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## Impact Category. Global Warming Potential

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**Brief summary.** Global Warming Potential (GWP) is the contribution of a substance to the greenhouse effect [1]. GWPs are based on the heat-absorbing ability of each gas relative to that of carbon dioxide (CO<sub>2</sub>), as well as the decay rate of each gas (the amount removed from the atmosphere over a given number of years). This value has been calculated for a number of substances for a specific time horizon (certain substances gradually decompose and will become inactive in time). A time frame of 100 years is currently most commonly used and accepted. An LCA only looking at the Global Warming Potential and no other impact categories is commonly called a Carbon Footprint.

**Units.** kg CO<sub>2</sub>-equivalents

**Detailed summary.** Increasing amounts of greenhouse gases in the atmosphere are thought to be enhancing the natural greenhouse effect that leads to an increase in global temperature. The effect of an enhanced greenhouse effect will be felt as sea level rise (estimated as about 10 cm by 2030), changes in availability of fresh water, agriculture and food supply impacts, impacts on ecosystems such as damage to coral reefs, impacts on human health such as increased spread of disease and increased frequency and/or intensity of extreme events (e.g. droughts and floods)[1].

The Intergovernmental Panel on Climate Change is the body responsible for state-of-the-art reporting on climate change. It was set up by the World Meteorological Organisation and United Nations Environment Programme to “provide the world with a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences” [2]. It published its 4th Assessment Report in 2007 [3]. These reports give Global Warming Potentials (GWPs) for the various gases. The GWP of a gas measures its relative radiative effect compared to carbon dioxide, for different time horizons of 20, 100 or 500 years.

New Zealand is a party to the United Nations Framework Convention on Climate Change which set up the Kyoto Protocol in 1997. New Zealand ratified the Kyoto Protocol in 2002, and is committed to reducing its total greenhouse gas emissions back to 1990 levels by 2012, and to 50% of 1990 levels by 2050 [4].

Methane and nitrous oxide emissions are particularly important for New Zealand because of its reliance on agricultural production for export revenue and their high GWP. Methane has a GWP of 25 kg CO<sub>2</sub> equivalent and nitrous oxide 310 Kg CO<sub>2</sub> equivalents. Methane is linked with enteric fermentation by ruminant farm animals, and nitrous oxide emissions come from farm excreta and nitrogenous fertiliser use. Taking a sectoral approach, 47% of greenhouse gas emissions are linked to the agricultural sector, 45% to the energy sector, and much smaller emissions to industrial processes (5.7%) and the waste sector (2.2%) [5]. These emissions are offset to some degree by the forestry sector which removed 35% of all greenhouse gas emissions in 2008 [5].

## References.

1. Houghton, J., *Global Warming: The Complete Briefing*. Cambridge University Press, Cambridge. 2004.
  2. IPCC. *Intergovernmental Panel on Climate Change website*, accessed 17 September 2010. <http://www.ipcc.ch/>. 2010.
  3. IPCC, *Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. [http://www.ipcc.ch/publications\\_and\\_data/publications\\_and\\_data\\_reports.htm](http://www.ipcc.ch/publications_and_data/publications_and_data_reports.htm). 2007.
  4. Ministry for the Environment, *New Zealand's 2020 Emissions Target*. Ministry for the Environment, Wellington. Available at <http://www.mfe.govt.nz/publications/climate/nz-2020-emissions-target/html/index.html>. 2009.
  5. Ministry for the Environment, *New Zealand's Greenhouse Gas inventory 1990-2008*. <http://www.mfe.govt.nz/publications/climate/greenhouse-gas-inventory-2010/index.html>. 2010.
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