

A GHG Inventory for CATALYST® R&D Ltd

18 May 2009



Period: April 1, 2008 – March 31, 2009





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1.0 Executive summary

CATALYST[®] R&D Ltd 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 2008/2009 financial year GHG emissions from Scope 1, Scope 2 and significant¹ Scope 3 business activity amounted to 14.28 tonnes CO₂e, a value similar to that for the same period the previous year (14.51 tonnes CO₂e).

Efforts have been made to keep these emissions to a minimum. The majority have arisen from airline flights. Most flights are client specified and therefore difficult to reduce. CATALYST[®] has control over emissions from vehicle use however, and initiatives put in place to reduce this source of emissions have been effective resulting in a 44% reduction on the previous period's vehicle emissions.

Where GHG emissions cannot be reduced they will be offset. A programme to offset emissions from vehicle use (Greenfleet) will not begin to be effective for some years to come due to the delayed nature of the offset. Therefore CATALYST[®] is investigating additional offset options. A project is presently being developed to offset the entire footprint for 2008/2009, and similar emission profiles for the coming 3 – 5 years.

¹ From air travel and use of taxis



2.0 Background

CATALYST[®] R&D Ltd is committed to the sustainable operation of its business activities, as outlined in our Sustainability Policy (Annex 2). We aim to be efficient in our use of resources, and where possible to use less of them.

To achieve this CATALYST[®] R&D Ltd has quantified its business emissions for each of the past two financial years using an in-house developed Annual Carbon Emissions calculator called ACE². The total emissions determined for each of these years is presented below.

| | |
|-------------------------|--------------------------------|
| April 2006 – March 2007 | 10.87 tonnes CO ₂ e |
| April 2007 – March 2008 | 14.51 tonnes CO ₂ e |

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

For the 2008/2009 financial year CATALYST[®] has once again measured its business activity emissions using ACE. This report presents the measurement and the methodology and calculations behind it. In addition, the report for the first time 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.

3.0 Report Details

3.1 Report period

The reporting period for this inventory is 2008/2009 in line with the CATALYST[®] R&D Ltd financial year, being 1 April – 31 March.

3.2 Responsible person/party

This report has been compiled by CATALYST[®] R&D Ltd 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 for the quantification and reporting of greenhouse gas emissions and removals (standard 14064-1:2006).

² Visit www.catalystnz.co.nz to learn about ACE

4.0 Organisational Boundaries

CATALYST[®] R&D Ltd is a consultancy business employing five independent 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 | 8 th Floor, 20 Amersham Way, Manukau City |

5.0 GHG inventory

5.1 Operational boundaries and scope

This inventory accounts for all Scope ³1 (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 ₂ e | Indirect emission |
| | | CO ₂ e | Indirect emission |
| Travel | Private vehicle usage | CO ₂ e | Direct emission |
| | Airline travel | CO ₂ e | Indirect emission |
| | Hire car usage | CO ₂ e | Indirect emission |
| | Taxi | CO ₂ e | Indirect emission |

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.

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 25 days per annum by a single consultant. Activity associated with this facility is minimal and not included in this report.

³ For an explanation of the technical definitions relating to Scope see Section 8



Table 2. Removals according to CATALYST[®] operational boundary

| Operation | Component | GHG | Description |
|-----------------------|---------------------------|-----------------|----------------|
| GreenFleet membership | Native forest plantations | CO ₂ | 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 CO₂ equivalent (CO₂e) emissions. The emissions of different GHGs are calculated separately and converted to CO₂ equivalents on the basis of their global warming potential. For example:

- 1 unit of methane (CH₄) is equivalent to 21 units of CO₂,
- 1 unit of nitrous oxide (N₂O) is equivalent to 310 units of CO₂.

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 ₂ e emission factor (kg CO ₂ e/L) | CO ₂ emission factor (kg CO ₂ /L) | CH ₄ emission factor (kg CO ₂ e/L) | N ₂ O emission factor (kg CO ₂ e/L) |
|------------------|---|--|---|--|
| Petrol - regular | 2.32 | 2.29 | 0.0136 | 0.0155 |
| Petrol - premium | 2.36 | 2.33 | 0.0137 | 0.0156 |
| diesel | 2.68 | 2.63 | 0.00305 | 0.0440 |

These emission factors reflect 2007 fuel combustion data derived from *Energy Greenhouse Gas Emissions 1990 – 2007* and are sourced from MfE.

Electricity

| | CO ₂ e emission factor (kg CO ₂ e/kWh) | CO ₂ emission factor (kg CO ₂ e/kWh) | CH ₄ emission factor (kg CO ₂ e/kWh) | N ₂ O emission factor (kg CO ₂ e/kWh) |
|-------------|---|---|---|--|
| Electricity | 0.165 | n/a | n/a | n/a |

These emission factors were also sourced from *Energy Greenhouse Gas Emissions 1990 – 2007* via MfE, and are grid-average factors for the 2007 generation of a kWh of electricity purchased from the New Zealand national grid.

Electricity transmission & distribution line losses

| | CO ₂ e emission factor (kg CO ₂ e/kWh) | CO ₂ emission factor (kg CO ₂ e/kWh) | CH ₄ emission factor (kg CO ₂ e/kWh) | N ₂ O emission factor (kg CO ₂ e/kWh) |
|-------------|---|---|---|--|
| Electricity | 0.0142 | 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 in *Energy Greenhouse Gas Emissions 1990–2007*.

Air travel

| | CO ₂ e emission factor (kg CO ₂ e/km) | CO ₂ emission factor (kg CO ₂ e/km) | CH ₄ emission factor (kg CO ₂ e/km) | N ₂ O emission factor (kg CO ₂ e/km) |
|-------------------|--|--|--|---|
| Domestic | 0.1753 | n/a | n/a | n/a |
| Inter. short haul | 0.0983 | n/a | n/a | n/a |

These emission factors were sourced from the UK Department for Environment, Food and Rural Affairs (DEFRA) via MfE (*2008 guidelines to DEFRA's GHG Conversion Factors: Methodology Paper for Transport Emission Factors*).

Travel by taxi and rental cars

| | unit | CO ₂ e emission factor (kg CO ₂ /unit) |
|--------------------------------------|------|---|
| Rental car – small (<1600 cc) | km | 0.175 |
| Rental car – medium (1600 – 2499 cc) | km | 0.241 |
| Rental car – large (>2499 cc) | km | 0.331 |
| Taxi – distance traveled | km | 0.331 |
| Taxi – fare based | \$ | 0.133 |

The small car emission factor is based on a fuel conversion rate of 7.53 L/100km. For medium and large vehicles the consumption rates used are 10.4 and 14.2 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 2007 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

- The average business vehicle travels 15,000km per annum
- The average business vehicle has a fuel efficiency of 10L/100km
- Native forest sequesters 400 t CO₂ (109 t C) over 200 years
- An assumed 10% mortality rate following planting

CATALYST[®] has 3 vehicles enrolled in the programme.



| | |
|--------------|--|
| 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:

Fuel consumed (L) = km traveled x vehicle fuel consumption rate⁵ /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 4.2.1 above).

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. The table below 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.

⁵ L/100km

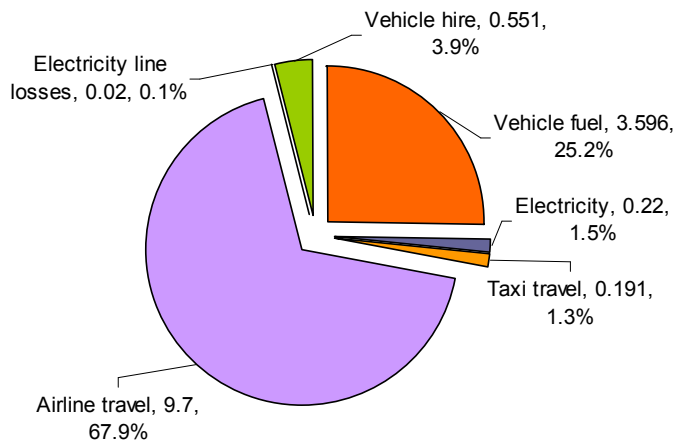


Table 4. GHG emissions for the CATALYST® office operations and associated travel for 2008/2009

| | GHG type | Source | Units | tonnes CO ₂ e |
|---------------------------------|------------------|--------------------------------------|------------------------|--------------------------|
| Scope 1 | CO ₂ | Fuel – premium petrol | 1,260.2 L | 2.936 |
| | | Fuel – regular petrol | 268.7 L | 0.615 |
| | | Total (direct CO₂) | | 3.551 |
| | CH ₄ | Fuel – premium petrol | 1,260.2 L | 0.017 |
| | | Fuel – regular petrol | 268.7 L | 0.004 |
| | | Total (direct CH₄) | | 0.021 |
| | N ₂ O | Fuel – premium petrol | 1,260.2 L | 0.020 |
| | | Fuel – regular petrol | 268.7 L | 0.004 |
| | | Total (direct N₂O) | | 0.024 |
| Total (direct, all GHGs) | | | | 3.596 |
| Scope 2 | n/a | Electricity | 1,334 kWh | 0.220 |
| | | | Total (Scope 2) | 0.220 |
| Scope 3 | n/a | Airline travel - domestic | 52,633 km | 9.226 |
| | | Airline travel – short int. | 4,840 km | 0.476 |
| | | Electricity line losses | 1,334 kWh | 0.019 |
| | | Vehicle hire | 3,150 km | 0.551 |
| | | Taxi travel (fare based) | \$1,395.10 | 0.185 |
| | | Taxi travel (fuel based) | 0.53 L | 0.001 |
| | | Taxi travel (km based) | 16 km | 0.005 |
| | | Total (Scope 3) | 10.463 | |
| GRAND TOTAL | | | | 14.28 |

This data is summarized and presented in Figure 1.

Figure 1. CATALYST® emissions for 2008/2009 (t CO₂e)



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.



5.5 Uncertainty

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

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

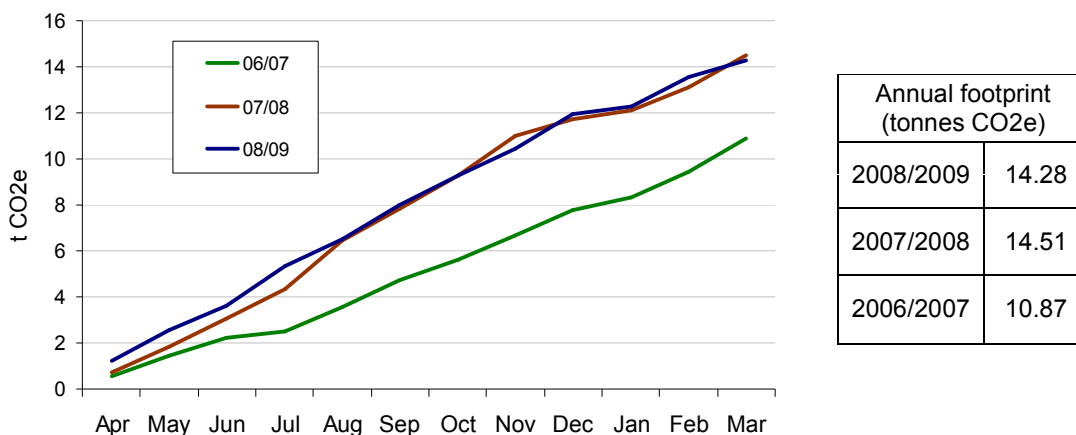
The emission factors used for electricity in this report have been sourced from *Energy Greenhouse Gas Emissions 1990 – 2007* via the New Zealand Ministry for the Environment, and are grid-average factors for the 2007 generation of a kWh of electricity purchased from the New Zealand national grid. Such 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 to this potential over-representation another exists regarding how we have treated minibus (e.g. airport shuttle) travel. With no robust methodology available for this form of public transport, minibus travel has been analysed using emission factors for taxi use.

6.0 Conclusions

In 2008/2009, CATALYST® business activities emitted 14.28 t CO₂e. For the same period in 2007/2008, the value was 14.51 t CO₂e, as shown in Figure 3. In 2006/2007, the first complete year of monitoring, CATALYST® emissions were 10.87 t CO₂e. An annual drop in emissions between November and February reflects a reduction in business activity over the Christmas/New Year holiday period.

Figure 3. Cumulative emissions 06/07, 07/08, 08/09

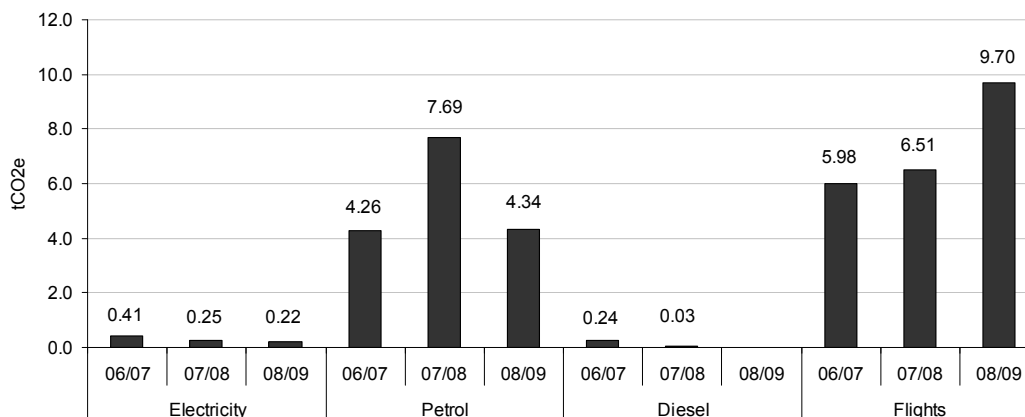


In terms of source, emissions in the 08/09 year have come predominantly from airline travel and vehicle fuel consumption, as shown in Figure 2. As for previous years, emissions from electricity



use are minimal. A long term contract this year requiring frequent air travel between Christchurch and Wellington has seen emissions from this source increase significantly compared with previous years. This has been countered by a reduction in vehicle travel (private vehicles, hire vehicles and taxi travel combined), as shown on Figure 4.

Figure 4. Total emissions by source, 06/07, 07/08, 08/09



When making these annual comparisons it is important to note any differences in calculation methodologies and/or assumptions. For 08/09, as described in this report, emission factors for the 2007 calendar year were used in lieu of more recent factors being available. The same emission factors were used in the determination of the 07/08 CATALYST® GHG inventory. For analysis of 06/07 activity data 2006 specific emission factors were sourced from MfE and used. Other differences include:

- Omission of taxi travel and electricity line loss emissions in the 06/07 footprint
- Vehicle fuel emission determinations in 06/07 were based on default vehicle fuel efficiencies rather than specific to the vehicles used

7.0 Next steps

7.1 Mitigation

Where practical, CATALYST® must look to reduce their GHG emitting activities. The main area to address is the amount of airline travel, which for this inventory accounts for 68% 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 instant offsetting programme.



7.2 Verification

This inventory has not been verified.



8.0 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.
3. **Scope 2:** Electricity indirect GHG emissions occur from the generation of purchased electricity⁸ consumed by the company. The GHG Protocol and ISO 14064-1 require Scope 2 emissions to be reported
4. **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 following terms have been used in this report. The definitions presented below have been taken from the ISO 14064-1 "Greenhouse gasses – Part 1. Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals".

carbon dioxide equivalent (CO₂e)

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 (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆).

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



activate

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



Annex 1. CATALYST Sustainability Policy

Values

1. We believe that successful and enduring businesses need to be continually evolving new processes and products with higher value for their customers.
2. We work to ensure the integrity of data and information used in decision making and innovation.
3. We consider the effect of our actions, both business and personal, on the environment.
4. We work towards ensuring a work/life balance is met and maintained.

Actions

1. We have an annual professional development programme.
2. We participate and present at scientific conferences, including participating in presentations on sustainability and climate change.
3. We have developed and made freely available a tool for quantification of greenhouse gas emissions (ACE).
4. We support working from home as appropriate to the person to minimise daily travel emissions. Carpooling and the use of public transport is supported.
5. We endeavour to maximise opportunities to reduce, reuse and recycle, thereby minimizing resource consumption and waste production by:
 - a. conserving energy by using energy efficient technology and turning off unused appliances
 - b. use of laptops over desktop computers to reduce power usage and to support working from home
 - c. minimising printing to the extent that it is almost eliminated
 - d. meeting and travel planning to minimise impacts by achieving more than one objective for each trip.
- e. We consider fair trade, origin of products, packaging, efficiency of products in use, and recyclability of products in all purchasing decisions.
- f. We measure our own greenhouse gas emissions as a step towards managing and reducing them.
- g. We are members of the Sustainable Business Network and participate in Greenfleet.