. Health	MOH	Taulasea Samoa; Medical Practitioners' Association.
8. Public Administration	PSC	Public Service Association.
9. Welfare and Social Services	MWCSD	National Council of Churches; Ministry of Commerce, Industry and Labour, Police; Samoa Umbrella for NGOs.
Infrastructure		
10. Construction	MWTI	Ministry of Commerce Industry and Labour.
11. Electricity	Electric Power Corporation	
12. Water	SWA	
13. Transport	MWTI	Samoa Shipping Services, Samoa Shipping Corporation, Transport Control Board, Polynesian Airlines, Samoa Airport Authority, Ports Authority.
14. Communications	MCIT	Samoa Broadcasting Corporation, SamoaTel.

28. **Environmental and Natural Resources Management Frameworks.** Samoa has developed a comprehensive policy and institutional framework for the management of its natural resources and environment. This started in 1993 with preparation of the National Environmental Management Strategy (NEMS), and resulted in the formulation of national policies for addressing several targeted environmental issues such as population, land use,

[11] Government of Samoa: Ministry of Finance/Economic Policy & Planning Division, Sector Planning Guidelines June 2003, p9

biodiversity conservation, climate change, waste management, water resources management, forest development. More recently, detailed and action oriented strategies have been formulated and implemented in order to address the key environmental concerns of the country. Table 2 summarises the existing relevant national environmental policy frameworks and the respective key issues they address.

Table 2

National Environmental Policy Frameworks Scope of Issues Covered

Year	Policy Frameworks	Key Environmental Issues
1991 – 1997	National Watershed Management Policy (NWM) National Forest Development Policy (NFDP)	Degradation of watershed areas, deforestation and demands for water and forest resources.
1994-2000	National Population Policy (NPP) National Land Use Policy (NLUP) National Waste Management Policy (NWMP) National Biodiversity Policy	Population needs, land use management, waste management, and conservation and sustainable management of biological resources.
2000	Coastal Infrastructure Management Strategy	Coastal erosion, landslide and flooding hazard zones.
2001	National Biodiversity & Action Strategy	National priorities for the conservation and sustainable use of the country's marine, freshwater and terrestrial biological resources.
2004	National Adaptation Programme of Action	Vulnerabilities to and resilience against the impacts of global warming and climate change
2005	National Implementation Plan	Impacts and management of persistent organic pollutants and toxic chemicals
2005	National Biosafety Framework	Handling and use biotechnologies and biotechnological products
2005	National Biodiversity Conservation Policy	Update of the National Biodiversity Policy of the '90s
2005	National Forest Policy	Update of the National Forest Development Policy of the '90s
2006	National Action Plan	Land degradation and land use management

29. The main goal of environmental frameworks is the maintenance of the carrying capacities of the country's natural and physical resources, through the promotion of environmentally sound and sustainable developments, and the preservation of critical aspects of the country's biological resources. While the Ministry of Natural Resources, Environment and Meteorology is charged with the over-arching responsibility for monitoring and promoting the implementation of these environmental policy frameworks, it is only able to fulfil this responsibility with the cooperation and assistance of many other relevant Governmental, non-governmental and private organizations and of village authorities. Table 3 below provides an indication of agencies with leading and supporting roles in addition to the over-arching environmental management role of MNREM, for key environment policy framework issues.

Table 3

Agencies with Potential Lead and
Support Roles for Key Environmental Policy Framework Issues

Key Environmental Policy Framework Issues	**Agency(ies) with Potential Leading Role(s)**	**Agencies with Potential Supporting Roles (Examples)**
Water and water resources utilization and management of water utilization systems.	SWA	MWTI, MAF
Population needs, environmental health, and waste management.	MOH	MWCSD, MESC, VC
Built environment for the control and management of coastal erosion, landslide and flooding hazard zones.	MWTI	SWA, MWTI, MAF
Management of agro-biodiversity and sustainable use of marine and terrestrial biodiversity.	MAF	MCIL, NUS, METI, OLSSI, METI, FSA, VC
Built environment (infrastructures) to cope with vulnerabilities to and enhance resilience against the impacts of global warming and climate change	MWTI	MAF, MCIL, NUS, USPA, OLSSI, METI, FSA, TSA
Management of persistent organic pollutants and toxic chemicals	MOH	MAF, SWA, NUS, USPA
Handling and use of biotechnologies and biotechnological products	MOH	MAF, MCIL, NUS, USPA
Land use and land degradation management	MAF/MWTI	NUS

3. Legal Frameworks

30. Table 4 lists the key national legislation and the lead institutions responsible for compliance and enforcement. For the Ministry of Finance and Ministry of Natural Resources, Environment and Meteorology it identifies the legislation that provides their respective over-arching mandate for economic and development planning processes and for environmental management processes.

31. **Economic and Development Planning.** The principal legislation which provides the Ministry of Finance with an over-arching legal mandate to lead and implement the country's economic and development planning processes are: (i) Part III of the Constitution of the Independent State of Samoa; (ii) the Public Finance Management Act 2003; and (iii) the Public Bodies (Performance & Accountability) Act and Regulations 2001. Additional legislation which authorises other key financial and economic management actions of the Government gives a mandate to other key Government ministries. This includes the legislation relevant to the Ministry of Revenue and the Ministry of Commerce, Industries & Labour.

32. **Environmental Management.** The principal legislation related to environmental management in Samoa is: (i) the Lands, Survey and Environment Act 1989; (ii) the National Parks and Reserves Act 1974; (iii) the Planning and Urban Management Act 2004; and (iv)

Table 4

Key Samoan Legislation
and Leading Enforcement Institutions for Economic and Environmental Management

Government Ministry	Key Legislation	Other Important Legislation
Ministry of Finance	Part VIII of the Constitution of the Independent State of Samoa Public Finance Management Act 2003 Public Bodies (Performance & Accountability) Act 2002 Treasury Instructions 1977 & Regulations 1965 Treasury Instructions 1977 & Regulations 1963	Stamp Ordinance 1932 Insurance Act 1976 Petroleum Act 1984 VAGST Act 1993/1994 Business License Act 1988 Income Tax Rates Act 1974 Income Tax Act 1974
Ministry of Natural Resources, Environment and Meteorology	Planning & Urban Management Act 2004 The Lands for Foreign Purposes Act 1993 The Land Registration Act 1993 Lands, Surveys & Environment Act 1989 Forest Act 1984 Plants Act 1984 Exclusive Economic Zone 1977 The Main Roads Development Act 1974 The National Parks & Reserves Act 1974 The Alienation of Freehold Land Act 1972 The Lands & Titles Investigation Act 1966 The Alienation of Customary Land Act 1965 Water Act 1965 The Taking of Land Act 1964 Noxious Weeds Ordinance 1961 Animal Ordinance 1961 The Survey Ordinance 1961	Biosecurity Act 2005 Fisheries Act 1988 The Agriculture, Forests & Fisheries Ordinance 1959

the Biosecurity Act 2005. This key legislation provides the basis for the conservation and sustainable development of natural resources and for environmental protection in general. Establishment and management of protected areas, the control and management of wastes, pollution and invasive species, and the enforcement of environment impact assessment and sustainable development regulations are also covered by the legislation. Further legislation mandates other ministries, such as the Ministry of Agriculture. It provides for the protection and sustainable development of other key areas of natural resources, such as marine resources and agro-biodiversity.

4 . Budgetary Framework

33. The third and fourth components of the economic and development planning cycle, namely project planning and performance budgeting, are the main frameworks for the allocation of financial, human and other resources to both the economic development and environmental management functions of Government. These frameworks are used annually

during formulation and approval of annual budgets, for the whole of Government and for each of its individual agencies. The formulation of each Government agency's budget is guided by the planned outcomes described in the corporate and management plans.

34. Table 5 illustrates the trend in national budgetary allocations to the key sectors of the economy that are underpinned by environmental and natural resources, namely agriculture, works, transport and infrastructure, and natural resources. The Government's financial commitment to the management of natural resources has averaged 3% of total national annual budgetary allocations over the last seven fiscal years (1998-2005). There has been very little variation from this average since the last seven years. This trend is similar to the Government's commitment to agriculture – a highly relevant environmental management area (in terms of biodiversity use and conservation).

Table 5

Percentage of Annual National Budgetary Allocations
for Key Environmental Management Areas of the Economy[12]

FISCAL YEAR (FY)	98/99	99/00	00/01	01/02	02/03	03/04	04/05
AGRICULTURE	5.8	5.9	5.8	5.9	5.6	5.2	4.7
WORKS, TRANSPORT & INFRASTRUCTURE,	14.5	12.2	13.4	12.5	13.6	14.1	15.6
NATURAL RESOURCES	3.1	2.8	3.1	3.6	2.9	2.8	3.6

35. Table 6 shows the trend in percentage of total foreign aid allocations for the key sectors of the economy that are underpinned by environmental and natural resources, namely agriculture, public works, environment, water and energy. For the environment area there is in general an increase in external aid commitment in the last four years, compare to agriculture which have dramatically decreases during the same period.

Table 6

Percentage of Annual Foreign Aid Allocations
for Key Environmental Management Areas of the Economy[13]

FISCAL YEAR	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005
AGRICULTURE	12.4	9.1	6.6	5.9	3.1	3.2	4.1
PUBLIC WORKS	1.6	9.3	2.3	1.8	1.9	0.0	0.0
ENVIRONMENT	0.5	0.0	1.0	3.2	2.1	1.9	1.5
WATER	5.1	21.9	21.8	35.7	6.7	2.1	2.2
ENERGY	0.0	0.0	0.0	0.0	0.7	0.0	0.0

36. Worth noting also is the considerable increase in assistance provided for the water sector in the late '90s. The increase in aid related to water followed the establishment of the Samoa Water Authority in the mid-90s when the sector was given more autonomy. Much of this assistance was from the European Union, for the improvement of water supply systems with implementation of a user pay system.

[12] Calculated from the Table of Actual Budgetary Expenditures for the Last Seven Financial Years 1998-2005.
[13] Calculated from the Table of Foreign Project Aid Estimate Utilisation Summary (WST).

37. In general, small allocations in terms of national budget and external aid has been provided in the last seven years to address environmental and natural resource management needs. In turn, much of the environmental management related work in the country is funded through external bilateral and multilateral assistance. This is shown by the latest information[14] on current and planned public sector investment projects which are relevant to environmental and natural resource management. Approximately 37% of the total value of the Government's public sector investment projects are related to environmental and natural resource management.

C. Performance Indicators

38. Largely as a result of political stability and the major public sector reforms, Samoa has been able to maintain a stable economy over the past five years. However, some major challenges still remain. These include further strengthening of the private sector and further development of the wider community[15].

39. In terms of environmental protection and sustainability, Samoa has in the last five years achieved a significant increase in protected areas and the development of major national environmental management frameworks.

1. Economic

40. For the years 2000-2005, the highest real growth rate (5.1%) was recorded in 2005[16]. Remittances continue to be the largest contributor to the country's economy and were largely responsible for the increase in the commerce industry. Agriculture rebounded in 2005, after a downturn in 2004 due to cyclone Heta. But fish exports, which use to be a major contributor to economic growth, continued to decline, primarily as a result of adverse weather conditions and overfishing. However, noni exports have climbed over the last three years. Public administration, personal services, tourism, manufacturing and construction industries continued a steady growth in 2005. Figures 4 and Figure 5 show increasing trends in tourism earnings and remittance over the past five years.

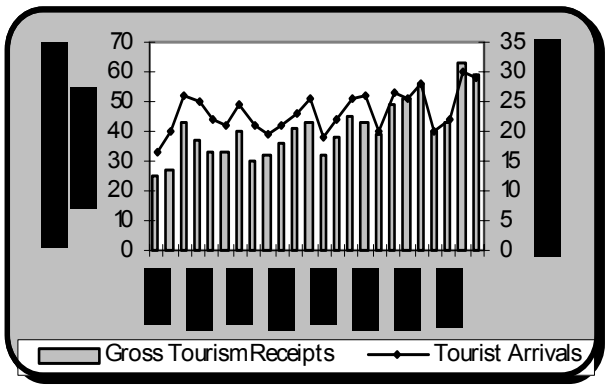


Figure 4. Gross Tourism Receipts (WST million) & Tourist Arrivals (thousands). Source: Quarterly Economic Review, Issue No 31, October-December, 2005. Economic Policy and Planning Division, Ministry of Finance.

[14] As in the Government of Samoa, Ministry of Finance's 'Public Sector Investment Progamme 2005/2006 – 2007/2008, document published in March 2006, pp 16-20. Public sector investment projects are largely aid funded either through loans or grants. .

[15] ADB, Country Strategy and Programme Update 2005-2006, Samoa, 4 August 2004, pp 2-9

[16] Ministry of Finance: Economic Policy & Planning Division, Quarterly Economic Review (Oct-Dec 2005).

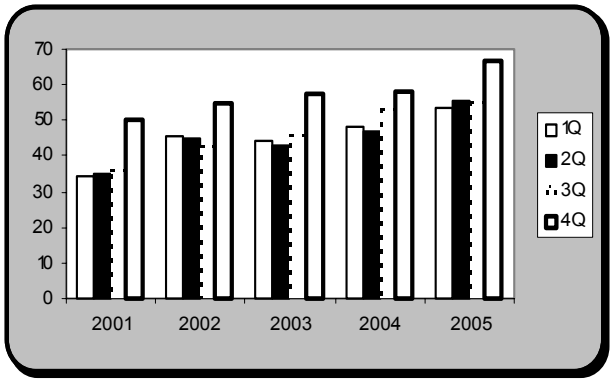


Figure 5. Remittances by Quarter, 2001 - 2005 (WST million). Source: Quarterly Economic Review, Issue No 31, October-December, 2005. Economic Policy and Planning Division, Ministry of Finance.

41. In general export earnings showed a steady decline in 2005 while imports continued to increase. There was a major upsurge in imports in 2005, due to construction works and the strong performance of the commerce industry. Other economic indicators are provided in the CSPU for Samoa. Figures 6 and 7 demonstrate the change in of exports and imports over the past five years.

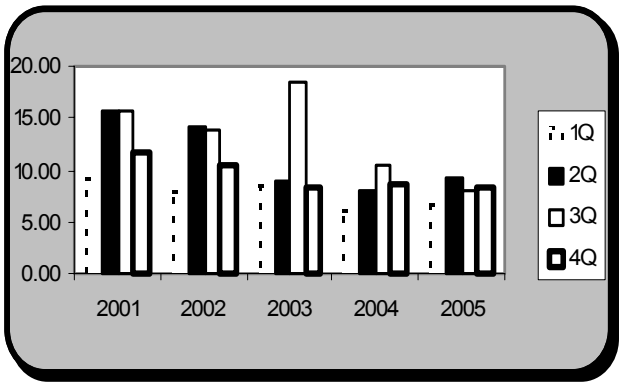


Figure 6. Exports by Quarter Compared Annually (WST million). Source: Quarterly Economic Review, Issue No 31, October-December, 2005. Economic Policy and Planning Division, Ministry of Finance.

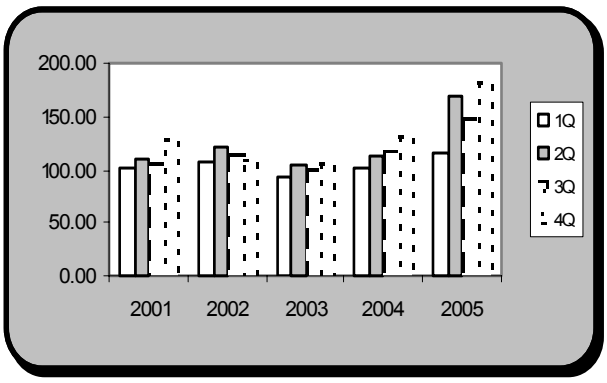


Figure 7. Imports by Quarter Compared Annually (WST million). Source: Quarterly Economic Review, Issue No 31, October-December, 2005. Economic Policy and Planning Division, Ministry of Finance.

2. Environment

42. Two new Government-owned national parks, two large indigenous community managed marine protected areas and several Government nature and recreational reserves in urban Apia areas were established in the last five years. Samoa has now achieved a significant level of protected areas – with more than 11% of its total terrestrial and 5% of its total marine area (EEZ) under some form of protection (Figure 8).

43. During the same period the Government has approved and commenced implementation of six major national frameworks which are directly relevant to sustainable development and environmental management. These are namely the NBSAP, NAPA, NIP, NBF, PUMA Act 2004, and Biosecurity Act 2005[17].

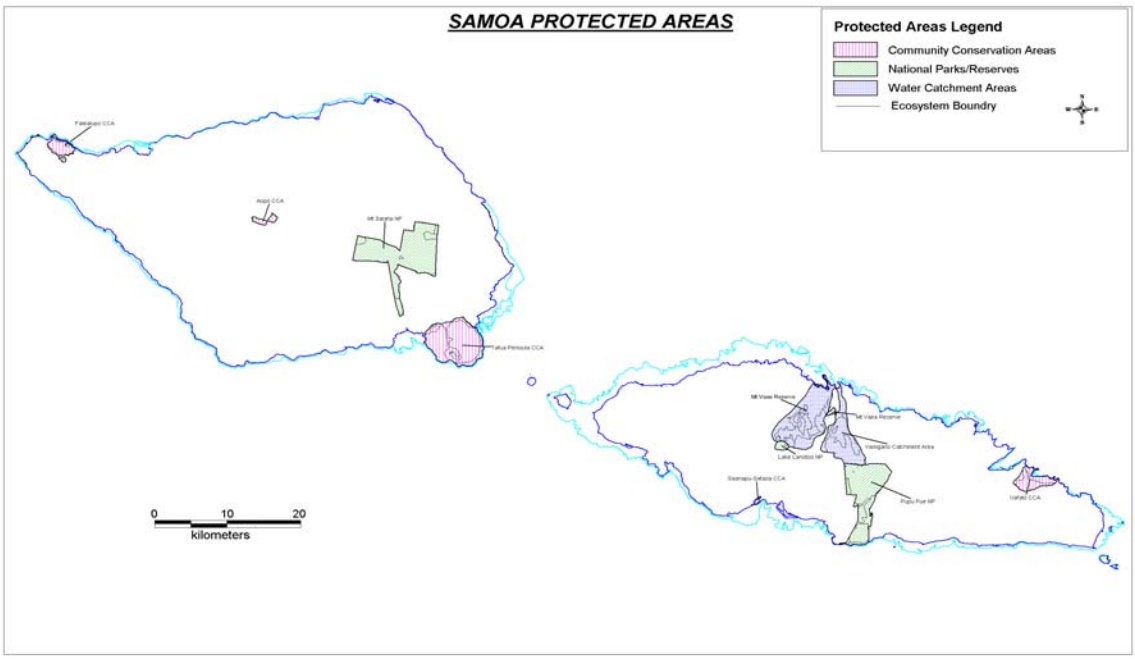


Figure 8. Status of Protected Areas in Samoa – State and Community Managed Protected Areas, as of 2005

44. The major national policy frameworks for environmental and resource management include responses to Samoa's obligations and commitments to key multilateral environment agreements (MEAs) to which it is a party. Table 7 lists the relevant MEAs to which Samoa is a party, with the corresponding national policy frameworks or actions.

45. Other environmental indicators are provided in the CSPU for Samoa.

[17] NBSAP – National Biodiversity Strategy & Action Plan 2001, NAPA – National Adaptation Programme of Action 2004 on climate change impacts, NIP – National Implementation Plan 2005 on organic pollutants, NBF – National Biosafety Framework 2005 on biotechnologies & biotechnology products, PUM Act 2004 – Planning & Urban Management Act on EIA, town planning and development consents, and Biosecurity Act 2005 – on the protection of agro-biodiversity and native biodiversity from the impacts and threats of plant and animal introductions into the country.

Table 7

Multilateral Environment Agreements to which Samoa is a Party

Pacific Developing Member Countries	Global Agreements / Conventions															Regional Agreements / Conventions				
	Ramsar Convention	World Heritage Convention	MARPOL	CITES	Convention of Migratory Species	UNCLOS	Ozone Layer (Vienna) Convention	Montreal Protocol	Basel Convention	Rotterdam Convention	Convention on Climate Change	Kyoto Protocol	Convention on Biological Diversity	Cartagena Biosafety Protocol	Convention to Combat Desertification	POPs Convention	Waigani Convention	SPREP Convention	Regulation of Whaling Treaty	Apia Convention	Pacific Tuna Convention
Samoa	®	®		®	®	®	A	A	A	A	®	®	®	®	®	®	®	®		®	S
Legend: ® - Ratified S- Signed A - Acceded	Established 1st Ramsar site										NAPA (2004)		NBSAP (2001)	NBF (2005)	NAP (under formulation)	NIP (2004)					
	Samoa's Corresponding National Policy Framework /Action																				

3. Sustainability

46. With a score of 0.766, Samoa has a ranking of 74 in the 2003 Human Development Index. In terms of the Millennium Development Goals, Samoa has already met its targets with respect to gender equity in primary and secondary education, infant and under five mortality, tuberculosis prevalence and death rate, terrestrial and marines areas under protection, CO_2 emissions, phase out of ozone depleting substances and urban and rural sanitation. In contrast, the country is making little of negative progress towards achieving the goals related to completion of primary level education, maternal mortality, and rural and urban water supply.

47. Other sustainability indicators are provided in the CSPU for Samoa.

48. In spite of the country's political and economic stability there remain important concerns which will demand attention in the coming years. These include building the capacity to ensure a sustainable expansion and consolidation of the private sector as well as the wider community's full engagement in, and ownership of, the country's economic development. There is also a need to ensure adequate capacity to sustain the expansion

and consolidation of environmental protection and natural resources preservation in the country.

49. Over 80% of the country's natural and human resources that are available to support economic development are under the direct management of grassroots communities. Priority conservation action also rests with these communities. This implies that future efforts will need to focus more attention on developing the grassroots communities, including their individual, institutional and systemic capacities. This is the most logical way forward, not only for expanding and consolidating environmental management in the country, but also for sustaining economic and social development.

D. Role of Environment and Natural Resources in the Economy

50. The environment and natural resources play both major direct and indirect roles in the economy of Samoa. In direct terms of the following key economic sectors of the economy underpin economic development – agriculture, fisheries, water, energy, and tourism. In indirect terms of ecological services which maintain the natural fabric of living resources which sustain economic development.

51. Figure 9 highlights the contribution of agriculture, fisheries and tourism to the economy. Importantly, Figure 10 shows that a major portion of household income is from subsistence agriculture. These three sectors depend on natural services provided by the environment in terms of stable and fertile soil, as in the case of agriculture, healthy marine ecosystems which increases fish and shell fish stocks in the fishing industry, and tourism attraction assets of unspoilt natural scenery; endemic species and native habitats.

52. Most of the country's water supply is from surface water runoff which is extracted from major water catchments. The rest of the water supply is pumped water from groundwater lenses and from rainwater harvesting. Water lenses are subject to contamination from uncontrolled waste and pollution, and rainwater harvesting relies on sustained and adequate rainfall.

Figure 9. GDP contribution from agriculture, fisheries & tourism

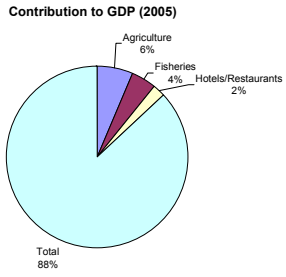
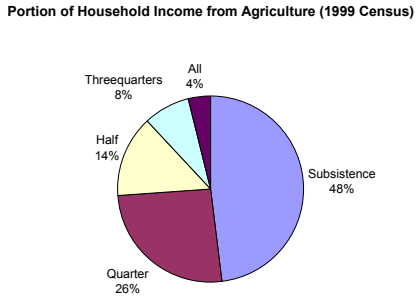


Figure 10. Household income from agriculture



53. More than 40% of the country's electric power supply is provided from hydropower generation[18], all on the island of Upolu. The sustainability of the supply of water and

[18] Electric Power Corporation, Annual Report for 2004-2005, p7 states that for 2004-2005 fiscal year. Electric Power Corporation generated a total of 100,555,119KWhr of 44,253,888 (44%) hydro, 45,985,739 in Upolu, 45,985, 739 (46%) diesel in Upolu and 10,315,492 (10%) diesel in Savaii.

hydroelectricity depends on maintaining the quality and integrity of water catchment areas, including the ecological services provided by rainforests in those catchments.

54. Extreme natural events, such as cyclones, droughts and heavy rainfall, as well as the spread of invasive species or agricultural pests and diseases, have significant impacts on the economy. The economic and social impacts of 12 disasters affecting Samoa between 1950 and 2004 were significant. In that period total reported losses were 2004 US$ 743.4. The average impact of disasters on GDP is 45.6% in disaster years and 6.6% in all years. On average, over 40% of the population are affected by disasters, when they occur.

55. Figure 11 demonstrates the impact of an agricultural disease such as the taro blight that first affected Samoa in 1993. Taro prices rose sharply as the supply of taro dropped dramatically. Only when a new variety of disease resistant taro restored the supply did taro prices declined again. Figure 12 demonstrates the impact of Cyclone Heta on food prices.

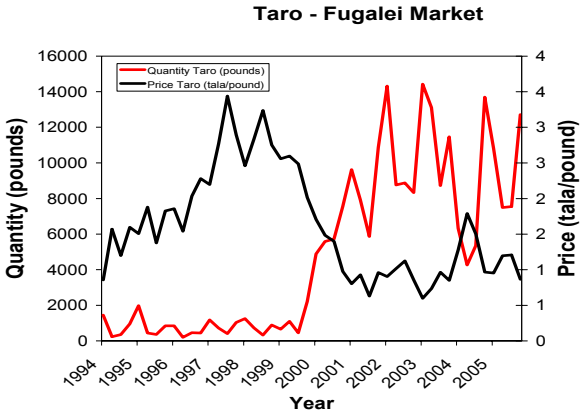


Figure 11. Impacts of the taro blight.

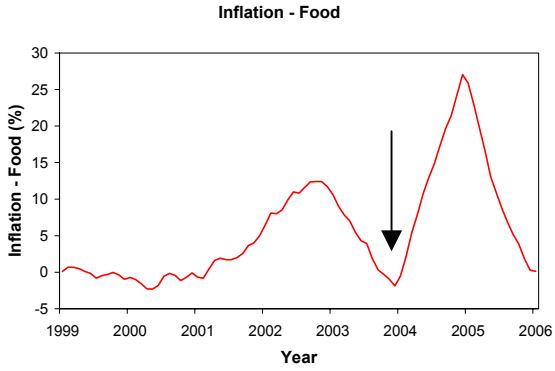
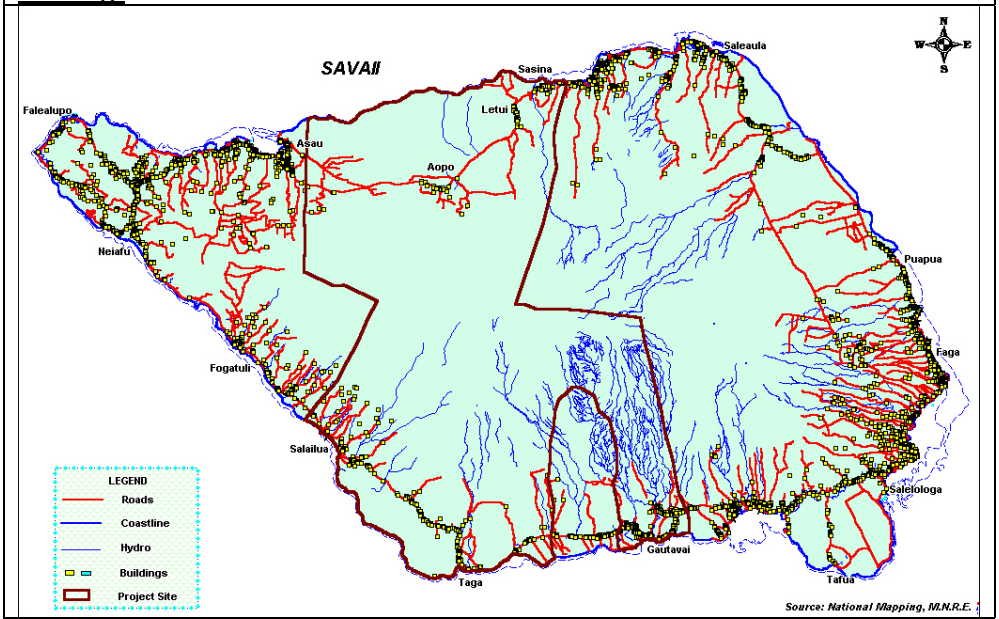
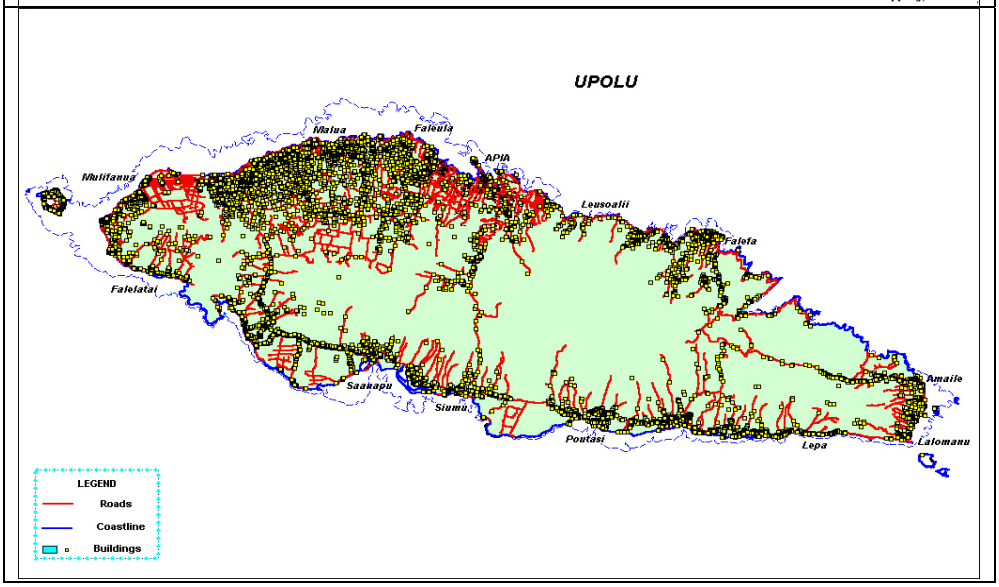


Figure 12. Impacts of Cyclone Heta on national food prices.

56. This vulnerability to climate and weather impacts is critically important to economic planning given the fact that 70% of the country's population are settled on low-lying coastal areas which are highly prone to flooding, erosion and landslide hazards as well as exposure to strong winds and wave actions from the sea. Figure 13 clearly demonstrates this situation.

Figure 13. Population settlements in the main islands of Samoa on coastal low-lying areas shown by yellow for housing and bright red for roading.





Annex 5

Review of ADB's Strategy and Programme for Samoa

1. Samoa joined ADB in 1966. The CSPU was last updated in 2004 and covers the period 2005-2006[19]. The update focused on: (i) current development trends and issue; (ii) a review of progress with implementing the existing country strategy; (iii) portfolio management issues; (iv) country performance and assistance levels; and (v) revisions to lending and non-lending assistance.

A. ADB's Strategic Priorities for the Samoa

2. ADB's operational strategy in Samoa is consistent with the current ADB strategy for the Pacific[20] and continues to support the Government's Strategy for the Development of Samoa. The ADB strategy for Samoa aims to enhance access to, and the quality of, basic social services by: (i) improving access to, and quality of, education; (ii) enhancing the environment and public health of Apia (water and sanitation); and (iii) meeting the growing power demand with improved efficiency, viability, and reliability. Second, the strategy aims to improve the enabling environment for the private sector by: (i) ensuring sound fiscal and macroeconomic policies; (ii) rationalizing state-owned enterprises (SOEs), and enhancing their efficiency and effectiveness; and (iii) improving the institutional and policy framework for the private sector. The ADB strategy reflects the most common aspirations of vulnerable and disadvantaged communities in Samoa, as expressed in ADB's 2002 participatory poverty survey[21]: access to basic social services, rewarding employment, finance and land.

3. For 2005-2006 ADB assistance is emphasizing the following themes: (i) enhance access to, and quality of, basic social services, including education, water and sanitation; (ii) improve the enabling environment for the private sector, including a study of options for land mobilization and securitization; and (iii) support further development of renewable energy.

4. Such a focus is designed to increase the effectiveness of ADB assistance to Samoa. Through assistance to the Government ADB will contribute to enhancing public participation in urban management and planning and fostering good corporate governance, especially in the SOE sector. ADB will continue its dialogue with the Government in relation to appropriate poverty reduction strategies. In the longer term, ADB support for education also encourages increased and effective participation and helps to address the demand for good governance. Since exposure of SOEs is a significant risk to sound economic and financial management ADB will remain engaged in supporting SOE reforms, in encouraging private sector participation in the economy, and in promoting a competitive economic environment.

B. Summary of Past and Current ADB Operations for Samoa

5. Since Samoa joined ADB in 1966 it has received 31 loans totaling $129.975 million and 83 TAs totaling $22,026 million. Five loans of $34.1 million and nine TAs of $3.2 million were active at the end of 2005. Table 1 shows cumulative ADB lending and technical assistance as of as of 30 April, 2006. All loan funds came from the Asian Development Fund.

Figure 1 shows ADB lending and disbursements to Samoa for 1966 to 2004. Table 2 classifies the cumulative loans and technical assistance in terms of the current two ADB

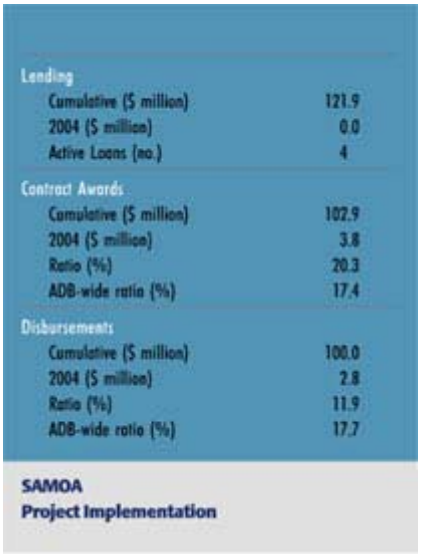
[19] ADB. 2004. Samoa Country Strategy and Programme Update (2005-2006).
[20] ADB. 2000. A Pacific Strategy for the New Millennium. Manila.
[21] ADB. 2001. Technical Assistance for Consultation Workshops on Poverty Reduction Strategies in Selected Pacific Developing Member Countries. Manila.

Table 1

Cumulative ADB Lending and Technical Assistance, by Sector

Sector	Number		$ million		Per Cent	
	Loan	TA	Loan	TA	Loan	TA
Agriculture, Natural Resources and Environment	8	14	32.870	2.342	25.3	10.3
Education	2	6	15.060	2.420	11.6	10.7
Energy	7	15	21.050	2.264	16.2	10.0
Finance	7	10	27.000	2.623	20.8	11.6
Transport and Communication	4	2	12.955	0.510	10.0	2.2
Industry and Trade	0	3		0.900		4.0
Law, Economic Management and Public Policy	0	27		9.552		42.1
Water Supply, Sanitation and Waste Management	0	1		0.115		0.5
Multi Sector	3	5	21.040	1.952	16.2	8.6
TOTAL	**31**	**83**	**129.975**	**22.677***	**100.0***	**100.0**

* Differs from sum of sector values, due to rounding.
Source: ADB Database.



Source: ADB Database

Figure 1. ADB lending and disbursements to Samoa, 1999 to 2004 ($million).

Table 2

Cumulative ADB Lending and Technical Assistance, by Current Strategic Priority

Strategic Priority	Number		Value ($ million)	
	Loan	TA	Loan	TA
Access to and Quality of Basic Social Services	10	25	36.1	4.50
Improve Enabling Environment for Private Sector	3	9	11.0	2.95
Others (Those Not Falling in Any of the Above Three Priorities)	18	49	82.9	15.23
TOTAL	**31**	**83**	**130.0**	**22.68**

Source: ADB Database.

strategic priorities for Samoa. It is clear that, while almost all of the technical assistance is directed towards addressing the strategic priorities, the loans are not as highly focused, as measured in terms of either the number or value of the loans.

6. In terms of this past assistance, five loans and 11 TAs have been related to environmental and natural resources management (Table 3). Over the years ADB's operational strategy in Samoa has ensured ongoing development assistance related to these two thematic areas. Many of the projects relate to the provision of basic social services - electricity, water and sanitation.

Table 3

ADB Assistance Related to Environmental and Natural Resources Management

Assistance	Project Name	Amount ($)	Date Approved
Loan 0392	Second Power	3,450,000	29 Mar 1979
Loan 0813	Afulilo Hydroelectric	5,400,000	04 Dec 1986
Loan 1228	Afulilo Hydroelectric Power (Supplementary)	2,000,000	22 Apr 1993
Loan 1886	Power Sector Improvement	6,000,000	17 Dec 2001
Loan 2026	Sanitation and Drainage	8,000,000	27 Nov 2003
TA 1065	Land Resource Planning	470,000	03 Jan 1989
TA 0288	Forest Utilization and Replanting	59,000	04 Apr 1979
TA 1515	Watershed Management and Community Development	94,000	15 May 1991
TA 3044	Evaluation of Sewage Treatment Options	115,000	10 Jul 1998
TA 2480	Integrated Urban Development	552,000	18 Dec 1995
TA 4229	Institutional Strengthening for Drainage and Wastewater Management	400,000	27 Nov 2003
TA 0091	Power	37,500	19 Jun 1973
TA 0091	Power (Supplementary)	14,500	18 Dec 1975
TA 0350	Feasibility Study of Fagaloa/Afulilo Hydropower Scheme	348,000	22 Apr 1980
TA 0608	Afiamalu Pump-Assisted Hydropower	250,000	29 Jun 1984
TA 3985	Savai'i Renewable Energy	300,000	15 Nov 2002

7. Lending and non-lending assistance programmed by ADB includes loans as well as project preparatory and advisory capacity-building TAs. The ongoing assistance and assistance pipeline comprises: (i) Education Sector; (ii) Sanitation and Drainage; (iii) Power Sector Improvement; (iv) Securitization of Land Leases; and (v) Small Business Development, including Supporting SOE Reforms and Privatization. The planned assistance related to power sector development, sanitation and drainage present a strategic opportunity for ADB assistance to address, in a direct manner, some of the key environmental concerns identified in the participatory consultations.

C. Assessment of Environmental Impacts of ADB's Assistance to Samoa

8. In Table 4 the TAs and loans related to environmental and natural resource considerations are classified in terms of: (i) their pre-implementation environmental rating; (ii) environmental impacts during implementation; and (iii) the sustained environmental and related impacts post implementation. It is clear that most assistance provided by ADB results in minimal environmental impacts, including during project implementation, and many environmental and related benefits.

Table 4

Environmental Performance of Environment and Natural Resources Related ADB Projects Implemented in Samoa

Project Name	Number	Environmental Category[22]	Adverse Environmental Impact	
			Due to Implementation	Sustained, Post Implementation[23]
Second Power	Loan 0392	N A	B	1
Afulilo Hydroelectric	Loan 0813	B	A	3
Afulilo Hydroelectric Power (Supplementary)	Loan 1228	B	A	3
Power Sector Improvement	Loan 1886	A	Not Implemented	
Sanitation and Drainage	Loan 2026	B	-	-
Land Resource Planning	TA 1065	C	C	1
Forest Utilization and Replanting	TA 0288	C	C	1
Watershed Management and Community Development	TA 1515	C	C	1
Evaluation of Sewage Treatment Options	TA 3044	C	C	1
Integrated Urban Development	TA 2480	C	C	1
Institutional Strengthening for Drainage and Wastewater Management	TA 4229	C	C	1
Power	TA 0091	C	C	1
Power (Supplementary)	TA 0091	C	C	1
Feasibility Study of Fagaloa/Afulilo Hydropower Scheme	TA 0350	A	A	3
Afiamalu Pump-Assisted Hydropower	TA 0608	A	A	3
Savai'i Renewable Energy	TA 3985	B	-	-

N A = Not assigned

Source: ADB loan documentation and present study.

[22] Available in advance only for loan projects; estimated retrospectively for TAs. Category A: Projects judged to have significant adverse environmental impacts (potential or actual); Category B: Projects judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for category A projects; Category C: Projects unlikely to have adverse environmental impacts.

[23] Environmental benefits post project implementation range between zero (Category 0) and substantial (Category 3).

D. Lessons Learned from ADB Assistance

9. The evolution of project preparatory activities and project implementation related to the Afuilio Hydroelectric Project (TAs 0350 and 0608 and Loans 0813 and 1228) provide several lessons and illustrate the nature and benefits of improved environmental safeguard polices and practices, both within ADB, by its consultants and contractors and by the Government of Samoa.

10. The Report and Recommendation of the President (RRP: SAM 17085) relating to the proposed project stated that "the Project will not cause any serious environmental problems". This was based on two environmental impact assessments. The first had been carried out by a consulting company in 1987. A second assessment had been commissioned by the South Pacific Regional Environment Programme and undertaken by the New Zealand Department of Conservation in 1991. The latter did identify three concerns: (ii) the need to avoid major fluctuations in reservoir level; (ii) the need to clear the reservoir between the maximum and minimum operating levels in order to avoid a reduction in water quality; and (iii) noise likely to emanate from the powerhouse. Initial attempts to clear the reservoir of trees were not successful – some trees were cut down, but these were not removed, thereby compounding the problem. If the trees floated they would constitute a hazard to the dam and intake works. If the trees remained submerged they would decompose anaerobically, generating hydrogen sulfide that would cause corrosion as well as obnoxious smells at Taelefaga. In the event, other contractors were employed in order that the clearing work be undertaken to the required standard. Reservoir filling then began.

11. The current view is that construction of the Afulilo hydroelectric dam resulted in the loss of a globally unique wetland forest which earlier had been proposed for conservation, as well as the degradation of a substantive area now forming the Afulilo reservoir. People living in Taelefaga have highlighted the brownish colour of water discharged from the power plant.[24] This is believed to have reduced the number of fish on the bay, forcing fishermen to travel further in order to catch fish. Men, women and youth groups in the village have also mentioned the foul smell of the water discharged from the power plant. The river can no longer be used for drinking water and other purposes. There is also evidence that river can no longer be used for prawn fishing and in shore corals are covered by material in the water discharged from the power plant.

12. Subsequently plans were developed to upgrade the existing facilities in Afulilo and increase the installed capacity of the hydropower plant from 4 MW to 6 MW. This would involve raising the dam crest by 1.7 m, installing a third 2 MW generator in Ta'elefaga power station and constructing a 7.1 km gravity diversion canal. The environmental impacts of increased dam height, increased discharge, noise levels, and the transmission line upgrade were assessed and the Project was this time classified as environmental category A. Several environmental management measures were identified to mitigate impacts, including installing a new water supply system for affected villages, building a new bridge downstream from the power station to improve safety, and implementing a post project water quality monitoring programme.

13. The foregoing highlights that environmental safeguard and related policies and practices have been improved substantially, making it unlikely that the adverse environmental consequences associated with the initial development of the Afuilio Hydroelectric Project would occur in relation to future development projects supported by ADB.

[24] ADB TA: SAM Participatory Assessment on Hardship, L. Zuniga, 2002

Annex 6

Renewable Energy Projects in Samoa

Name	Nature (objectives)	Implementing Agency	Date Started	Progress Achieved	Lessons Learned	Recommendations
PIEPSAP	Covers all energy not just RET and EET	SOPAC	2004 - 2007	On-going		
Coconut Fuel Generation	FS into the use of coco oil in EPC power generation	SOPAC	2004	Completed the second draft of FS.	Target suppliers/farmers will not fully support a project that requires them to sell below market price.	The Project's buying price has to be at market price to be acceptable to target suppliers (farmers).
REEP	Some training and information delivery	SOPAC	2002	Completed the first phase (Feb 06).		
PREGA	Identification of environ-mental & social issues constraining RE projects Information awareness on importance of RE to stakeholders particularly communities	ADB	2001 - ongoing	Completed 2 island-level (Upolu and Savai'i) and 4 community consultations in hydro host communities in Upolu under PREGA 2 on Dec 2005.	Consulted communities were appreciative of bringing information to them regarding RE. Most common concerns by hydro host communities were depletion of water resources such as prawns and fish as well as claims of polluted/decreased water supply.	Conduct additional information awareness on renewable energy particularly its different types, advantages and disadvantages to help communities make informed decisions regarding support to RE. Wait for the results of the national election, to find out if the winning Member of Parliament from the project area is supportive of the Project before any more project activities are implemented.
Apolima PV Electrification	Samoa PV development	UNDP, GOS	2004-2005	On-going		
Wind Mill Pilot Testing		UNDP	2005-2006	UNDP with EPC is to start pilot testing of wind mill in the Afulilo Dam area in 2006.		
Savaii Hydro Development	FS of Savai'i Renewable Energy Project (.25 to 2 MW generation)	EPC/Government of Samoa	2003		As mentioned in PREGA 2 above.	
PIREP		GEF		Completed; have a second stage named PIGGAREP[25]		

[25] Pacific Islands Greenhouse Gas Abatement through Renewable Energy

Annex 7

Project Concepts

A. Developing an Inclusive, Participatory Consensus on the Contribution of the Environment to Development

Background:

Both the environment and natural resources of Samoa provide substantial development opportunities, in such sectors as agriculture, fisheries, tourism and energy. There is widespread agreement on the desirability of, and opportunities for, environmental and related improvement in the key economic sectors. But there is no consensus on how these opportunities might be realized, let alone who should lead the process. It is clear that many of the necessary changes will have to be initiated and facilitated by Government, in a whole of Government approach that encompasses the SDS and sector strategies and plans. MNREM has the vision and capacity to coordinate the process. Senior people in Government will need to understand that, while a concerted effort will be required, many of the benefits will only become apparent in the longer term. The stable political situation in Samoa should be conducive to Government taking such a longer-term approach to development, including paying increased attention to environmental considerations. There is also a need to change the mind set of most senior Government officials. This requires that they make themselves more aware of what is happening, and should be happening, in the villages and other communities.

Extensive participatory consultation will be a prerequisite to success. This will require consultations within Government, as well as engaging effectively with the private sector and civil society, to the village level. People are keen to move forward, but need to be guided and encouraged, and need to see that the contributions that make will bring tangible improvements in their quality of life. Both the increased openness of Government, and its greater willingness to engage in dialogue, provide a foundation on which to build a consensus on how the environment can contribute further to the development of Samoa, without compromising environmental quality and the integrity of the country's natural resource base. While it is important that the process and resulting development strategies be nationally owned, support will be required from development partners. The latter will also need to be ready to reflect the new strategies in their assistance programmes.

Goal and purpose:

The goal is to highlight and take advantage of the many ways in which the environment, including natural resources, can further the social and economic development of Samoa. This goes beyond the conventional view of environment as one of the three pillars of sustainable development, to also consider the Samoan environment as a key component of the "enabling environment" for development. It is important that this contribution be sustainable. Prudent policies and wise management practices are required since, in all likelihood, the natural assets of Samoa will play an increasingly important role in the economic and social well-being of the country. The project should give *practical* meaning to the statement "sound environmental management is a profitable investment, not an unproductive cost".

The proposed project will assist Samoa to implement a broad-based consultation process to build the necessary consensus; such a consensus is critical to developing a more effective working relationship between the Government and the communities that have ownership of the vast majority of the land and other natural resources that will underpin future development of Samoa; the private sector must also be engaged as it also plays a critical role in the development process.

A critical step is to achieve a consensus regarding what is needed to facilitate development in Samoa through sustainable use of environmental and related assets. Not only is a whole-of-Government consensus and commitment to action required, but indeed the consensus must be whole-of-country. The vision and implementing strategy will be more inclusive and robust if it is built up from village and community levels. This is not to imply a prolonged and expensive consultative process. Quite the contrary, thanks to the committed efforts of NGOs, CBOs, the Government and other key players. Amongst village and community leaders, and their constituents, there is already a well-developed understanding regarding what is needed to increase their individual and collective well-being, including that of the country at large. Government should heed these messages and ensure they are better reflected in such important policy and planning instruments as the SDS and sector and cross-sectoral policies and plans. This approach is preferable to updating such policy documents as the National Environmental Management Strategy. Doing so would do much to negate the limited progress already made in mainstreaming environmental considerations in development and planning processes.

Components and outputs:

The first step would be to establish an inclusive national task force, comprising qualified and motivated individuals from ministries seconded to work with like-minded key players from the private sector and civil society. The task force would be mandated to identify and define the national consensus regarding what is needed to facilitate development in Samoa through sustainable use of environmental and related assets. It would also be charged with the responsibility to provide bureaucrats with a menu of options for policy, planning and operational initiatives that would give effect to the consensus view. The task force could also become a more formal Government unit under the MNREM and undertake the monitoring and evaluation of the mainstreaming activities, with staff trained for the purpose.

Expected results and deliverables:

One of the main results and deliverables would be a high level policy directive that environmental considerations will be incorporated in all relevant policies, plans and projects. A statement to this effect will be included in a set of principles that guide the content and implementation of the SDS. Subsequent policy goals and plans will give effect to this principle. This will provide the policy context for all ministries and other Government agencies.

All public sector institutions will thus be mandated to mainstream environmental considerations and can no longer assume that environmental policy, planning and management are largely, if not exclusively, the responsibility of MNREM. The mandate of MNREM will also be clarified regarding its roles in environmental policy, planning and management, in light of the environmental responsibilities assigned to other Government institutions. National cross-sectoral policies will be strengthened to clarify which Government institution has principal responsibility for implementation of the environmental considerations.

Social and/or environmental concerns:

Numerous social and environmental benefits will result from this TA. There will be no adverse social or environmental impacts.

Plans for disseminating results/deliverables:

Reports, meetings, workshops, and seminars.

Proposed executing/implementing agency:

Ministry of Finance and Ministry of Natural Resources, Environment and Meteorology

Nature/extent of government/beneficiary involvement in identifying or conceptualizing the assistance:

This TA is a direct consequence of participatory consultations conducted as part of the country environmental analysis (CEA), including a National Dialogue on Integrating Environmental Considerations in Economic and Development Planning Processes in Samoa.

B. Enhancing Capacity of Government to Mainstream Environmental Considerations

Background:

Capacity building is increasingly taking a more integrated approach to development planning. This includes building capacity within Government to prepare and secure approval of national policies and legislation. While many activities are still project driven, a more programmatic approach is now are emerging. Recent reforms mean that the Government is now outsourcing delivery of services to both rural and urban communities, as well as the provision of policy and technical advice. Given the increasingly important roles being played by NGOs there is a need for capacity building around mechanisms for the Government to engage with NGOs, including how to channel funding and outsource activities. One aspect of this capacity building relates to cultural change within Government, helping officials and politicians to see the value of utilising NGOs in implementation and to not feel threatened by such partnerships. Currently there is a tendency for some Ministries to 'create' an NGO if they want or need an NGO to work with.

Capacity is thus required in line ministries to ensure effective engagement with the private sector and NGOs and also to ensure that outsourced work is adequately monitored, assessed and interfaced with Government policies and plans. The focus should be on providing an enabling environment, including improved coordination and cooperation between ministries and with other stakeholders.

One of the main constraints to ensuring environmental and related improvements in the key economic sectors is the lack of understanding of the environment and related legislation, resulting in less than desirable levels of compliance and in a lack of enforcement. Much development is inconsistent with at least the spirit of the legislation and ignores or downplays environmental considerations. There is a need to improve understanding of the relevant legislation, including the processes related to gaining a development consent. These constraints suggest the need for capacity building, especially in relation to procedures for development approvals.

The increasing pace and changing nature of development activities in Samoa is causing a rapid transition into the more technical aspects of environmental management, including in situ and remote monitoring and laboratory analyses. The need for such information is growing in importance. It can assist in establishing baseline conditions against which the anticipated and eventual environmental impacts of planned development can be judged.

Goal and purpose:

The goal of this project is to help achieve the successful mainstreaming of environmental considerations by equipping relevant individuals in Government institutions with the understanding and skills that will ensure sector and cross-sectoral policies and plans, including the SDS, incorporate strategies and actions to minimize adverse environmental impacts and maximize the appropriate use of environmental services in ways that add further value to intended outcomes. It is also important that in each institution there are individuals with the ability to establish environmental performance targets and identify, monitor and evaluate appropriate performance indicators. Furthermore, all relevant Government institutions need to have staff with the expertise needed to undertake the environmental assessments required as part of project planning and programming.

Components and outputs:

A key component of the project is to identify and implement a mechanism for determining the extent to which specific environmental outcomes are being achieved, including identifying

and using environmental indicators. These indicators will also be used to ensure that environmental considerations are an integral part of performance based budgeting.

Another component of the project will be to enhance capacity in relevant Government institutions, including line ministries, to: (i) undertake EIAs, including social impact assessments; (ii) assess the EIA findings and provide guidance to decision makers; and (iii) monitor project outcomes, across all areas, including the environmental outcomes.

Expected results and deliverables:

Project activities will help develop an informed and willing acceptance of such a whole of Government approach to, and a collective responsibility for, environmental stewardship Relevant individuals in Government institutions will gain the understanding and skills to ensure that sector and cross-sectoral policies and plans, including the SDS, incorporate strategies and actions to minimize adverse environmental impacts and maximize the appropriate use of environmental services in ways that add further value to intended outcomes. In each institution individuals will be provided with the ability to establish environmental performance targets and identify, monitor and evaluate appropriate performance indicators. Staff in all relevant Government institutions will be given the training required to enable them to undertake the environmental assessments required as part of project planning and programming.

One of the main results will be management plans which include measurable and time bound targets that encompass environmental outputs and outcomes in conjunction with the conventional outputs and outcomes of the institution. The environmental targets will reflect the commitment in the relevant sector plan to minimize adverse environmental impacts and maximize the appropriate use of environmental services in ways that add value to their efforts. The plans will also include establishing and monitoring a suite of indicators which can be used to assess the extent to which the targets have or have not been achieved. They will also include the requisite reporting and quality improvement activities, based on the targets and indicators

Social and/or environmental concerns:

Numerous social and environmental benefits will result from this TA. There will be no adverse social or environmental impacts.

Plans for disseminating results/deliverables:

Reports, meetings, workshops, and seminars.

Proposed executing/implementing agency:

Ministry of Finance and Ministry of Natural Resources, Environment and Meteorology

Nature/extent of government/beneficiary involvement in identifying or conceptualizing the assistance:

This TA is a direct consequence of participatory consultations conducted as part of the country environmental analysis (CEA), including a National Dialogue on Integrating Environmental Considerations in Economic and Development Planning Processes in Samoa.

C. Building Capacity of Village Mayors and Women Government Representatives in Development Decision Making and Environmental Leadership

Background:

Communities are becoming more aware of the potential of their lands. With over 80% of land in customary ownership, the resources of the country are largely under the stewardship of communities, including villages. This is therefore where the greatest opportunities exist for using these resources in a sustainable manner to further the development of communities, and the country as a whole. However, at present the majority of customary land owners and users lack the capacity to make and implement decisions that will result in more productive and sustainable use of their resources.

Opinion leaders in the community can play an important role in mainstreaming environmental management. This can be achieved as much by highlighting the widespread and diverse benefits of improving and maintaining environmental quality as by documenting systemic and specific failures that lead to environmental degradation and unsustainable use of natural resources. The Government can do much to ensure that the expertise available within civil society is used productively to complement rather than substitute for the work of Government employees. In a true partnership there will be mutual respect and a shared vision for the management of Samoa's environment and natural resources.

The recently completed National Adaptation Programme of Action and the National Capacity Self Assessment thematic report related to climate change have identified many measures that can be implemented to reduce Samoa's vulnerability to climate change. These included providing training for village leaders (chiefs, women's committee, church ministers, untitled men's groups and youth groups) to help them understand and integrate adaptation actions and measures into their current and future activities.

Goal and purpose:

The goal of this project is to build the capabilities and capacities of village mayors and women government representatives in order that they can make sound decisions and also serve as well informed and highly effective leaders in their communities. The focus of the project is achievement of sustainable management of the environment and natural resources at village and household levels.

If mayors and women government representatives encourage and enable their constituents to engage in more environmentally sound and sustainable practices there will be a major improvement in environmental quality and in the availability of natural resources. This is because in Samoa a large proportion of these assets are in customary ownership.

Components and outputs:

The main components of this project will be awareness raising and targeted training activities for village mayors and women government representatives, focusing initially on the information and skills required to make environmentally sound decisions and to provide effective leadership with respect to environmental stewardship.

The main outputs will be village mayors and women representatives with the ability to make environmentally sound decisions and to provide effective leadership with respect to environmental stewardship.

Expected results and deliverables:

Not all mayors and women representatives will be involved in this project in the first instance.

The awareness raising and targeted training activities will be trialled on a small scale initially. Once the methods are confirmed as to their acceptability and effectiveness a more comprehensive programme of awareness raising and training will be undertaken.

Social and/or environmental concerns:

Numerous social and environmental benefits will result from this TA. There will be no adverse social or environmental impacts.

Plans for disseminating results/deliverables:

Reports, meetings, workshops, and seminars.

Proposed executing/implementing agency:

Ministry of Women, Community and Social Development.

Nature/extent of government/beneficiary involvement in identifying or conceptualizing the assistance:

This TA is a direct consequence of participatory consultations conducted as part of the country environmental analysis (CEA), including a National Dialogue on Integrating Environmental Considerations in Economic and Development Planning Processes in Samoa.

D. Enhancing Capacity of NGOs to Include Environmental Considerations in Community (including Family) Development Projects

Background:

There has been impressive progress with implementing community development projects in Samoa, in part as a result of improving working relationships between Government and the NGO community. Several NGOs have demonstrated success in increasing the income generating abilities of families and small businesses, many of which are reliant on aspects of the environment and natural resource base. However, NGOs still highlight an urgent need to raise awareness and improve decision making skills at the individual and household levels. Many people fail to recognise the wider consequences of their individual and collective decisions and actions. Communities are therefore being encouraged to develop plans to improve their well being, and to be proactive and well informed when making decisions and implementing them.

It is unlikely that the renewed importance Samoan's are placing on the environment will become widespread and enduring in the absence of substantial efforts to support awareness raising and action oriented programmes in the villages and other communities. Importantly, experience has shown that it is not productive to just promote the environment to communities – it is far more effective to facilitate livelihood improvements. Environmental improvements then follow indirectly, as co-benefits.

Government is outsourcing an increasing number of development projects, but there has not been a concomitant increase in the capacity of civil society to provide these additional, and sometimes new, services. Where possible there should be greater emphasis on involvement of civil society at the programmatic level, in order to ensure sustainability of expertise and service delivery.

Significant gaps in environmental awareness still exist in the general population. These need to be addressed if members of civil society are to be more effective partners in development and environmental projects. In many villages there is still a lack of understanding about practical and feasible opportunities to improve the well being of individuals and families. Over 80% of the population have not completed a basic education,

Neither the Government nor NGOs working alone have sufficient capacity to assist communities with develop projects, including improving the management of the environment and natural resources. There is now increasing coordination and cooperation, with the Government providing technical and other assistance. An important issue facing both the Government and NGOs is how to ensure effective multi-stakeholder participation in both project preparation and implementation.

Samoans rely heavily on biological resources for their economic, social and cultural wellbeing. The use of natural resources for food, artisanal and medicinal purposes is an essential expression of the Samoan culture. The challenge is to achieve protection for biodiversity resources within the context of sustainable use. This is best done with the cooperation of those living in the area and who are the main owners and users of the resources.

The agricultural sector is a substantial subsistence base which continues to provide a source of livelihood for over 80% of the population and a high level of domestic food security. As noted in the SDS, increased community agriculture production is central to the need for food security. The latest study to measure poverty in Samoa used the results of the 2002 Household Income Survey to examine food and basic need poverty lines. The Food Poverty Line was estimated at WST 24.68 per capita per week. Around 8% of households have incomes and expenditures which are below this value.

A survey undertaken by the Ministry of Health in 2002 showed that most Samoans eat fruit less than three days a week. Approximately one third of the population eat no fruit, or less than one serving a day. The same survey found that people eat vegetables most days of the week. However, consumption of vegetables would have been much less had the survey not included starchy foods such as taro, bananas, yams and breadfruit as vegetables.

The recently completed National Adaptation Programme of Action and the National Capacity Self Assessment thematic report related to climate change have identified many measures that can be implemented to reduce Samoa's vulnerability to climate change. These include providing training for village leaders (chiefs, women's committee, church ministers, untitled men's groups and youth groups) to help them understand and integrate adaptation actions and measures into their current and future activities as well as enhancing community water resources by developing water purification programmes for communities, community watershed management programmes, alternative water storage programmes and by restoring coastal springs in communities.

Goal and purpose:

The goal of the project is to support village-based farmers and farmer groups, including women and youth groups, through the sharing of ideas, experiences and farming techniques that can lead to solutions to common problems that hinder production. One reason for such support is to enhance food production and food security. Improvements in marketing will also assist in achieving this goal. Thus the overall purpose is to enhance food security at the village level through: (i) improving access for producers to agricultural, fisheries and food management information; (ii) demonstration of good agricultural, and food preparation and storage practices and of community-based resource management systems; and (iii) project development at the village level initiated through the *pulenu'u*.

Components and outputs:

The main components of the project are as follows:

- Promote and demonstrate traditional and modern sustainable land use practices at community level;
- Enhance food security and nutrition;
- Promote harmonization of traditional and science-based methods and technologies for food production, processing and preservation;
- Improve water quality, accessibility and availability; and
- Improve agricultural, fisheries and food preparation and storage practices and technologies by rural families.

The main output will be individuals and families who have adopted environmental sound and sustainable food preparation, storage, marketing and consumption practices.

Expected results and deliverables:

The main result will be the application of traditional and science-based methods and technologies for food production, processing and preservation.

Social and/or environmental concerns:

Numerous social and environmental benefits will result from this TA. There will be no adverse social or environmental impacts.

Plans for disseminating results/deliverables:

Reports, meetings, workshops, and seminars.

Proposed executing/implementing agency:

Ministry of Agriculture and Fisheries and Ministry of Women, Community and Social Development.

Nature/extent of government/beneficiary involvement in identifying or conceptualizing the assistance:

This TA is a direct consequence of participatory consultations conducted as part of the country environmental analysis (CEA), including a National Dialogue on Integrating Environmental Considerations in Economic and Development Planning Processes in Samoa.

E. Building Capacity for Sustainable Land Use Planning and Management at National and Community Levels

Background:

In recent years there has been a rapid and accelerating transition from a subsistence to a cash economy, along with growing pressures on customary resources and practices. Communities are becoming more aware of the potential of their lands. With over 80% of land in customary ownership, the resources of the country are largely under the stewardship of communities, including villages. A large number of villages are reclaiming customary lands, with the associated rights of use. Importantly, many of these areas constitute critical watershed lands. As a result, there is a need for the Government to be more proactive with respect to ensuring protection of such important areas.

Unregulated clearance of native forests occurs as a result of shifting cultivation and expansion of family plantations, leading to soil erosion and the loss of other environmental assets and services. Approximately one third of the country's forests were cleared between 1977 and 1990, the clearance rate of 3% per year being one of the highest in the world. Deforestation impacts adversely on wood supply, water supplies, biological diversity and on livelihoods. Many Samoan families actively maintain a weed-free environment. This can promote the exposure of soils to rain splash action, with the resultant movement of particulate matter downslope and downstream. The practice of slash-and-burn farming, and shifting cultivation on steep slopes and riverbanks, without buffer zones, is relatively common.

Monocropping, rather than the more traditional systems such as mixed cropping and integrated farming, is more likely to result in land degradation via soil erosion due to rainwater. Commercial logging has, over the years, contributed significantly to the reduction of forest areas as well as their severe degradation. Changes in agricultural land use patterns and the consequences of the taro leaf blight in the late 1980s have influenced the increase of secondary forests and overgrown agriculture plantations on the major islands of Upolu and Savaii.

Samoan island ecosystems are especially vulnerable to the problems of land degradation and unsustainable land use because their natural resource base is limited and ecologically fragile. In some well-delineated areas, such as the watersheds and catchment areas around the Apia urban area and in northwest Savaii, a variety of factors interplay to produce a situation where land degradation is an issue of increasing concern. The most pressing land degradation issues in Samoa include: a) deforestation as a result of: i) commercial felling/extraction, with little replanting; ii) inappropriate agricultural activities and inappropriate land uses which in turn causes the loss of soil fertility; and b) coastal erosion as a result of: i) extraction of sand; ii) destruction of mangroves; and iii) inappropriate coastal reclamation. The push for cash crops is a principal reason for land clearance, with people ignoring there own need for a secure food supply of adequate nutritional value.

The quality and security of water supplies are being threatened by forest clearance within catchment areas and by deforestation on marginal land areas, for both subsistence and commercial oriented agriculture. While some benefits of policy and management initiatives are showing, the need for watershed protection is not being addressed in a coordinated manner.

Goal and purpose:

The goal of this project is to help ensure appropriate and sustainable utilisation of land resources. Degradation of land and its resource base is believed to be almost non-reversible, especially in view of the severe repercussions on the soil and for productivity of the land.

Consequently, there is a need to promote land capability guidelines and an integrated system of land information that developers can use to guide the best development methods to the most suitable land. Such measures can now be strengthened under the umbrella of the recently approved Land Use Policy for Samoa. Addressing the high population growth rate and the impacts of increasing urbanisation will require concerted efforts to establish an integrated planning and management system that is responsive to urban growth pressures and which builds on the existing capabilities of agencies and village groups already servicing the urban area. The system should provide regulatory policies and frameworks that would ensure good delivery of services required to sustain the quality of life desired.

Components and outputs:

Knowledge and skills will be strengthened at national level for land use planning and at community level for land use practices.

Expected results and deliverables:

The project will contribute to strengthened sustainable land use planning and management at national and community levels.

Social and/or environmental concerns:

Numerous social and environmental benefits will result from this TA. There will be no adverse social or environmental impacts.

Plans for disseminating results/deliverables:

Reports, meetings, workshops, and seminars.

Proposed executing/implementing agency:

Ministry of Natural Resources, Environment and Meteorology and Ministry of Agriculture and Fisheries.

Nature/extent of government/beneficiary involvement in identifying or conceptualizing the assistance:

This TA is a direct consequence of participatory consultations conducted as part of the country environmental analysis (CEA), including a National Dialogue on Integrating Environmental Considerations in Economic and Development Planning Processes in Samoa.

F. Upgrading Technical Early Warning Systems and Response Capabilities

Background:

There are many natural hazards that pose a threat to Samoa, including tropical cyclones, storm surges, volcanic eruptions, earth quakes, tsunami and drought. The vulnerability of Samoa to the impacts of climate change and sea-level rise is an especially serious concern because 70% of its population and infrastructure are located in low lying coastal areas. Mapping of areas vulnerable to natural hazards indicates that 65% of all areas assessed for sensitivity to coastal hazards were highly vulnerable, 20% medium and 11% being very highly sensitive. Only 4% of the coastline is considered to be resilient to coastal hazards.

As a semi-subsistence nation, Samoa is sensitive to threats on water supplies, food production and natural resources. The occurrences of tropical cyclones, long periods of droughts and flooding events have in the past affected the source of income of most of the Samoan population. People are losing land to accelerated erosion from destructive waves, frequent storm surges and landslips, causing social problems among families and communities. Some people are facing hardship due to destruction of their plantations by flooding, cyclones, pests and diseases, all of which threaten food security.

The Disaster Management Office is in the final stages of gaining approval for the National Disaster Management Plan. This will include a review of relevant legislation, to ensure authorities have the appropriate mandates for dealing with a disaster. The emergency response plans of various agencies are also in the final stages of preparation. To give effect to these plans there is an urgent need to improve the capacity to receive, generate and disseminate early warnings for a wide range of hazards, related to both natural and human causes. Another urgent priority is to raise awareness of natural and other hazards. Currently there is relatively low awareness, despite the high vulnerability. In this respect the Disaster Management Office, working in conjunction with NGO and other partners such as the Red Cross, has initiated awareness campaigns. However, with only three staff in the Disaster Management Office, the impact of these programmes has been very limited to date.

Goal and purpose:

The goal of this project is to deploy early warning systems so that there is whole of country-coverage for timely early warning of hazards such as tropical cyclones, storm surges, volcanic eruptions, earth quakes, tsunami and drought and to undertake awareness raising and education programmes that ensure members of the public can take appropriate action on receipt of such a warning. The purpose of the project is to reduce the impact of such hazards as and when they occur.

Components and outputs:

The project has three major components:

- Needs and capacity assessments to determine the requirements for, and nature of, the early warning systems and the activities to strengthen response capabilities;
- Procurement and deployment of early warning systems; and
- Awareness raising and education programmes designed to provide the public with ability to take appropriate action on receipt of a warning.

Expected results and deliverables:

This project will result in the deployment of appropriate early warning systems and in the strengthening of response capabilities.

Social and/or environmental concerns:

Numerous social and environmental benefits will result from this TA. There will be no adverse social or environmental impacts.

Plans for disseminating results/deliverables:

Reports, meetings, workshops, and seminars.

Proposed executing/implementing agency:

Ministry of Natural Resources, Environment and Meteorology and Ministry of Women, Community and Social Development.

Nature/extent of government/beneficiary involvement in identifying or conceptualizing the assistance:

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