SOUTHERN COUNCILS CLIMATE COLLABORATION

COUNCIL CARBON AND ENERGY FOOTPRINT INFORMATION SERIES

CLIMATE CHANGE AND GREENHOUSE EFFECT

What is climate?

Climate is a term used to describe the average weather experienced at a site or region over a period of at least several years. The typical period used to assess whether climate is changing over the medium term is a baseline of 30 years to allow for the natural variability of weather. The quantities that are most often used in describing the climate are surface atmospheric variables such as temperature, rainfall and wind.

What is climate change?

Climate change occurs when there is a significant difference in the climate averages (such as temperature) between different periods. Climate change can occur naturally as a result of many factors such as variations in the Sun's energy output, cycles in the Earth's orbit and emissions of dust or gases from volcanic eruptions. Over millions and even periods of thousands of years there have been large changes in the Earth's climate, including ice ages and periods hotter than now. Over the past 6,000 years the global climate has been undergoing a very stable period.

Climate change which has occurred in the past 50 or so years (which uses a baseline of the period 1961 to 1990) includes a significant increase in global temperature along with changes in other climate indicators. Work by the International Panel on Climate Change (IPCC) has determined that the most significant factor contributing to these changes is the increased emissions of greenhouse gases resulting from human activities.

What is the greenhouse effect?

The greenhouse effect is a result of certain gases ("greenhouse gases") being relatively transparent to visible light wavelengths (from which the Earth receives most of its energy from the sun), but are relatively more opaque to longer, infra-red wavelengths (ie heat). As an example, a road surface can be heated by light on a sunny day and as the road temperature rises excess energy is radiated as heat. An increase in the concentration of greenhouse gases results in less of this heat which is radiated being released back into space.

There are some greenhouse gases, such as water vapour, which are kept in balance by natural processes ie if there is excess water vapour this will result in additional rainfall. Other greenhouse gases however can last in the atmosphere for tens or hundreds of years or even longer, as the natural processes which break them down or remove them are relatively slow. If there were no greenhouse gases present in the atmosphere the average global temperature would be below 0°C.

Prior to the industrial age, greenhouse gas emissions were matched by the natural processes removing such gases from the atmosphere, keeping the atmospheric concentrations largely constant. With the increasing growth of fossil fuel use and other sources of greenhouse gases from human activities the atmospheric concentration of such gases has increased as the emissions have exceeded the natural capacity of removal. For example, the concentration of carbon dioxide in the atmosphere has varied between 200 to 280 parts per million over the past 800,000 years but has now risen to 415 parts per million.

Which greenhouse gases are important?

Six gases were identified in the Kyoto Protocol for inclusion in national inventories, due to their overall impact on the global climate. These are carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons.

For local government the main greenhouse gases for inventories are carbon dioxide, methane and nitrous oxide. Carbon dioxide emissions largely result from combustion of fossil fuels. Most of the methane and nitrous oxide emissions are related to disposal or treatment of waste, with a small amount from use of fossil fuels. The other gases noted above are largely associated with industrial processes and are not covered in local government inventories.

Carbon dioxide equivalent and global warming potential

The main greenhouse gas that affects the Earth's temperature is carbon dioxide. To provide some way of comparing different greenhouse gases, the approach has been to use carbon dioxide as the reference gas against which other GHGs are measured. The common unit used to add up the quantity of greenhouse gas emissions is carbon dioxide equivalent (such as kilograms or tonnes of CO_2-e).

To calculate the emissions associated with a particular greenhouse gas the quantity of gas is determined and is multiplied by the global warming potential (GWP) factor. Each of the greenhouse gases has its own particular factor depending on its properties and these factors are based on climate impacts of the specific gas over a 100 year time frame. As an example 100 kilograms of methane, which has a GWP of 28, will is equivalent to 2,800 kg of CO_2-e.

The Council Carbon and Energy Footprint Information Series has been developed as part of the Southern Councils Climate Collaboration. The Collaboration is an initiative of the Southern Tasmanian Councils Authority climate program, the Regional Climate Change Initiative. It is supporting the 12 southern councils to build capacity and capability to develop climate responses, to reduce their carbon emissions, and respond to the challenges and opportunities of a changing climate.

The Collaboration uses a common and consistent approach to work with councils to find local solutions. The approaches and resources used in the Collaboration have been developed specifically to meet the role and functions of councils and enable actions to be scaled between councils or regionally resulting in greater efficiencies and avoid duplication and maladaptive responses. The Information Series outlines key concepts, and methods, used in the preparation of Council Carbon and Energy Footprints through the Collaboration.

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