

OUR ENVIRONMENT OUR HERITAGE

THE SCIENCE OF CLIMATE CHANGE

Climate Change is a great environmental problem, created by developed countries such as the USA, Europe and other nations. For the Pacific we contribute very less to the problem but we and the whole world will share the same consequences. "Unfortunately, while the countries of the Pacific contribute least to the causes of climate change, we will amongst those most at risk from its negative impacts" (WWF 2003). The root cause of Climate Change is from the emissions of greenhouse gases into the atmosphere and now we will look at the science to how climate change occurs.

WHAT IS THE "NATURAL" GREENHOUSE EFFECT?

The earth's climate is driven by a continuous flow of energy from the sun, which we receive as heat through its rays. Some of this heat is absorbed by the earth's surface while the remainder bounces off the surface into the atmosphere, and out into space.

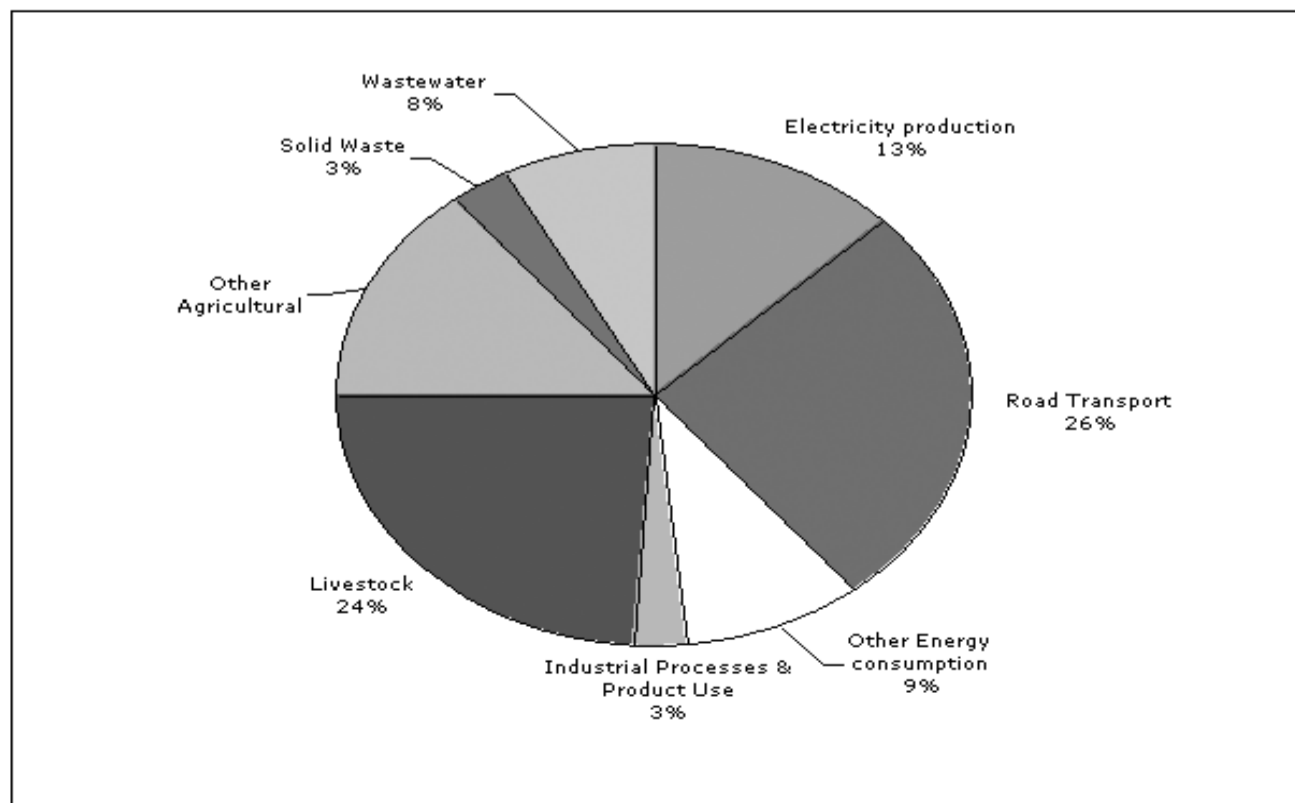
In order to prevent all this heat being lost into space, some of it is retained within the earth's atmosphere, by a **blanket of gases / Greenhouse blanket**. This blanket of gases acts as like a greenhouse by trapping the heat, keeping the earth at a temperature suitable for sustaining human, plant and animal life.

Generally Greenhouse gases absorb and re-radiate the sun's warmth, and maintain the earth's surface temperature at a level necessary to support life, without them the earth would be too cold to sustain any lifeform.

SO WHY IS OUR CLIMATE CHANGING?

Remember, greenhouse gases are all naturally occurring gases. Unfortunately, human activities are releasing too many greenhouse gases into the atmosphere, upsetting the natural balance of GHG emissions. This is sometimes called the Enhanced Natural Greenhouse Effect. This is a result from the burning of fossil fuels such as coal, oil and natural gas. Some emissions are from land clearing and agricultural activities. In other words, human activities are adding gases to the natural mix. In Samoa, the main source of emissions is from energy generation, land use change and from forestry.

The following pie graph summarizes the main sources and their contributions to Samoa's total GHG emissions



This has caused a thickening of the greenhouse blanket with the result that too much heat is trapped into the earth's atmosphere. This will lead to the rising of global temperatures (global warming). If global emissions of GHG continue to rise, we are committing ourselves to warmer climate in the future. Temperatures in some parts of the globe such as the Polar Regions are expected to rise even faster.

THE GREENHOUSE GASES

■ Carbon dioxide (CO₂) - The increase in CO₂ concentration in the atmosphere is primarily due to human activities such as fossil fuel combustion, land use conversion and cement production

■ Methane (CH₄) - Methane is another naturally occurring greenhouse gas whose concentrations in the atmosphere is growing as a result of human activities such as agriculture and waste disposal, and fossil fuel production and use.

■ Nitrous Oxide (N₂O) - There are many small sources of nitrous oxide, both natural and from human activities. The human activities which emit nitrous oxide are from agriculture and industrial processes.

■ Halo Carbons - These are carbon compounds containing fluorine, chlorine, bromine or iodine. Many of these are effective greenhouse gases. For most compounds, human activities are the main source.

■ Ozone (O₃) - Ozone is an important greenhouse gas in the atmosphere. Changes in ozone causes radiative forcing by influencing both solar and terrestrial radiation.

■ Water Vapour - Water vapour is the most abundant greenhouse gas. Human activities have little direct impact on its amount in the atmosphere

SAMOA'S CONTRIBUTION TO GHG EMISSIONS

In 2004 global GHG emissions were estimated to be approximately 49 billion tonnes, of which Samoa contributed approximately 0.0007%.

In comparison, the USA accounted for approximately 15% of global emissions, while Europe contributed about 9%.

China is estimated to contribute even more to global GHG emissions than the USA. In 2005, Samoa's per capita GHG emissions were 1.86 t CO₂-e per person. This is a 78% increase since 1994 when the rate was 1.05 t CO₂-e per person (Figure 2.5).

However, Samoa's per capita emissions remain small when compared to other countries. For example, Australia's per capita rate is 27.6 t CO₂-e per person, which is one of the highest in the world.

The global average rate of per capita emissions is estimated to be 5.6 t CO₂-e per person.

SO WHAT WILL HAPPEN TO SAMOA'S CLIMATE?

For Samoa and the rest of the Pacific, the most devastating change will be the rise in sea level resulting from the melting ice caps. According to Meteorological findings, our sea level has been rising by 5.22 mm/year since the last century.

Extreme winds will also become frequent especially in tropical regions. Samoa will be visited by tropical cyclones frequently in the future.

The maximum wind gust ever recorded in Samoa was 61 knots (31.2ms⁻¹) in January 2004, during cyclone Heta but was never recorded in other past cyclones.

Samoa will also experience high rainfall in the coming years and a rise in temperature.

Meteorological findings and global models have also showed this trend with 2002 as the hottest year with an average temperature of 35°C. Such temperatures haven't been recorded from 1960's up to early 1990

(Read more next week with - Impacts of Climate Change on Samoa)

For more information contact our:
Meteorology Office
Climate Change Unit
Mulinnu
Ph # 20855 / 20856

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Children's Corner



Children aged 9-15 are invited to answer the following corner. The name of 3 students with top scores at the end of every month will be posted under the "Children's Corner" for special prizes. "2008 Young Environmentalist Star Awards" will be given to 10 students with top total scores at the end of the year.

SHORT ANSWERS - Answer the following questions

1. What is an example of a fossil fuel?
2. What is the most abundant greenhouse gas?
3. What is the term given to carbon compounds containing fluorine, chlorine, bromine or iodine?
4. Give one example of an industrial nation?
5. Which activity contributes to most GHG emissions in Samoa?
6. Which contributes the least? (2 answers)
7. What percentage of global GHG emissions did USA contribute in 2004?
8. Which of the GHG do Samoans emit the most and what percentage does the gas represent in the total emissions?

FIND THE FOLLOWING WORDS - In the box

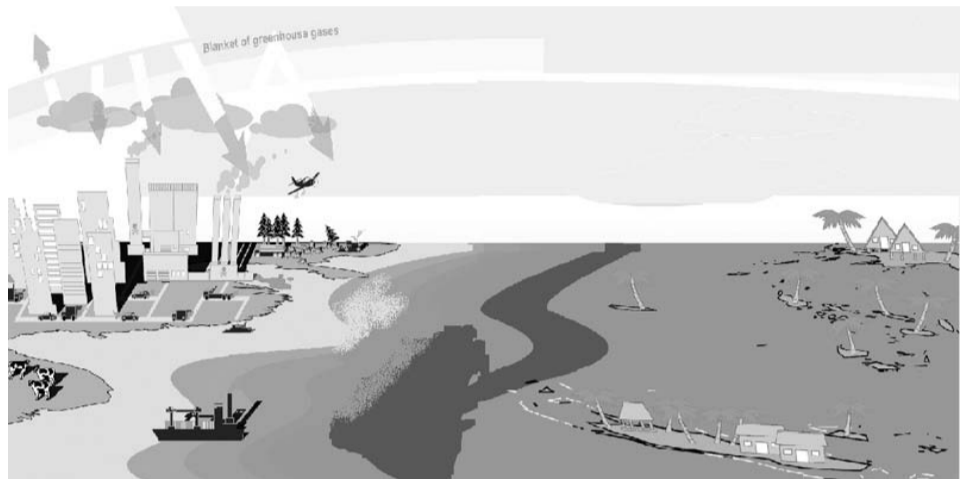
Meteorology
Science
Halocarbons
Emissions
Rainfall

Methane
Sealevel
Carbon
Ozone
Waste

M	E	T	H	A	N	E	S	O	F
E	S	E	A	L	E	V	E	L	L
T	C	A	L	W	V	C	M	J	M
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Y	J	K	N	P	Y	A	S	A	U
N	M	D	S	R	Z	C	L	R	T

SPOT THE GREENHOUSE GAS EMISSIONS

There are at least 5 sources of greenhouse gas emissions in this picture. Can you spot these?



PARAGRAPH ANSWERS.....

Briefly explain the difference between "Natural" and "Enhanced" greenhouse effect

In your own words, explain how Samoa's climate will be changed in the future

CONGRATULATIONS!!!!

To our last month's three winners, please come to our office (Friday 13th June) at the - DBS building - Level 3 - to uplift your prizes.....

- ★ MICHELLE CURRY
- ★ MALAEA SCHUSTER
- ★ NOEDA CHAN BOON

ACKNOWLEDGEMENTS

We wish to acknowledge and thank the following companies for sponsoring our children's corner prizes

- STRICKLAND BROS
- DIGICEL 
The Bigger. Better Network.
- McDONALD'S RESTAURANT
- BUSINESS SYSTEM

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