Fact Sheet

2 Climate Change

Atmosphere

Trends

Greenhouse gas emissions **decreased** 7% since 1990.

Greenhouse gas emission sources **increased** 11% since 1990 but have been stable since 2001.

Emissions from industry are **up** 7% since 1990.

Emissions from the transport sector have **increased** 6% since 1990.

Agriculture sector emissions have **decreased** by 4% since 1990.

Residential energy and transport emissions have **increased** by 28% since 1990.

Climate Change Issues

The 'greenhouse effect' is a natural process whereby greenhouse gases in the atmosphere trap heat to maintain the Earth at a temperature needed for us to live here. Without the greenhouse effect, the earth would be cold and life would not be able to exist. Over the past century, certain human activities have increased the levels of greenhouse gases in the atmosphere. This has created what is known as the 'enhanced greenhouse effect' and is expected to cause the Earth to warm over the coming decades.

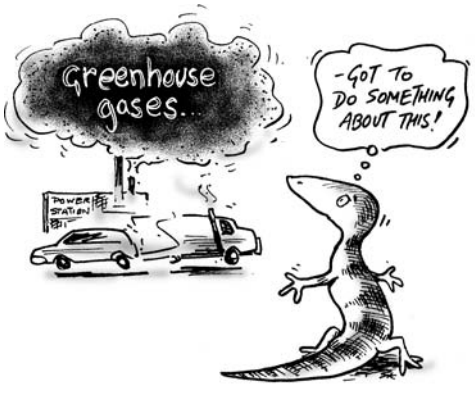
Climate change due to the 'enhanced greenhouse effect' is now being seen through the widespread melting of snow and ice; rises in global sea level; changes in rainfall patterns and ocean currents, as well as an increase in air temperature. Scientists have also observed that plants, animals and insects have shifted ranges, which means that they now live in different areas due to climate change.

Global temperatures have been rising over the past century, and although the Earth's temperature has risen and fallen across many centuries, it is believed that the global climate is warming faster now than it ever has before. It is predicted that by the year 2070, temperatures could rise by as much as 6°C if the current levels of greenhouse gas emissions continue.

A rise of 2°C above the average temperatures recorded prior to human industry could amount to 'dangerous' climate change which is judged by the likely effect on sea levels and extinction of species (IPCC, 2007). In South Australia, the average surface temperature has increased by 0.96°C between 1910 and 2005. This is higher than national (0.89°C) and global temperature (0.74°C) increases during the same time.

The major greenhouse gases are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (NO), and the major source of carbon dioxide is the burning of oil, gas and coal (fossil fuels). This includes the use of petrol in motor vehicles and the generation of electricity using coal and gas. Methane (CH_4) is produced when organic material is broken down without oxygen. The biggest source of methane comes from animals such as sheep and cows during their digestive processes.

Nitrous oxide (NO) is emitted naturally from oceans and soils, but is also produced by burning or clearing vegetation, as well as from some fertilisers and industrial processes. Environments like forests are thought of as 'carbon sinks' – areas that reduce the level of CO_2 in the atmosphere – as plants absorb CO_2 during photosynthesis.



Climate Change

What is the Current Climate Change Situation?

Condition indicators

Greenhouse gas atmospheric concentrations

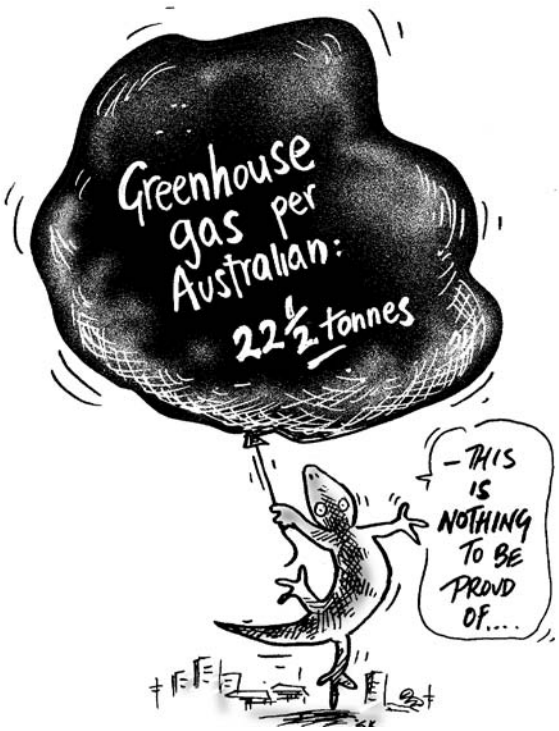
The CSIRO and Bureau of Meteorology monitor the concentrations of atmospheric greenhouse gases above Australia at Cape Grim on the north-western coast of Tasmania. According to their results, the concentrations of carbon dioxide, nitrous oxide and methane are continuing to increase. The annual CO_2 emissions measured at Cape Grim have risen by around 80% since 1974 and have increased at a higher rate in the last decade.

Pressure indicators

Sources of greenhouse gas emissions in South Australia

The largest single activity that releases greenhouse gases into the atmosphere is the generation and use of energy. The consumption of energy, such as the use of petrol in cars and trucks, and the generation of energy, such as electricity generation in power stations, contribute to greenhouse gas emissions. The amount of emissions produced by a unit of electricity in South Australia is similar to the average recorded across the National Electricity Market, which is about one tonne of CO_2 per Megawatt-hour in 2006.

Electricity generation continues to be the biggest single source of emissions but a dramatic growth in wind generated renewable electricity has occurred in South Australia. It is expected that over 20% of the electricity generated in South Australia will be sourced from wind by 2010. While increases in vegetation and the use of renewable energy are predicted, it is expected that this will be countered by a growth in emissions from energy intensive sectors.



Climate Change

Responding to Climate Change

In 2007, State Parliament passed Australia's first climate change legislation, the **Climate Change and Greenhouse Emissions Reduction Act, 2007**. This Act contains a commitment to reduce emissions to 60% below the 1990 level by 2050 and commits the government to effectively measuring and reporting on greenhouse gas emissions every two years. Emission levels in 1990 are used as a baseline in international discussions on climate change, and form the basis for the Kyoto Protocol.

The Kyoto Protocol was enacted in Kyoto, Japan in 1997 with the aim of reducing global greenhouse gas emissions and it was set up as a legally binding global agreement. The main objective of the Kyoto Protocol is to reduce emissions by 5.2% between the years 2008 to 2012. Australia is one of 178 countries which have signed and approved the Kyoto Protocol. Australia ratified the protocol in December 2007.

A national emissions trading scheme is planned to be in place by the end of the first Kyoto commitment period, before 2012. Emissions trading is a market-based scheme in which companies that reduce carbon emissions past set targets are given carbon credits. Excess carbon credits can then be sold to companies who find it more difficult to reach the set targets. Using this system, companies that reduce emissions can make a profit while at the same time helping the environment.

The State Government has set goals to help achieve the necessary reduction in emissions as part of the **South Australian Strategic Plan.** These goals include:

- increasing the use of public transport (buses, trains and trams),
- supporting the development and use of renewable energy such as solar hot water heaters,
- increasing the energy efficiency of houses, and
- reducing the amount of waste in landfill.

> "A national emissions trading scheme is planned to be in place by the end of the first Kyoto commitment period, before 2012."

Taking Action for Air Quality

- Document the activities that you undertake everyday that contribute to the greenhouse effect.
- What are some of the things that you can do to reduce your impact on climate change?
- Are there alternatives to your actions?
- Can you try and catch a bus, train or tram; can you walk or cycle more often?

Impacts of Climate Change

Biodiversity

With the predicted changes to the environment, some ecosystems will adapt better than others. The ecosystems likely to be most sensitive to climate change include native grasslands, mangroves, wetlands and deserts. Certain types of plants and animals will also be very sensitive to the changes in climate. On the other hand, some of the pest plants and animals are likely to thrive in the changed conditions. For example, warmer temperatures may cause the fruit fly to span out and create problems in more areas, while a decrease in rainfall will place forests at greater risk of bushfires.

Inland Waters

Reduced rainfall will mean less water for our rivers, streams and wetlands. This will have an impact on aquatic plants and animals, and reduced rainfall will increase competition for already stressed water resources.

Economy

Initially, the changes in CO_2 are likely to stimulate plant growth but over time, productivity rates will decline. Decreases in rainfall will reduce agricultural productivity, and higher temperatures will put stress on livestock and lower the quality of grazing land.

Coasts and the Sea

Increases in sea level and increased intensity of storm events will impact on coastal ecosystems and coastal communities, particularly in relation to stormwater management.

Health

Higher summer temperatures may lead to more deaths. Increased numbers of mosquitos in some areas may lead to more outbreaks of Dengue Fever and Ross River Virus.

Attention!!

A challenge for all South Australians

The **South Australian Strategic Plan** has set a target of 2 million residents in South Australia by 2050 as well as a target of reducing greenhouse gas emissions for the State by 60% (based on 1990 levels) by the same time. This poses a significant challenge.

The residential sector is a key producer of South Australian greenhouse gas emissions. Although the population of South Australia increased by 8.4% from 1990 to 2005, residential emissions increased by a significantly larger 28% during this same period, and made up a quarter of the state's total emissions in 2005. The challenge for South Australia is to accommodate an estimated additional 390,000 households in the state from 1990 to 2050 and simultaneously contribute to a 60% reduction in greenhouse gas emissions.

Greenhouse gas emissions in South Australia, by end-use sector (Mt CO_2-e)

	1990	2006	% Change
Agriculture, Forestry and Fishing	7.7	2.0	-74%
Mining	5.1	4.9	-4%
Manufacturing & Construction	7.6	8.0	+ 5%
Utilities	1.8	2.2	+ 25%
Commercial	2.7	3.4	+ 26%
Transport and Storage Industry	2.5	3.0	+ 21%
Residential	6.1	7.7	+ 28%
TOTAL (inc. LULUCF)	33.3	31.2	-7%
TOTAL (exc. LULUCF)	31.7	35.3	+ 11%

LULUCF means Land Use, Land Use Change and Forestry—the figures show the difference between CO_2 removed from the atmosphere by growing forests and CO_2 emitted to the atmosphere by cutting forests for cropping and grazing.

Source: Department of Climate Change 2008

Research Ideas

about Climate Change

1 What is meant by the 'enhanced greenhouse effect' and 'global warming'?

2 What are 'greenhouse gases'? How are they produced?

3 How can the 'enhanced greenhouse effect' impact ecosystems?

4 What human activities in your community, South Australia and internationally have resulted in the 'enhanced greenhouse effect'?

5 How do different types of development and associated human lifestyles (the way we live) impact on greenhouse gas emissions?

6 What does the State of the Environment report tell us about the 'enhanced greenhouse effect' in South Australia?

7 What might happen in the future if things continue as they are?

8 What are government, business and industry doing to address greenhouse issues?

9 What can we do individually, or in communities, to reduce our impact on climate change?

References

IPPC (2007) Climate change 2007: Synthesis Report. Contribution of Working Groups I,II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [core writing team, Pachauri, R.K. and Reisenger, A (eds.)] IPCC Geneva 104 pp

Resources

For more detailed information on the issue and actions you can take see the State of the Environment report for South Australia 2008.

This is available at:
www.epa.sa.gov.au/soe

This fact sheet is part of a set of 20 fact sheets about the key environmental issues identified in the State of the Environment report 2008, produced for the Environment Reporting Education Resource. You can access the fact sheets and learn more about taking action for the environment at the Education Resource website: www.epa.sa.gov.au/soe.
For more information call the Environmental Education Unit of the Department for Environment and Heritage (08) 8463 3911.

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