

## A Carbon Inventory for CATALYST® R&D Ltd

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**18 June 2010**

**Period: April 1, 2009 – March 31, 2010**

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## 1. Executive Summary

CATALYST® R&D Ltd (CATALYST) is a consultancy company with 5 offices nationwide employing 3 full time and 2 part-time consultants. For lifestyle purposes, and to maintain a more sustainable business operation, 3 of these offices are home based. In the 2009/2010 financial year GHG emissions from Scope 1, Scope 2 and significant<sup>1</sup> Scope 3 business activity amounted to 11.67 tonnes CO<sub>2</sub>e, 18% less than that for the same period the previous year (14.28 tonnes CO<sub>2</sub>e).

As a consultancy, the majority of emissions arise from travel. We have managed to reduce these significantly from 2008/2009 levels, with 22% and 14% reductions in airline and vehicle emissions respectively. For airline travel, this is a reduction in emissions of 2.11 tonnes CO<sub>2</sub>e. For vehicle travel the reduction is 0.59 tonnes CO<sub>2</sub>e.

Where GHG emissions cannot be reduced they will be offset. CATALYST® has been enrolled in a programme (Greenfleet) to offset emissions from vehicle use for the past four years however this will not begin to be effective for some years due to the delayed nature of the offset. CATALYST® is investigating additional options that will be based on an investment that either results in avoided emissions (e.g. home insulation) or in a “real-time” offset.

## 2. Background

CATALYST® is committed to the sustainable operation of its business activities, as outlined in our Sustainability Policy. We aim to be efficient in our use of resources, and where possible to use less of them.

To achieve this CATALYST® has quantified its business emissions for each of the past three financial years using an in-house developed Annual Carbon Emissions calculator (ACE)<sup>2</sup>. The total emissions determined for each of these years is presented below.

April 2006 – March 2007	10.87 tonnes CO <sub>2</sub> e
April 2007 – March 2008	14.51 tonnes CO <sub>2</sub> e
April 2008 – March 2009	14.28 tonnes CO <sub>2</sub> e

The 2006/2007 year, as the first full year emissions were quantified, is the CATALYST® base year.

For the 2009/2010 financial year CATALYST® has again measured its business activity emissions using ACE. This report presents the measurement and the methodology and calculations behind it. In addition, the report examines the GHG removals associated with CATALYST® emission mitigation strategies. A comparative analysis with previous periods at the end of the report highlights trends and identifies areas where emissions may be reduced or mitigated, and identifies strategies for consideration for following years.

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<sup>1</sup> From air travel and use of taxis

<sup>2</sup> Visit [www.catalystnz.co.nz](http://www.catalystnz.co.nz) to learn about ACE

### 3. Report Details

#### 3.1. Report period

The reporting period for this inventory is 2009/2010 in line with the CATALYST® financial year, 1 April – 31 March.

#### 3.2. Responsible person/party

This report has been compiled by CATALYST® based on logged and filed in-house data and information. CATALYST® has taken every care in the compiling and analysis of the data, and in the preparation of this report. CATALYST® is responsible for all GHG calculations within the report as well as the completeness and accuracy of the data provided.

#### 3.3. ISO 14064-1

This report has been produced in conformance with the principles set out by the International Standards Organisation (ISO) for the quantification and reporting of greenhouse gas emissions and removals (Standard 14064-1:2006).

### 4. Organisational Boundaries

CATALYST® R&D Ltd is a consultancy business employing five consultants with offices in Christchurch, Wellington, Rotorua, Tauranga and Auckland. Business activity takes place in each of these offices as well as offsite at the premises of clients, partners and associates.

Christchurch office	Home office (address not available)
Wellington office	32 Salamanca Road, Wellington
Rotorua offices	Home offices (addresses not available)
Tauranga office	27 Church Street, Katikati
Auckland office	8th Floor, 20 Amersham Way, Manukau City

### 5. GHG inventory

#### 5.1. Operational boundaries and scope

This inventory accounts for all Scope<sup>3</sup> 1 (direct) and Scope 2 (electricity indirect) emissions arising from activities within the Christchurch, Wellington, Rotorua and Tauranga offices, as well as business travel in private vehicles (see Table 1). Scope 3 emissions included (indirect emissions other than electricity) arise from airline travel, hire car travel, and travel by taxi cab.

**Table 1.** Emissions included in CATALYST® operational boundary

Operation	Source	GHG	Description
Offices	Electricity	CO <sub>2</sub> e	Indirect emission
		CO <sub>2</sub> e	Indirect emission
Travel	Private vehicle usage	CO <sub>2</sub> e	Direct emission
	Airline travel	CO <sub>2</sub> e	Indirect emission
	Hire car usage	CO <sub>2</sub> e	Indirect emission
	Taxi	CO <sub>2</sub> e	Indirect emission

<sup>3</sup> For an explanation of the technical definitions relating to Scope see Section 8

The following are excluded from the inventory

- Activity that takes place in the premises of clients and associates. This activity is considered the responsibility of the hosting partner
- Biodegradable waste to landfill; this is negligible due to recycling and composting practice and has therefore been discounted
- Emissions arising from the use of public transport, due to a lack of robust methodology for New Zealand.

To mitigate a proportion of these emissions, CATALYST® is a member of GreenFleet, a Sustainable Business Network of New Zealand initiative to offset business vehicle emissions. This operation is summarized in Table 2 and discussed further in Section 5.2.2.

The Auckland office is utilized a maximum of 10 days per annum by a single consultant. Activity associated with this facility is minimal and not included in this report.

**Table 2.** Removals according to CATALYST® operational boundary

Operation	Component	GHG	Description
GreenFleet membership	Native forest plantations	CO <sub>2</sub>	Direct removal

## 5.2. Methodology

### 5.2.1. Calculating emissions

All GHG emission data presented in this report is calculation based, determined by multiplying activity data by emission or removal factors.

Emissions (tonnes GHG) = quantity of energy (unit) X emission factor (tonnes GHG/unit)

Emission factors are provided in terms of CO<sub>2</sub> equivalent (CO<sub>2</sub>e) emissions. The emissions of different GHGs are calculated separately and converted to CO<sub>2</sub> equivalents on the basis of their global warming potential. For example:

- 1 unit of methane (CH<sub>4</sub>) is equivalent to 21 units of CO<sub>2</sub>,
- 1 unit of nitrous oxide (N<sub>2</sub>O) is equivalent to 310 units of CO<sub>2</sub>.

Emission factors have been sourced principally from the New Zealand Ministry for the Environment (MfE). Their values and original sources are listed below.

#### Fuel

Fuel type	CO <sub>2</sub> e emission factor (kg CO <sub>2</sub> e/L)	CO <sub>2</sub> emission factor (kg CO <sub>2</sub> /L)	CH <sub>4</sub> emission factor (kg CO <sub>2</sub> e/L)	N <sub>2</sub> O emission factor (kg CO <sub>2</sub> e/L)
Petrol - regular	2.33	2.30	0.0136	0.0155
Petrol - premium	2.37	2.34	0.0138	0.0157
Petrol - default	2.34	2.31	0.0136	0.0155
Diesel	2.69	2.64	0.00306	0.0441

The emission factors above were derived by MfE using calorific values sourced from the New Zealand Energy Data File 2009. All emission factors incorporate relevant oxidation factors which are sourced from *Energy Greenhouse Gas Emissions* (2009).

**Electricity**

	CO <sub>2</sub> e emission factor (kg CO <sub>2</sub> e/kWh)	CO <sub>2</sub> emission factor (kg CO <sub>2</sub> e/kWh)	CH <sub>4</sub> emission factor (kg CO <sub>2</sub> e/kWh)	N <sub>2</sub> O emission factor (kg CO <sub>2</sub> e/kWh)
Electricity	0.195	n/a	n/a	n/a

This emission factor is derived from the net electricity generation data in the New Zealand Energy Data File 2009 and reflects the CO<sub>2</sub>-e emissions associated with the generation of a unit of electricity, purchased from the national grid, in New Zealand in 2008.

**Electricity transmission & distribution line losses**

	CO <sub>2</sub> e emission factor (kg CO <sub>2</sub> e/kWh)	CO <sub>2</sub> emission factor (kg CO <sub>2</sub> e/kWh)	CH <sub>4</sub> emission factor (kg CO <sub>2</sub> e/kWh)	N <sub>2</sub> O emission factor (kg CO <sub>2</sub> e/kWh)
Electricity	0.020	n/a	n/a	n/a

The transmission and distribution line losses emission factor accounts for emissions (from the generation) of the electricity lost in the transmission and distribution network due to inefficiencies in the grid and is the difference between the generation and consumption emission factors reported by the Ministry of Economic Development.

**Air travel**

	CO <sub>2</sub> e emission factor (kg CO <sub>2</sub> e/km)	CO <sub>2</sub> emission factor (kg CO <sub>2</sub> e/km)	CH <sub>4</sub> emission factor (kg CO <sub>2</sub> e/km)	N <sub>2</sub> O emission factor (kg CO <sub>2</sub> e/km)
Domestic	0.1728	n/a	n/a	n/a
Inter. short haul	0.0946	n/a	n/a	n/a

These emission factors provided were sourced by MfE from the UK Department for Environment Food and Rural Affairs (DEFRA) in their *2009 Guidelines to DEFRA / DECC's GHG Conversion Factors for Company Reporting*. These are deemed to be the most suitable emission factors currently available.

**Travel by taxi and rental cars**

	unit	CO <sub>2</sub> e emission factor (kg CO <sub>2</sub> /unit)
Rental car – small (<1600 cc)	km	0.172
Rental car – medium (1600 – 2499 cc)	km	0.234
Rental car – large (>2499 cc)	km	0.310
Taxi – distance traveled	km	0.332
Taxi – fare based	\$	0.133

The small car emission factor is based on a fuel conversion rate of 7.35 L/100km. For medium and large vehicles the consumption rates used are 10.01 and 13.24 L/100km respectively. These fuel conversion rates and subsequent emission factors were sourced from MfE.

The emission factor for taxis, based on distance traveled, is the same as that for large vehicles. Data from the Motor Industry Association New Vehicles Sales database shows that for the period January 2002 – July 2008, 84.2% of taxis purchased were in the large vehicle class size.

The fare based emission factor for taxis is based on a national average fare figure of \$2.50 per kilometer traveled, sourced from Taxicharge New Zealand.

### 5.2.2. Calculating sinks

In 2006 CATALYST® joined GreenFleet, the Sustainable Business Network programme for offsetting business emissions relating to vehicle use.

For each vehicle enrolled in the programme 23 native seedlings are planted in a local reforestation project. The basis for this number is

- a. The average business vehicle travels 15,000km per annum
- b. The average business vehicle has a fuel efficiency of 10L/100km
- c. Native forest sequesters 400 t CO<sub>2</sub> (109 t C) over 100 years
- d. An assumed 10% mortality rate following planting

CATALYST® has 3 vehicles enrolled in the programme.

The GreenFleet programme is a “future forests” offset programme designed such that the emissions relating to the year of planting will be offset over a period of 100 years. As such these cannot be considered instant offsets. The trees will need to grow for 100 years before they can accumulate the amount of carbon emitted in the year of their planting.

For this reason, and for the purposes of this inventory, it has been deemed necessary to assess actual removals of these plantings on a year by year basis. This can be achieved by calculating change in biomass for each year’s plantings based on their age at the start and the end of each reporting period. In the absence of annual biomass change data for a mixed species native plantation we have referred to data determined by Scion (and published by MAF<sup>4</sup>) for a variety of tree species (exotic and native) and have determined that for the number and age of trees in this inventory removals over the period will have been negligible.

## 5.3. Quantification

### 5.3.1. Activity data

Table 3 summarises CATALYST’s total GHG activity data for the 2009/2010 year and explains how the data was determined or where it was sourced.

**Table 3.** Activity data for CATALYST® 2009/2010

	Data	Determined by/Source
<b>Removals by Sinks</b>		
Native reforestation	69 x 3yo plants (planted 2006) 69 x 2yo plants (planted 2007) 69 x 1yo plants (planted 2008) 69 seedlings (planted 2009)	Assigned plantings as per GreenFleet programme

<sup>4</sup> <http://www.maf.govt.nz/climatechange/reports/sequestration/Indicative-Forest-Sequestration-Tables.pdf>

<b>Emissions by Sources</b>		
Electricity	1,789 kWh	Individual consultant determinations – see explanation below
Private vehicle fuel	1,260 L	Individual consultant travel logs – see explanation below
Hire car travel	2,455 km	
Travel by taxi	226 km	
Travel by taxi	\$822.00	
Airline travel (domestic)	41,591 passenger km	Airline electronic itinerary details
Airline travel (short haul international)	4,258 passenger km	

Activity data is logged monthly by each consultant and tallied at the end of the period. How this data is determined is outlined below. Records are filed and processed in the Tauranga office.

### Electricity

CATALYST® operates out of individual, independent offices. Electricity usage at each office is determined as follows:

Tauranga	Leased office Electricity meter readings for appliances; ceiling lights estimated
Rotorua 1	Home office 10% total household units (based on accounting protocol)
Rotorua 2	Home office Electricity meter readings for appliances; ceiling lights estimated
Wellington	Leased office Electricity meter readings for appliances; ceiling lights estimated
Christchurch	Home office Electricity meter readings for appliances, including free standing lights

### Private vehicle travel

Travel logs are kept by each consultant to record distances traveled relating to business activity. This includes travel to and from meetings as well as daily travel to and from offices. Where car pooling takes place with person(s) from another business organisation a determination is made as to which business is accountable and data is logged accordingly.

Fuel use by private vehicle is then calculated based on distance traveled and the fuel consumption rates determined by each consultant for their vehicle:

$$\text{Fuel consumed (L)} = \text{km traveled} \times \text{vehicle fuel consumption rate}^5 / 100$$

### Hire vehicle travel

Each time a hire vehicle is used its engine size is noted and distance traveled recorded.

### Taxi use

Where possible, travel distances are recorded. In situations where this is not feasible the fare is recorded and used to determine the related emissions (see Section 5.2.1 above).

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<sup>5</sup> L/100km



## Public transport

Public transport activity (use of buses, trains, cable cars) is recorded. As there is currently no robust methodology for determining emissions from these forms of transport in a New Zealand setting, this category has been excluded from the analysis.

### 5.3.2. Calculations

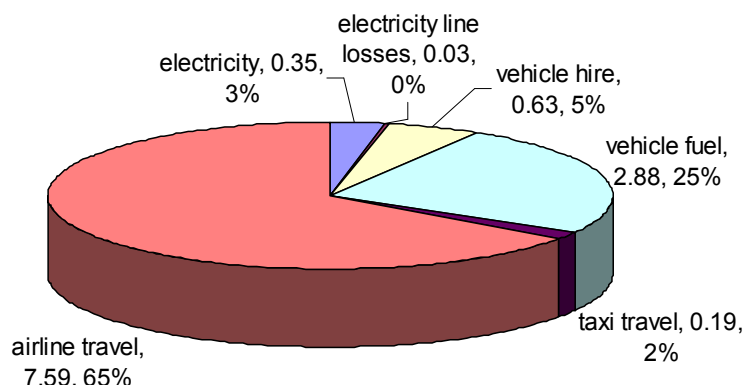
#### a. Emissions

Emissions have been calculated for each source based on the emission factors listed in Section 5.2.1 and the activity data in Table 3. Table 4 presents the values for each category of emission (Scope 1, 2, 3), and in accordance with ISO guidelines Scope 1 emissions have been presented according to GHG type.

**Table 4.** GHG emissions for the CATALYST® office operations and associated travel for 2009/2010

	GHG type	Source	Units	tonnes CO <sub>2</sub> e
Scope 1	CO <sub>2</sub>	Fuel – premium petrol	799 L	1.87
		Fuel – regular petrol	324 L	0.75
		Fuel - default	96 L	0.22
		<b>Total (direct CO<sub>2</sub>)</b>		<b>2.84</b>
	CH <sub>4</sub>	Fuel – premium petrol	799 L	0.01
		Fuel – regular petrol	324 L	0.004
		Fuel - default	96 L	0.002
		<b>Total (direct CH<sub>4</sub>)</b>		<b>0.02</b>
	N <sub>2</sub> O	Fuel – premium petrol	799 L	0.01
		Fuel – regular petrol	324 L	0.005
		Fuel - default	96 L	0.002
		<b>Total (direct N<sub>2</sub>O)</b>		<b>0.02</b>
<b>Total (direct, all GHGs)</b>				<b>2.88</b>
Scope 2	n/a	Electricity	1,789 kWh	0.35
		<b>Total (Scope 2)</b>		<b>0.35</b>
Scope 3	n/a	Airline travel - domestic	41,591 km	7.19
		Airline travel – short int.	4,258 km	0.40
		Electricity line losses	1,789 kWh	0.03
		Vehicle hire	2,455 km	0.63
		Taxi travel (fare based)	\$822	0.11
		Taxi travel (km based)	226 km	0.08
		<b>Total (Scope 3)</b>		<b>8.44</b>
<b>GRAND TOTAL</b>				<b>11.67</b>

This data is summarized and presented in Figure 1.

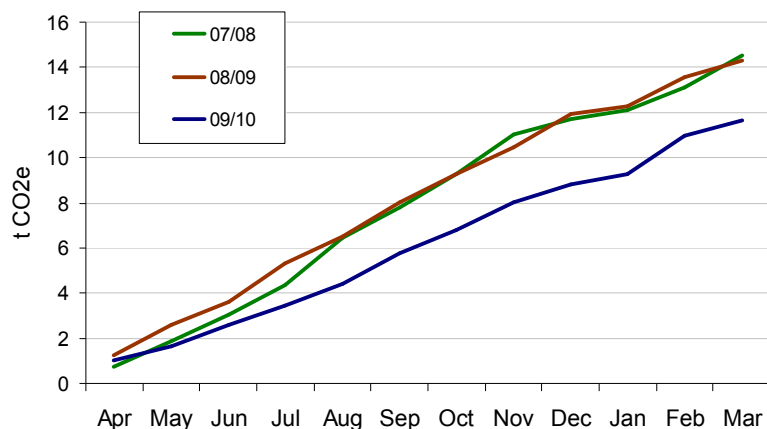
**Figure 1.** CATALYST® emissions for 2009/2010 (t CO<sub>2</sub>e)

### b. Removals

As discussed in Section 5.2.2, based on the age and number of trees in the GreenFleet programme, biomass change will be minimal. Therefore removals by this activity for the period of the inventory are deemed negligible.

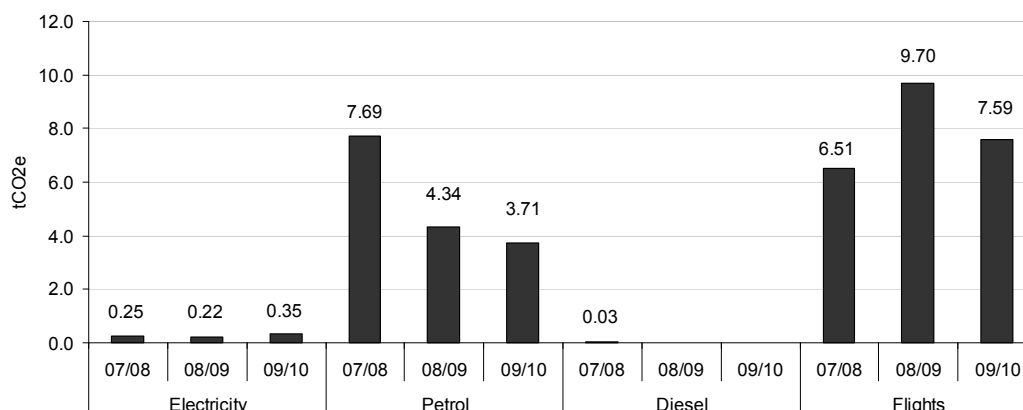
## 5.4. Interpretation

In 2009/2010, CATALYST® business activities emitted 11.67 t CO<sub>2</sub>e. For the same period in 2008/2009, the value was 14.28 t CO<sub>2</sub>e, as shown in Figure 3. In 2007/2008 CATALYST® emissions were 14.51 t CO<sub>2</sub>e. An annual drop in emissions between November and February reflects a reduction in business activity over the Christmas/New Year holiday period.

**Figure 2.** Cumulative emissions for 07/08, 08/09 and 09/10

Annual footprint (tonnes CO <sub>2</sub> e)	
2009/2010	11.67
2008/2009	14.28
2007/2008	14.51

In terms of source, emissions in the 09/10 year have come predominantly from airline travel and vehicle fuel consumption, as shown in Figure 3. As for previous years, emissions from electricity use are minimal.

**Figure 3.** Total emissions by source for 07/08, 08/09 and 09/10

When making these annual comparisons it is important to note any differences in calculation methodologies and/or assumptions. For 09/10, as described in this report, emission factors for the 2008 calendar year were used in lieu of more recent factors being available. Emission factors for the 2007 calendar year were used in the determination of the 07/08 and 08/09 CATALYST® GHG inventories as these were the most suitable factors available at the time of the analyses.

## 5.5. Uncertainty

This inventory has been prepared with care and to the highest degree of accuracy. However an area of uncertainty exists, relating to the determination of indirect emissions from electricity. The uncertainty exist for two reasons

- units (kWh) used in the calculation are estimate based (see Section 5.3.1)
- emission factors used may not accurately represent emissions associated with the generation of the electricity consumed by CATALYST®.

The emission factors used for electricity in this report have been sourced from *Energy Greenhouse Gas Emissions 1990 – 2008* via the New Zealand Ministry for the Environment, and are grid-average factors for the 2008 generation of a kWh of electricity purchased from the New Zealand national grid. Such a national average may not accurately represent the CATALYST® emission profile for electricity if the provider(s) generates electricity from sources atypical to those represented by the national grid average. For example, electricity generated from renewable resources such as wind, hydro or solar will emit no GHGs. For future inventories CATALYST® may like to investigate how their electricity providers generate electricity and use emission factors specific to that form of generation.

In addition, a second area of uncertainty exists in relation to minibus travel (e.g. airport shuttle). With no robust methodology available for this form of public transport, minibus travel has been analysed using emission factors for taxi use.

## **6. Next steps**

### **6.1. Mitigation**

Where practical, CATALYST® looks to reduce its GHG emitting activities. The main area to address is the amount of airline travel, which for this inventory accounts for 65% of total emissions. The bulk of this travel is specified by clients and cannot be readily reduced. Where alternatives are available e.g. conference calls, these are used. Petrol use is the other major source of emissions and CATALYST® actively seeks to reduce the number of vehicle trips made. Initiatives in place already include

- Scheduling multiple meetings per journey
- Carpooling to the office
- Using buses, shuttles and trains in place of taxis
- Where more than one vehicle is available taking the most fuel efficient option

CATALYST® GHG offsetting programmes is another area for assessment. As explained in Section 5.2.2, the GreenFleet programme is designed to offset vehicle only emissions, over a 200 year period. CATALYST® is looking to invest in a complimentary but more immediate offsetting programme.

### **6.2. Verification**

This inventory has not been verified.

## 7. Glossary of Terms

The following terms have been used in this report.

**Scope** (taken from MfE's Guidance for Voluntary, Corporate Greenhouse Gas Reporting):

The GHG Protocol categorises emission sources into **Scope 1, Scope 2 and Scope 3** activities as follows:

1. **Scope 1:** Direct GHG emissions occur from sources that are owned or controlled by the company (ie, sources within the organisational boundary), for example emissions from combustion of fuel in owned or controlled vehicles. The GHG Protocol and ISO 14064-1 require Scope 1 emissions to be reported
2. **Scope 2:** Electricity indirect GHG emissions occur from the generation of purchased electricity<sup>8</sup> consumed by the company. The GHG Protocol and ISO 14064-1 require Scope 2 emissions to be reported
3. **Scope 3:** Other indirect GHG emissions occur as a consequence of the activities of the company, but occur from sources not owned or controlled by the company, for example emissions from air travel. Under the reporting framework of The GHG Protocol and ISO 14064-1, Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions.

The definitions presented below have been taken from the ISO 14064-1 "Greenhouse gases – Part 1. Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals".

### **Carbon dioxide equivalent (CO<sub>2</sub>e)**

unit for comparing the radiative forcing of a GHG to carbon dioxide

NOTE The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its global warming potential .

### **Base year**

historical period specified for the purpose of comparing GHG emissions or removals or other GHG-related information over time

NOTE Base-year emissions or removals may be quantified based on a specific period (e.g. a year) or averaged from several periods (e.g. several years).

### **Facility**

single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organizational unit or production process

### **Greenhouse gas (GHG)**

gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds

NOTE GHGs include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF<sub>6</sub>).

**Greenhouse gas source**

physical unit or process that releases a GHG into the atmosphere

**Greenhouse gas sink**

physical unit or process that removes a GHG from the atmosphere

**Greenhouse gas reservoir**

physical unit or component of the biosphere, geosphere or hydrosphere with the capability to store or accumulate a GHG removed from the atmosphere by a greenhouse gas sink or a GHG captured from a greenhouse gas source

NOTE 1 The total mass of carbon contained in a GHG reservoir at a specified point in time could be referred to as the carbon stock of the reservoir.

NOTE 2 A GHG reservoir can transfer greenhouse gases to another GHG reservoir.

NOTE 3 The collection of a GHG from a GHG source before it enters the atmosphere and storage of the collected GHG in a GHG reservoir could be referred to as GHG capture and storage.

**Greenhouse gas emission or removal factor**

factor relating activity data to GHG emissions or removals

**Greenhouse gas activity data**

quantitative measure of activity that results in a GHG emission or removal

NOTE Examples of GHG activity data include the amount of energy, fuels or electricity consumed, material produced, service provided or area of land affected.

**Responsible party**

person or persons responsible for the provision of the greenhouse gas assertion and the supporting GHG information

NOTE The responsible party can be either individuals or representatives of an organization or project and can be the party who engages the validator or verifier. The validator or verifier may be engaged by the client or by other parties, such as the GHG programme administrator.

**Verification**

systematic, independent and documented process for the evaluation of a greenhouse gas assertion (2.11) against agreed verification criteria

NOTE In some cases, such as in first-party verifications, independence can be demonstrated by the freedom from responsibility for the development of GHG data and information.

**Uncertainty**

parameter associated with the result of quantification which characterizes the dispersion of the values that could be reasonably attributed to the quantified amount

NOTE Uncertainty information typically specifies quantitative estimates of the likely dispersion of values and a qualitative description of the likely causes of the dispersion.