



GOVERNMENT OF SAMOA

NATIONAL GREENHOUSE GAS ABATEMENT
STRATEGY 2008-2018

**MINISTRY OF NATURAL RESOURCES &
ENVIRONMENT**

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NATIONAL GREENHOUSE GAS ABATEMENT STRATEGY 2008-2018

Introduction

Climate change is an issue of major concern to the future economic, social and environmental wellbeing of all Samoans. Initially adaptation was seen as the main priority of national efforts on climate change leading to the Cabinet approval in 2005 of the National Adaptation Programme of Action and its current implementation. In recent years, however, and in spite of Samoa's contribution to global warming being very small, there is growing agreement that climate change mitigation is everyone's responsibility. It is also considered that the reduction of greenhouse gas (GHG) emissions through this National GHG Abatement Strategy 2008-2018 (NGHGAS) will enhance national sustainable development efforts and improve the efficiency of the local economy. The mitigation of and adaptation to climate change impacts are among the key strategic priority for Samoa as highlighted in the National Policy on Combating Climate Change.

According to the Intergovernmental Panel on Climate Change (IPCC), average global temperatures increased by approximately 0.76°C since the mid-1800s. During the period 1961-2003 there was an average increase in global sea level of approximately 1.8mm per year. Rainfall patterns have also changed markedly over recent decades with more intense and long droughts observed in the tropics. Other climate extreme events such as heatwaves, cyclones and flooding have also become more common.

Significant scientific evidence indicates that an increase in the global average temperature of more than 2°C above pre-industrial levels poses severe risks to natural systems, human health and population well-being. Sustained warming of this magnitude could result in the extinction of many species and extensive melting of the Greenland and West Antarctic ice sheets, causing global sea level to rise between 12 and 40 feet. In light of this evidence a number of countries have indicated their commitment to a long-term goal of limiting warming to 2°C above pre-industrial levels. This will require immediate and sustained action to reduce heat-trapping emissions through increased energy efficiency, expanding the use of renewable energy and reducing deforestation and degradation. So to avoid a temperature increase of more than 2°C, according to the IPCC, worldwide global warming emissions should be reduced by at least 50 per cent below 1990 levels by 2050.

Local observations compiled by the Meteorology Division of the Ministry of Natural Resources & Environment (MNRE) over the last century appeared to confirm the global climate change trends. Since 1900 the mean daily temperature in Samoa has increased by approximately 0.59°C. During the period 1993-2000 the SEAFRAME gauge in Apia Harbour recorded a relative fall of 3mm/year in sea level although this is against the trend elsewhere in the Pacific of 1.07mm/year. Daily extreme rainfall events have also become more common. For example, an extreme daily rainfall event of 300mm (which has the potential to cause major flooding) is becoming more common with the return period decreasing from one in every 300 years to one in every 10 years.

The IPCC projects global climate change to worsen over the coming decades with many of the observed trends described above expected to intensify. Samoa is seen to be particularly vulnerable to climate change impacts with strong threats predicted to the water, health, agriculture, fisheries, biodiversity and infrastructure sectors.

The World Resource Institute reported that in 2000, the total global greenhouse gas (GHG) emissions comprised of 77% CO₂, 14% CH₄, 8% N₂O and 1% combined F-gases. In terms of sectors, 61.4% of global GHG emissions came from the energy sector; 18.2% from land use change and forestry; 13.5% from agriculture; 3.6% from waste and 3.4% from industrial processes. In the energy sector 40% came from burning fossil fuel emissions for electricity and heat, 22% from transportation, 17% from industry, 15% from other combustion and 6% from fugitive emission, mainly oil/gas extraction, refining and processing. For electricity and heat emissions over 60 % is attributed to buildings. Global GHG emissions are therefore largely attributed to the energy sector followed by land use and forests, agriculture and industry.

National GHG emissions

Samoa like all parties to the United Nations Framework Convention on Climate Change (UNFCCC) is acutely concerned about the impacts of climate change to its people and their livelihoods. As a small island developing state and least developed country Samoa contributed very little to global warming and yet is among the most vulnerable to its impacts and consequences.

According to the Samoa's First National GHG Inventory the total national GHG emission was 200,000 tons in 1994 while the preliminary findings of the Second National GHG Inventory estimated emissions at 370,000 tons in 2005 – a rise of nearly 86%. The 2005 emissions were made up of 23% from transportation 20% from livestock; 18% from land use and land use change and forests; 12% from electricity production; 10% from waste; 9% from domestic aviation; and 7% from other sources. The priority sectors therefore for GHG abatement actions are energy with 52% of total emissions; agriculture and other land uses with 38% and waste management with 10%.

Samoa is heavily dependent on imported petroleum products for its energy needs. Fuel imports in 2004 were 27 million litres of petrol (ST48 million) where most was used in land transport; 35 million litres of diesel (ST58 million) with nearly half used for electricity generation; 16 million litres of kerosene (ST25 million) with most used for aviation purposes; and 1.3 million kg of liquefied petrol gas with half used by commercial customers. The national annual fuel bill is over ST130 million and growing with the global price of oil now over USD90 a barrel.

Objectives, outcomes and strategies

The overall objective of the NCHGAS is to mitigate the impact of climate change through GHG abatement; supporting global action to reduce GHG emissions but also strengthening the national economy by the efficient operation of the relevant sectors producing GHG. Action in the energy sector, particularly land transportation and electricity generation would achieve the dual global and national benefits while trade offs in the agriculture, land use and land use change and forests may provide cross-cutting national benefits in key sectors such as tourism and manufacturing. As seen from the matrix below the strategy deals with a range of relevant sectors and issues.

In the land transportation sector energy efficiency is a top priority in the motorised subsector while the increased use of non-motorised transport would lead to further reduction in GHG emissions. Energy efficiency is also a main consideration in the electricity sector focussing on both the demand and supply management. While the development of renewable energy is

also being promoted it is really in energy efficiency, according to the International Energy Agency, where the main benefits in GHG reduction will accrue during the next 30-50 years.

One of the key issues to be considered under electricity demand management is peak demand. In 2000 the average demand was recorded at about 87,000 MWH which increased to about 108,000 MWH in 2006. Since electricity cannot be effectively stored, electrical networks must instantaneously balance generation and load, i.e., supply must always equal demand. Therefore there is a need to build for the peak because sufficient generation capacity must meet maximum instantaneous demand whenever it happens. Meeting varying demands requires a mix of generation capacity including base-load and peak-load generation. A base load generation unit is one that provides a steady flow of power regardless of total power demand by the grid. In contrast a peak-load unit runs only when there is a high demand. In Upolu for instance peak demand occurs during the day when people are at work and in the evening when people returned home. These highs and lows result in significant unused power leading to an oversupply of electricity.

Objective 1: Reduced GHG emissions from the land transport sector

Outcomes	Strategies
○ Energy efficiency in motorised land transport operations improved	<ul style="list-style-type: none"> ➤ Conduct awareness programmes on energy efficiency for transport users ➤ Enforce the requirements for vehicle testing and warrant of fitness ➤ Enforce engine performance as priority in vehicle road worthiness ➤ Focus on vehicles engines with efficient fuel consumption ➤ Enforce road speeds to maximise fuel consumption ➤ Design and construct roads to maximise fuel consumption ➤ Introduce vehicles using fuel other than fossil fuel e.g. electric cars ➤ Provide safe and secure parking facilities for bicycles ➤ Strengthen public transport services and enforce operating schedules ➤ Provide safe and comfortable bus stop shelters ➤ Promote the use of car pooling
○ Energy efficiency standards in motorised land transport strengthened	<ul style="list-style-type: none"> ➤ Develop vehicle standards to maximise energy efficiency ➤ Establish road design and construction standards to maximise energy efficiency ➤ Set speed standards to maximise energy efficiency ➤ Enact enabling legislation to enforce standards
○ Greater use of non-motorised transport	<ul style="list-style-type: none"> ➤ Conduct public awareness programmes in non-motorised transport ➤ Provide dedicated paths and tracks for foot traffic ➤ Develop safe (e.g. separated from vehicles) and convenient (e.g. even surface) areas for pedestrians ➤ Provided dedicated and safe lanes/tracks for bicycle users

○ Financial incentives to encourage energy efficiency in land transport operations established	<ul style="list-style-type: none"> ➤ Increase taxes on vehicles with large engines and their spare parts; reduce same on energy efficient vehicles ➤ Increase registration and licensing fees for vehicles with large engines ➤ Reduce taxes on bicycles ➤ Enact enabling legislation to support financial incentives
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Objective 2: Reduced GHG emissions from the electricity sector

Outcomes	Strategies
○ Energy efficiency in the enduse of electricity strengthened (demand management)	<ul style="list-style-type: none"> ➤ Conduct consumer awareness programmes in end-use energy efficiency ➤ Mainstream audits of consumer energy uses ➤ Use energy efficient light bulbs ➤ Turn off lights and electrical equipment, including stand-by modes, when not in use. ➤ Use energy efficient appliances and equipment ➤ Improve the operation of industrial processes and systems
○ Energy efficiency in electricity supply strengthened (supply management)	<ul style="list-style-type: none"> ➤ Identify and effect energy saving measures in electricity diesel generation ➤ Identify and effect energy efficiency gains from existing hydro electricity generators ➤ Identify and effect energy saving measures in electricity transmission ➤ Identify and effect energy saving measures in electricity distribution ➤ Undertake institutional and financial reforms for energy suppliers to improve operational efficiency
○ Efficiency standards for electrical appliances, devices and equipment established	<ul style="list-style-type: none"> ➤ Develop labelling of energy ratings for electrical equipment and appliances ➤ Conduct energy performance testing for equipment and appliances ➤ Consider both pricing and energy rating in public tender of equipment and appliances. ➤ Enact enabling legislation to enforce standards
○ Financial incentives to encourage efficient electricity use established	<ul style="list-style-type: none"> ➤ Reduce taxes on products that enhance energy savings ➤ Reduce taxes on technologies that enhance energy savings ➤ Promote service competition in the electricity sector ➤ Provide tax breaks on funding for research and development in energy efficiency products and systems ➤ Enact enabling legislation to support financial incentives

Objective 3: Reduced GHG emissions from buildings

Outcomes	Strategies
○ Improved building design and construction systems to	<ul style="list-style-type: none"> ➤ Improve public awareness on the concepts of energy efficiency in building design and construction. ➤ Check orientation of buildings to maximise natural

support energy efficiency	<ul style="list-style-type: none"> ventilation and shading. ➤ Check layout of rooms to improve internal comfort ➤ Provide maximum external openings to improve natural ventilation and lighting ➤ Construct buildings on stilts to enhance natural ventilation ➤ Ensure adequate shading of external walls to reduce heat transfer and improve internal comfort ➤ Place isolation in roofs to reduce heat transfer and improve internal comfort ➤ Provide high ceilings to maximize internal air circulation
○ Building standards to promote improve energy efficiency strengthened	<ul style="list-style-type: none"> ➤ Review building code to improve energy efficiency standards for: <ul style="list-style-type: none"> - Design standards - Building materials standards - Electrical standards - Construction standards ➤ Inspect building construction to ensure compliance
○ Financial incentives to support energy efficiency in building established	<ul style="list-style-type: none"> ➤ Reduce taxes on building materials that support energy efficiency ➤ Reduce taxes on solar water heaters ➤ Enact enabling legislation to effect financial incentives

Objective 4: Reduced GHG emissions from deforestation and degradation

Outcomes	Strategies
○ Strengthened the conservation of forests for carbon sequestration	<ul style="list-style-type: none"> ➤ Conserve existing native forests ➤ Plant new forest for conservation ➤ Protect and expand existing mangroves forests ➤ Protect marshlands and other wetlands ➤ Promote the implementation of relevant Clean Development Mechanism (CDM) projects

Objective 5: Reduced GHG emissions from the aviation and maritime transport sectors

Outcomes	Strategies
○ Improved energy efficiency in aviation and maritime transport	<ul style="list-style-type: none"> ➤ Conduct energy audits of national aviation and maritime transport operations ➤ Promote energy efficiency in national aviation and maritime transport ➤ Explore, in collaboration with global development partners, alternative fuels for air and sea transport ➤ Develop options to offset carbon emissions from air travel

Objective 6: Reduced GHG emission from replacing fossil fuel with biofuel

Outcomes	Strategies
○ Use of oil from biomass explored	<ul style="list-style-type: none"> ➤ Conduct research to produce oils from biomass ➤ Identify the best local sources of bio-oils ➤ Establish the most viable bio-oil for local production

	<ul style="list-style-type: none"> ➤ Develop the use of bio-oil as substitute for fossil fuel ➤ Promote the implementation of relevant CDM projects
○ Use of ethanol from biomass explored	<ul style="list-style-type: none"> ➤ Conduct research to produce ethanol from biomass ➤ Identify the best local sources of ethanol ➤ Develop the use of ethanol as substitute for fossil fuel ➤ Promote the implementation of relevant CDM projects
○ Use of methane gas from biomass developed	<ul style="list-style-type: none"> ➤ Capture gas from landfill sites ➤ Produce gas from organic waste ➤ Promote the implementation of relevant CDM projects.
○ Greater efficiency in the use of wood fuel	<ul style="list-style-type: none"> ➤ Reduce the burning of wood for cooking ➤ Develop more efficient wood stoves ➤ Develop effective solar cookers ➤ Promote the implementation of relevant CDM projects
○ Financial incentives to develop biomass energy established	<ul style="list-style-type: none"> ➤ Provide financial incentives for the development of new biomass energy ➤ Enact enabling legislation for development incentives

Objective 7: Reduced GHG emissions through new sources of renewable energy

Outcomes	Strategies
○ New hydro power plants developed	<ul style="list-style-type: none"> ➤ Develop the Sili hydro project as soon as possible ➤ Assess feasibility of new hydro power plants ➤ Review existing legislation to vest the ownership of water resources in the government
○ Solar energy developed	<ul style="list-style-type: none"> ➤ Encourage research and development in solar energy ➤ Promote collaboration between local and overseas development partners ➤ Facilitate the transfer of appropriate technology ➤ Promote the implementation of relevant CDM projects
○ Wind energy developed	<ul style="list-style-type: none"> ➤ Encourage research and development in wind energy. ➤ Promote collaboration between local and overseas development partners. ➤ Facilitate the transfer of appropriate technology ➤ Promote the implementation of relevant CDM projects
○ Ocean wave energy explored	<ul style="list-style-type: none"> ➤ Encourage research and development in ocean wave energy. ➤ Promote collaboration between local and overseas development partners. ➤ Facilitate the transfer of relevant technology ➤ Promote the implementation of relevant CDM projects
○ Financial incentives to develop new sources of renewable energy established	<ul style="list-style-type: none"> ➤ Promote research and development in new sources of renewable energy ➤ Promote research and development in energy efficiency ➤ Enact enabling legislation on financial incentives for renewable energy development

Objective 8: Regulatory framework to mitigate GHG emissions strengthened

Outcomes	Strategies
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<ul style="list-style-type: none"> ○ Policy framework to support the reduction of GHG emissions developed 	<ul style="list-style-type: none"> ➤ Formulate and implement national policies on GHG abatement in the relevant sectors ➤ Enact enabling legislation for GHG abatement and monitor compliance ➤ Meet Samoa's obligations on mitigation under the United Nations Framework Convention on Climate Change
<ul style="list-style-type: none"> ○ Designated National Authority (DNA) for the CDM promoted 	<ul style="list-style-type: none"> ➤ Set up the DNA comprising the: <ul style="list-style-type: none"> - MNRE for climate change mitigation, forests & renewable energy - Ministry of Works, Transport & Infrastructure (MWTI) for transportation & buildings - Electric Power Corporation (EPC) for electricity supply - Ministry of Agriculture & Fisheries (MAF) for land use and land use change - Research & Development Institute of Samoa (RDIS) for renewable energy research - Ministry of Finance (MoF) for energy policy and investment ➤ Attract foreign investors to establish local CDM projects

Roles of implementing agencies

With a range of agencies responsible for different aspects of GHG emissions the success of the strategy is largely dependent on the level of cooperation and collaboration among the following:

MNRE coordinates the implementation of the NCGAS and responsible for the UNFCCC implementation, forest management and renewable energy policy and development;

MWTI is responsible for the regulation of transport operations as well as building design and construction;

EPC is responsible for the generation, distribution and transmission of electricity;

MAF deals with land use and land use change in agriculture;

RDIS is tasked with research and development in renewable energy; and

MoF coordinates the procurement of fossil fuel and facilitates investment in energy.

Relevant policies

1. National policy on combating climate change
2. National adaptation programme of action on climate change
3. National policy on forestry for sustainable development
4. National energy policy

References

- Baumert, K.A., Herzog, T. & Pershing, J. 2004. Navigating the numbers: greenhouse gas data and international climate policy. World Resource Institute. www.cait.wri.org
- Government of Samoa. (forthcoming). Samoa's second national communication to the UNFCCC. MNRE.
- Government of Samoa. 2005. Promotion of renewable energy, energy efficiency and greenhouse gas abatement. ADB.
- Government of Samoa. 1999. Samoa's first national communication to the UNFCCC. Department of Lands, Surveys & Environment.

- Hay, J. & Suaesi, T. 2005. Country environment analysis for Samoa. ADB.
- IPCC. 2007. Summary for policy makers: a report of Working Group I of the IPCC, www.ipcc.ch.
- IPCC. 2007. Climate change mitigation: summary for policymakers. Working Group III
- International Energy Agency. 2007. Energy Efficiency Policy Recommendation to the G8 2007 Summit, Heiligendamm.
- Isikuki Punivalu & Associates. 2005. Promotion of environmentally sustainable transportation. Apia.
- Herbert, W., Johnston, P. & Vos, J. 2004. Pacific regional energy assessment: barriers to the development of renewable energy to mitigate climate change and capacity development needs for removing the barriers. Samoa's national report. SPREP.
- Pacific Forum Secretariat. 2002. Pacific island energy planning and policy. www.forumsec.org.fj
- SOPAC. 2004. Pacific Islands energy policies and strategic action plan. www.sopac.org
- SPREP. 2007. Pacific islands greenhouse gas abatement through renewable energy project. www.sprep.org
- SPREP. 2005. Pacific climate change framework 2006-2015. www.sprep.org
- Tonkin & Taylor International. 2003. Samoa power sector expansion program. EPC.
- World Bank. 1991 Pacific regional energy assessment: Samoa issues and options of energy sector. Volume 13. www-wds.worldbank.org
- United Nations Economic and Social Commission for Asia and the Pacific. 2004. Strategies planning and management of the energy sector for Samoa.

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