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IPCC Third Assessment Report

### IPCC Third Assessment Report - Climate Change 2001 - Complete online versions

This website contains the full text and graphics from the three working group contributions to the IPCC Third Assessment Report "Climate Change 2001" and the Synthesis Report. It was published to the web by GRID-Arendal in 2003.

#### Greenhouse effect

→Greenhouse gases effectively absorb →infrared radiation, emitted by the Earth's surface, by the atmosphere itself due to the same gases, and by clouds. Atmospheric radiation is emitted to all sides, including downward to the Earth's surface. Thus greenhouse gases trap heat within the surface-troposphere system. This is called the natural greenhouse effect.

Atmospheric radiation is strongly coupled to the temperature of the level at which it is emitted. In the → troposphere the temperature generally decreases with height. Effectively, infrared radiation emitted to space originates from an altitude with a temperature of, on average,  $-19^{\circ}\text{C}$ , in balance with the net incoming solar radiation, whereas the Earth's surface is kept at a much higher temperature of, on average,  $+14^{\circ}\text{C}$ .

An increase in the concentration of greenhouse gases leads to an increased infrared opacity of the atmosphere, and therefore to an effective radiation into space from a higher altitude at a lower temperature. This causes a → radiative forcing, an imbalance that can only be compensated for by an increase of the temperature of the surface-troposphere system. This is the enhanced greenhouse effect.

#### Greenhouse gas

Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. This property causes the → greenhouse effect. Water vapour ( $\text{H}_2\text{O}$ ), carbon dioxide