

GHG - Northmore Gordon

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GHG

A greenhouse gas is a gas that traps heat in the atmosphere and contributes to climate change. Greenhouse gases are expressed on a carbon-dioxide-equivalent (CO₂-e) basis using stated methodology, allowing different gases with varying warming potentials to be measured comparably. Each gas has a different global warming potential (GWP) over different time frames; the higher the GWP number, the greater its climate impact. Over 200 greenhouse gases have been identified in the IPCC fifth assessment report. Common examples include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and various synthetic gases. Understanding GHG composition and concentration is essential for carbon accounting, emissions reporting, and developing decarbonisation strategies.

Related guidance

Carbon advisory

Scope 1, 2 and 3 emissions

Certificates

Government schemes

Certificate trading

Measurement and verification

What is a greenhouse gas (GHG)?

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What is global warming potential (GWP), and why does it use different time frames?

Global warming potential measures how much heat a greenhouse gas traps in the atmosphere relative to carbon dioxide over a specified time frame. Because different gases persist in the atmosphere for different periods, their warming effect varies depending on whether measured over 20 years or 100 years. Methane, for example, has a 20-year GWP of 84 but a 100-year GWP of 28, reflecting its shorter atmospheric lifetime. The 100-year GWP is used in current carbon accounting standards for consistency. Understanding GWP time frames is critical when evaluating project emissions reductions, comparing climate impacts across gases, and selecting appropriate accounting methodologies for reporting obligations.

Why is carbon dioxide (CO₂) used as the reference point in greenhouse gas accounting?

Carbon dioxide is used as the reference baseline because it has a global warming potential (GWP) of 1 for both the 20-year and 100-year time frames. This standard reference point allows all other greenhouse gases—regardless of their different warming potentials—to be expressed on a common carbon-dioxide-equivalent (CO₂-e) basis. For example, methane's 100-year GWP of 28 means one tonne of methane equals 28 tonnes of CO₂-e for accounting purposes. This standardised approach simplifies emissions measurement, comparison, and reporting across different gas types. Using CO₂-e enables organisations to aggregate Scope 1, 2, and 3 emissions into a single comparable metric for inventory, compliance, and transition planning.

How are different greenhouse gases compared and aggregated in emissions inventories?

Different greenhouse gases are converted to a common measurement unit called carbon dioxide equivalent (CO₂-e) using their respective 100-year global warming potential (GWP) values. This conversion allows organisations to sum emissions from multiple gas types into a single comparable figure. For instance, nitrous oxide (N₂O) has a 100-year GWP of 265, so one tonne of N₂O equals 265 tonnes of CO₂-e. This standardised approach is critical for corporate inventories, facility reporting under NGER (National Greenhouse and Energy Reporting), and NSW Climate Change Mitigation and Adaptation Plans. Our carbon advisory services help organisations establish appropriate boundaries, calculate emissions using correct GWP factors, and prepare emissions inventories that aggregate all gas types accurately for reporting and transition planning.

What is the relationship between greenhouse gas emissions and carbon accounting frameworks?

The GHG Protocol provides international standards for classifying and reporting greenhouse gas emissions across three scopes: Scope 1 (direct emissions from owned or controlled sources), Scope 2 (indirect emissions from purchased electricity, steam, heat, or cooling), and Scope 3 (indirect emissions from other sources). These frameworks establish how organisations must measure, classify, and report GHG emissions in corporate inventories, product lifecycles, value chains, and projects. Accurate classification is essential for regulatory compliance with NGER, the Safeguard Mechanism, and sustainability reporting obligations. Our carbon advisory services assist organisations in establishing correct accounting boundaries, applying appropriate emission factors and GWP values, and preparing emissions inventories that comply with applicable frameworks.

What are the highest-impact synthetic greenhouse gases, and where do they matter in carbon accounting?

Synthetic gases have dramatically higher global warming potentials than carbon dioxide. Sulfur hexafluoride (SF₆) has a 100-year GWP of 23,500—meaning one tonne equals 23,500 tonnes of CO₂-e—making it one of the most potent gases. Hydrofluorocarbon HFC-134a has a 100-year GWP of 1,300. These gases are used in refrigeration, electrical insulation, and other industrial applications. Even small quantities have significant climate impact, making their measurement and control critical in facility-level emissions inventories and compliance reporting. Organisations using these gases must ensure they are properly accounted for in Scope 1 emissions calculations, reported under NGER if thresholds are exceeded, and included in transition planning. Our carbon advisory services help organisations identify sources of high-GWP gases, quantify their emissions accurately, and assess reduction or substitution opportunities.

How do greenhouse gas emissions relate to reporting thresholds under Australian regulations?

Australian reporting obligations use greenhouse gas emissions (expressed in tonnes CO₂-e) to determine regulatory applicability. NGER requires reporting from facilities with Scope 1 and 2 emissions exceeding 25,000 tonnes CO₂-e per year, or from corporate groups exceeding 50,000 tonnes. The Safeguard Mechanism applies to facilities with covered emissions exceeding 100,000 tonnes CO₂-e annually. NSW Climate Change Mitigation and Adaptation Plans apply to licensed premises with at least 25,000 tonnes CO₂-e of Scope 1 and 2 emissions in any of the previous three

financial years. Accurate measurement of all greenhouse gas types and their conversion to CO₂-e is essential for determining whether these thresholds are met. We provide emissions inventory services that quantify total organisational and facility-level emissions, document GWP assumptions, and assess regulatory applicability.

What role do greenhouse gas emissions play in decarbonisation transition planning?

Greenhouse gas emissions quantified in tonnes CO₂-e form the baseline against which decarbonisation progress is measured. A comprehensive emissions inventory documenting all significant GHG sources—across Scope 1 (fuel, process), Scope 2 (purchased electricity), and Scope 3 (supply chain, transport)—establishes the starting position for transition planning. This baseline enables organisations to set credible reduction targets, prioritise opportunities by emissions impact, evaluate competing project options on a consistent basis, and track progress toward net-zero or interim goals. Different reduction strategies address different gas types: switching fuels reduces methane or CO₂ from combustion; improving refrigeration efficiency reduces SF₆ or hydrofluorocarbon leakage; renewable energy procurement addresses Scope 2 electricity emissions. Our transition planning services help organisations connect emissions baselines to practical reduction pathways, assign owners to opportunities, and link energy projects to emissions outcomes.

Why is understanding greenhouse gas composition important for product carbon footprint assessments?

Product carbon footprint assessments measure total greenhouse gas emissions across a product's lifecycle or within a defined system boundary. Accurate results require identifying all relevant gas types—not just CO₂ from energy use, but also methane from refrigeration, nitrous oxide from agricultural inputs, or SF₆ from electrical equipment. Each gas must be quantified separately and converted to CO₂-e using the correct 100-year GWP value before being summed into a final product emissions result. Incomplete gas identification can significantly understate a product's climate impact. Product footprints are used to support marketing claims, respond to customer requirements, identify manufacturing improvements, and guide procurement decisions. Our product footprint assessment service helps organisations establish appropriate system boundaries, identify all relevant emission sources and gas types, document data gaps, and prepare transparent results that support valid environmental claims.

How do renewable energy certificates relate to greenhouse gas emissions reduction?

Renewable energy certificates and greenhouse gas emissions are distinct concepts that address different accounting purposes. Purchasing a renewable energy certificate (such as an LGC, REGO, or STC) provides ownership of the renewable-electricity attribute but does not eliminate an organisation's total greenhouse gas emissions. A certificate purchase affects only Scope 2 accounting (under market-based methods) and only for the electricity covered by the certificate. Scope 1 emissions from direct fuel use and Scope 3 emissions from supply chain and other sources remain unchanged. Additionally, a renewable-electricity claim does not eliminate Scope 3 emissions. Therefore, a certificate portfolio cannot be presented as eliminating 'all our emissions' without clarifying which scopes and gas types are addressed. Our moREnewable100 service and environmental-attribute due diligence support ensure organisations understand the specific emissions impact of certificate purchases and make credible claims aligned with applicable accounting standards.