

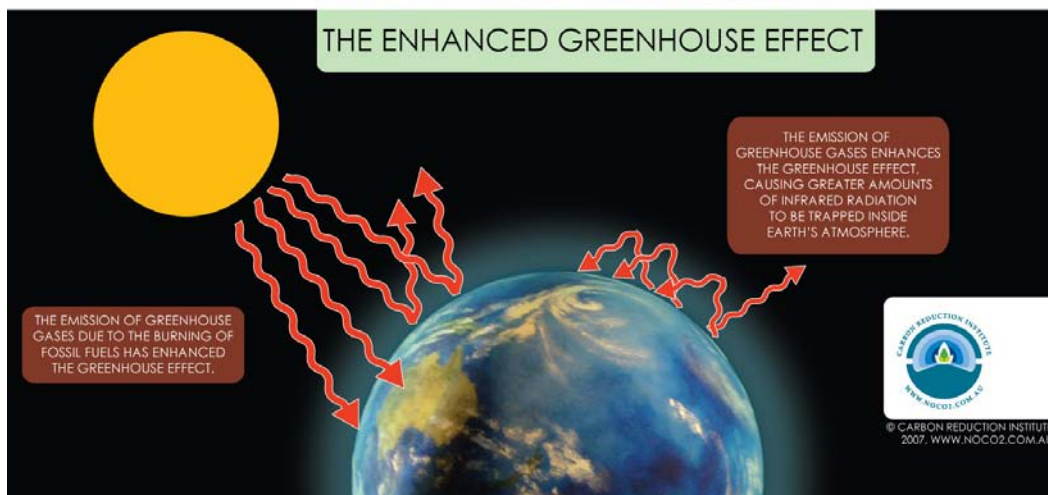
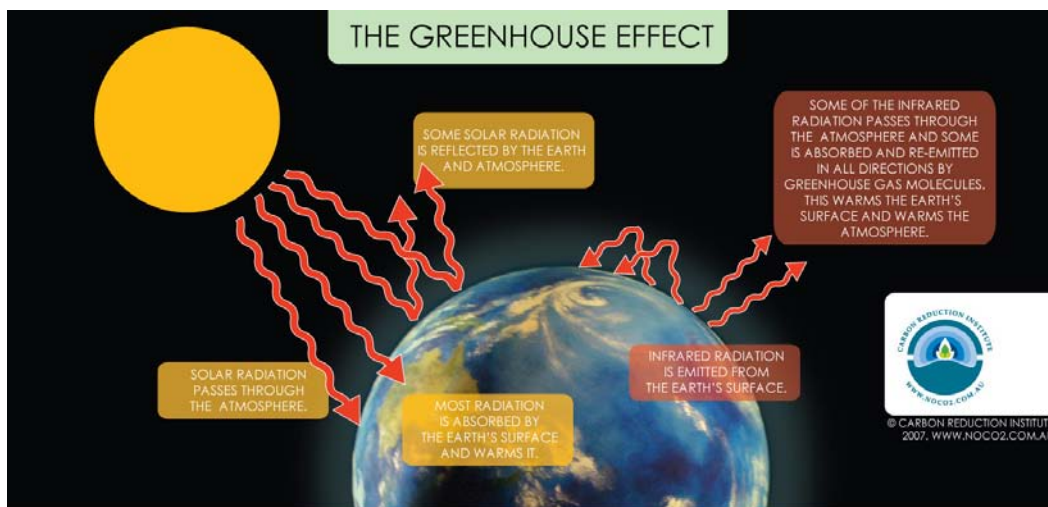
Climate Change

The three terms global warming, climate change and the enhanced greenhouse effect are used when discussing what is commonly termed climate change.

Global Warming refers to the increase in the Earth's average temperature over recent history and the projected continuation of this increase.

Climate Change is the variation of the global or regional climate over a period time, such as that occurring due to global warming. Climate change has begun to refer to recent changes in the climate, attributable to the release of greenhouse gases through human activities such as fossil fuel burning and land clearing. These greenhouse gas emissions from human activities add extra greenhouse gas to the atmosphere which causes the enhanced greenhouse effect.

The Enhanced Greenhouse Effect is the mechanism by which extra heat is trapped in the earth's atmosphere due to the additional greenhouse gases. The figure below shows an explanation of the greenhouse and the enhanced greenhouse effect.



Greenhouse Gases

There are six gases which are identified as greenhouse gases under the Kyoto Protocol. Although there are many more gases which can have a positive or negative greenhouse effect on the atmosphere, these particular gases are identified as the main sources of the increasing greenhouse effect in the atmosphere.

The six greenhouse gases recommended by the Intergovernmental Panel on Climate Change (IPCC) comprise carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆). (The HFCs and PFCs are classes of chemical species rather than individual species.) While some of these gases occur naturally in the atmosphere (carbon dioxide, methane and nitrous oxide) certain human activities have added significantly to the atmospheric levels of these gases. The remaining synthetic gases, while produced in lesser quantities, are nonetheless very potent greenhouse gases.

This potency is due to their strong infrared absorption characteristics, as a result of which 1 kg gas in the atmosphere can be equivalent in greenhouse warming to many tonnes of CO₂. The CO₂ equivalence of a particular gas, when integrated over a time horizon of 100 years, is referred to as its Global Warming Potential (GWP). The Global Warming Potentials over 100 years of the six IPCC greenhouse gases are shown below.

The global warming potential of these gases is used to convert quantities of these gases into an equivalent quantity of CO₂ (CO₂e). The CO₂e term is used as a convenient way to determine the net global warming impact of an action, such as driving a car, rather than breaking this down into each separate gas.

Greenhouse Gas	100 year Global Warming Potential (GWP100) ²
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	23
Nitrous Oxide (N ₂ O)	296
Hydrofluorocarbons (HFCs)	12,000
Perfluorocarbons (PFCs)	2,290
Sulphur hexafluoride (SF ₆)	22,000

1 Intergovernmental Panel on Climate Change (IPCC). (1996). Guidelines for national greenhouse gas inventories – Greenhouse gas inventory reference manual. IPCC WGI Technical Support Unit, Bracknell, UK.

2 Intergovernmental Panel on Climate Change (IPCC). (2001). Climate change 2001: the scientific basis. [Third Assessment Report from Working Group 1. Edited by Houghton, J.T. et al.] Cambridge University Press, UK.