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Environmental Affairs and Tourism  
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## Further reading

**Boiling point: people in a changing climate.** 2008.  
L. Joubert. Wits: Johannesburg.

**The fire dogs of climate change: an inspirational call to action.** 2009. S. Andrew. Findhorn: Scotland.

**Bending the curve: your guide to tackling climate change in South Africa.** 2008. R. Zipplies (ed). Africa Geographic: Cape Town.

**U.S. Environmental Protection Agency: Climate Change.**  
Website [www.epa.gov/climatechange/index.html](http://www.epa.gov/climatechange/index.html)

Various publications are available from the Energy Research Centre. See *Useful addresses* below.

**Enviro Facts: Energy and Environment, Energy Options, Pollution, Waste Management.**

## Useful addresses

**Energy Research Centre.** University of Cape Town,  
Private Bag, Rondebosch, 7701. Tel (021) 650 3230;  
Fax (021) 650 2830; Website [www.erc.uct.ac.za](http://www.erc.uct.ac.za)

**Department of Environmental Affairs and Tourism.**  
Private Bag X447, Pretoria, 0001. Tel (012) 310 3911;  
Call Centre no. 086 111 2468;  
E-mail [callcentre@deat.gov.za](mailto:callcentre@deat.gov.za); Website [www.deat.gov.za](http://www.deat.gov.za)

**Department of Minerals and Energy.** Private Bag X59, Pretoria, 0001.  
Tel (012) 317 8000; Fax (012) 322 3416; Website [www.dme.gov.za](http://www.dme.gov.za)



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Please write to: Share-Net, Enviro Facts Project,  
PO Box 394, Howick, 3290. Tel (033) 330 3931 ext 124/143/144;  
Fax (033) 330 4576; e-mail [sharenet@wessa.co.za](mailto:sharenet@wessa.co.za)

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## Enviro Facts 11

March 2009

# Global Warming

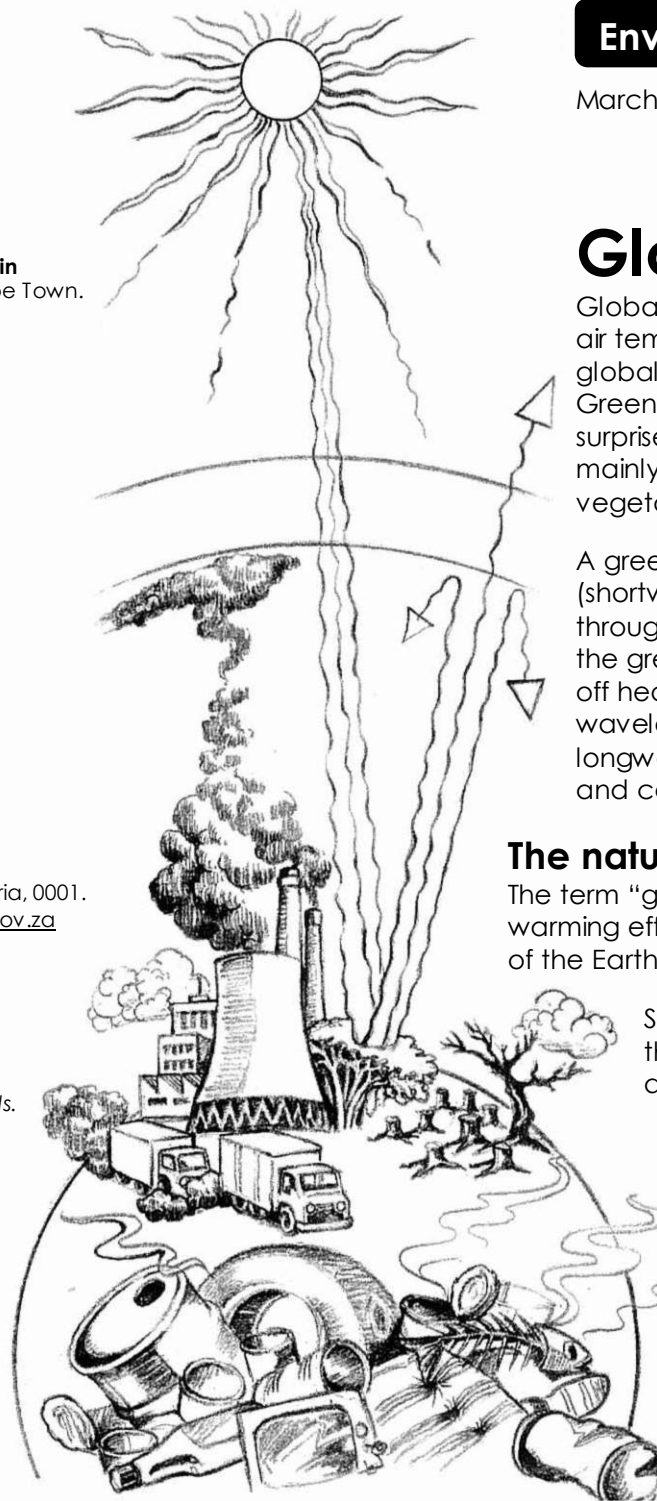
Global warming describes the gradual increase of the air temperature in the Earth's lower atmosphere. Why is global warming called the greenhouse effect? Greenhouses are not common in Africa, so do not be surprised if you have never seen one! They are used mainly in the cooler northern hemisphere to grow vegetables and flowers.

A greenhouse is made entirely of glass. When sunlight (shortwave radiation) strikes the glass, most of it passes through and warms up the plants, soil and air inside the greenhouse. As these objects warm up they give off heat, but these heat waves have a much longer wavelength than the incoming rays from the sun. This longwave radiation cannot easily pass through glass, and causes everything in the greenhouse to heat up.

## The natural greenhouse effect

The term "greenhouse effect" is used to describe the warming effect that certain gases have on the temperature of the Earth's atmosphere under normal conditions.

Sunlight (shortwave radiation) passes easily through the Earth's atmosphere. Once it strikes and warms the Earth's surface, longwave radiation is given off and goes back into the atmosphere. While some of this longwave radiation, or heat, escapes into space, most of it is absorbed or held by carbon dioxide and other gases that exist in small quantities in the atmosphere. Thus these gases keep the Earth at an average of 33°C warmer than it would be if this greenhouse effect did not occur. Without these gases the whole planet would be an icy wasteland with an average temperature of 16°C below freezing!



## How have people made the atmosphere warmer?

Human population growth and related industrial expansion, have led to greater air pollution and a change in the composition of the Earth's atmosphere. Some pollutants enhance global warming, resulting in increased global atmospheric temperatures.

## What gases are responsible for global warming?

- **Water vapour** is the main greenhouse gas. Human activities are not known to have had a significant influence on the atmospheric concentration of water vapour.
- **Carbon dioxide** (CO<sub>2</sub>) is the pollutant most responsible for increased global warming. It is released into the atmosphere mainly through the burning of fossil fuels (such as coal, petrol and diesel).

In addition, widespread destruction of natural vegetation, particularly forests, has contributed to increased atmospheric CO<sub>2</sub> levels (see Enviro Facts *Deforestation*). This has occurred for two reasons. First, plants take up CO<sub>2</sub> through the process of photosynthesis. The destruction of vegetation, as occurs in deforestation, reduces the amount of CO<sub>2</sub> that is removed from the atmosphere. Second, when forests are cleared, and burnt or left to rot, CO<sub>2</sub> is released.

- **Methane** (CH<sub>4</sub>) has more than doubled in concentration, since pre-industrial times, according to the Intergovernmental Panel on Climate Change (IPCC).
- **Nitrous oxide** (N<sub>2</sub>O), has, since the Industrial Revolution, increased in the atmosphere by 16%.
- **Chlorofluorocarbons** (CFCs), in addition to damaging the ozone layer, are potent greenhouse gases.

## Signs that global warming has begun

- The average global temperature is about 0,5°C warmer than it was 100 years ago.
- Snow and ice-cover have decreased this century, deep ocean temperatures have increased, and cloud cover over North America has also increased over this period. The latter indicates increased atmospheric water vapour.
- Over the last 100 years, global sea levels have risen by between 100mm and 250mm.

## Further effects of global warming

If current pollution trends continue, some scientists estimate that the Earth could probably be about 1°C warmer by 2025 and 3°C warmer by 2100. This rapid temperature rise could have several effects:

- These changes in global temperature, although apparently small, could cause very large changes in climate. For example, the last Ice Age, which ended approximately 15 000 years ago, was only 5°C colder than current temperatures, but the resulting climate changes were massive: most of North America was covered in a layer of ice about 1,5km thick and sea levels in the Cape were about 120m lower than at present. In those days, if you had wanted to go for a swim at Cape Agulhas you would first have had to walk about 150km to reach the sea!
- A rapid extinction of species.
- Rising sea levels - water expands as it warms and glaciers melt, adding water to the oceans, thus we can expect widespread flooding of coastal areas as sea levels rise.
- Greater frequency and scale of extreme weather conditions, e.g. drought and flood.
- Changes in the distribution of disease-bearing organisms so that people, domestic animals, and crops might be exposed to diseases previously absent from an area.

## What we can do

- *Find out about the disagreements between scientists on the issue of global warming.*
- *Reduction of pollutants responsible for global warming requires greater energy efficiency. Industrialists and governments have a key role to play here. As individuals we can: reduce electricity consumption; use lift clubs, public transport, bicycles or our feet for transport; and, reduce, reuse, recycle, and save energy - the manufacture of all products requires energy.*