

**The Association for Tropical Biology and  
Conservation Meeting  
July 2007, Morelia, Mexico**


**Greenhouse Gas Emissions  
Assessment**



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## Climate Change Impact Assessment - ATBC Meeting

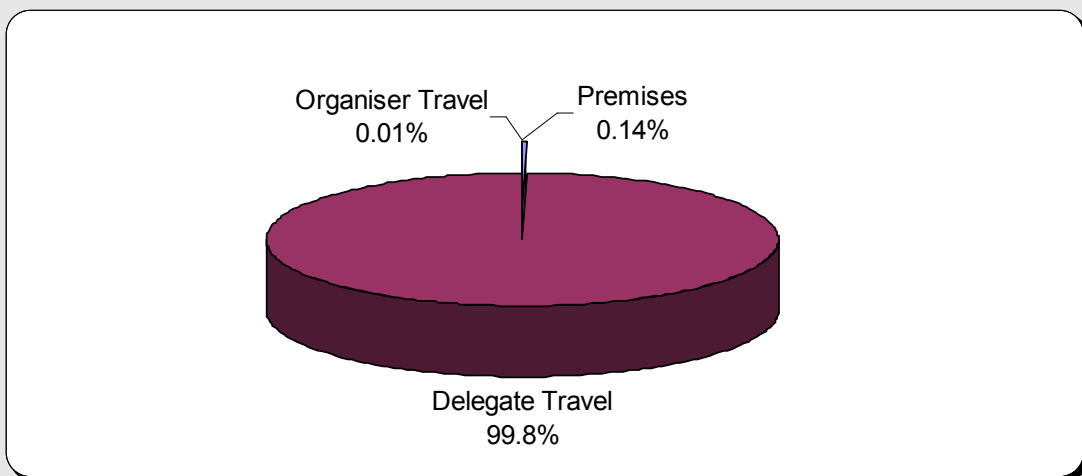
### Executive Summary

#### Background

This assessment covers the greenhouse gas (GHG) emissions arising from the Association for Tropical Biology and Conservation (ATBC) meeting to be held in Morelia, Mexico from the 15<sup>th</sup> to 19<sup>th</sup> July 2007.

#### Summary of Emissions

ECCM estimates that, during the duration of the ATBC meeting, the GHG emissions produced will be equivalent to **1,069 tonnes of CO<sub>2</sub>**.



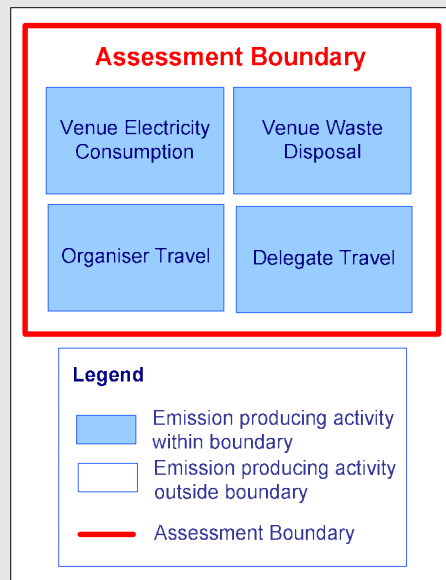
Delegate travel (by car, bus, air and hotel stays) contributed the majority of emissions with 1,067.1 tonnes of CO<sub>2</sub>e. Premises emissions (from electricity consumption and waste disposal) made a small contribution with 1.5 tonnes of CO<sub>2</sub>e. The remaining 0.1 tonnes of CO<sub>2</sub>e were generated by organiser travel (by petrol car).

### Scope and Methodology

The assessment methodology follows the reporting principles and guidelines provided by the WBCSD Greenhouse Gas Protocol.

The organisational boundary of the assessment comprises the operational activities of ATBC meeting which is to be held in Morelia, Mexico from the 15<sup>th</sup> to 19<sup>th</sup> July 2007.

The operational boundary of the assessment includes venue electricity consumption and waste disposal and the travel of delegates and organisers (see diagram below).



### Recommendations

- The ATBC should review its meeting's emissions profile annually so that any changes in emissions can be monitored. This will allow an emissions baseline to be established, against which targets can be set and progress can be monitored.
- The ATBC should investigate the potential for reducing emissions from the travel of delegates.

## 1. Introduction

### 1.1 Background

Climate change presents a serious challenge for responsible business leaders in the 21<sup>st</sup> century. Most scientists now agree that rising atmospheric concentrations of greenhouse gases (GHGs), particularly carbon dioxide (CO<sub>2</sub>), threaten to have severe impacts on food production, natural ecosystems and human health over the next 100 years. Industrialised and rapidly industrialising countries are the main sources of greenhouse gases. However, the greatest impacts will be felt by people in developing countries, particularly those in low lying coastal regions and marginal agricultural areas.



Figure 1. Flooding in Bangladesh

In response to the threat of climate change, the Kyoto Protocol was adopted in December 1997. Under the Protocol, industrialised countries have a legally binding commitment to reduce their collective greenhouse gas emissions by at least 5% compared to 1990 levels by the period 2008-2012. Russia ratified the Kyoto Protocol on 18<sup>th</sup> November 2004 and as a result it came into force on February 16<sup>th</sup> 2005. In November 2006 at the UN Climate Change Meeting in Nairobi, the parties agreed on a work plan detailing the steps needed to reach an agreement on a new set of post 2012 commitments.



Figure 2. Kyoto Ratification -The UN Secretary General Kofi Annan receives Russia's instrument of ratification. Allowing the Kyoto Protocol to enter into force in early 2005. Picture taken from <http://unfccc.int/2860.php>.

## **1.2 Why carry out a Climate Change Impact Assessment?**

National governments and the EU are taking a variety of steps to reduce GHG emissions including emissions trading schemes, voluntary reduction and reporting programs, carbon or energy taxes, and regulations and standards on energy efficiency and emissions. Increasingly, companies will need to understand and manage their GHG risks in order to maintain their license to operate, to ensure long-term success in a competitive business environment, and to comply with national or regional policies aimed at reducing corporate GHG emissions (WBCSD/WRI 2004).

ECCM helps companies to install and run the systems they need to understand and control their climate change impact. A Climate Change Impact Assessment is the first step in the carbon management process, giving a company an estimate of the size and breakdown of its 'carbon footprint'.

A Climate Change Impact Assessment provides the basis for further initiatives such as public reporting, target setting and implementation of mitigation activities. Mitigation activities may include energy efficiency measures, embedding renewable energy sources and offsetting irreducible emissions through offset schemes.

## **1.3 Client Details**

The Association for Tropical Biology and Conservation was founded in 1963 to promote research, education, conservation and communication for tropical biology. The ATBC is conducting their annual meeting in Morelia, Mexico in July 2007, hosted by the National Autonomous University of Mexico.



## 2. Assessment Methodology

### 2.1 General Procedure

The assessment methodology used here follows the reporting principles and guidelines provided by the Greenhouse Gas Protocol published by the World Business Council for Sustainable Development and the World Resources Institute (WBCSD/WRI Protocol).

In line with the WBCSD/WRI Protocol, ECCM uses the following procedure to undertake a Climate Change Impact Assessment:

1. Establishment of the assessment boundaries (including the selection of: greenhouse gases, project boundaries and operational boundaries).
2. Collection of client data.
3. Evaluation of data quality and of client data sources.
4. Calculation of emissions using appropriate conversion factors.
5. Determination of suitable recommendations for future action.

The assessment procedure and a summary of results are presented in the main text of the report. A detailed description of emissions calculations and associated assumptions are presented in Appendix II. Details of the uncertainty analysis are given in Appendix III.

A glossary of climate change terms is found in Appendix I.

### 2.2 Greenhouse Gases - Overview

A Climate Change Impact Assessment can include all six greenhouse gases covered by the Kyoto Protocol. The six Kyoto gases are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), sulphur hexafluoride (SF<sub>6</sub>), perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs).

The global warming potential (GWP) of each greenhouse gas may be expressed in CO<sub>2</sub> equivalents (see Table 1). For those gases with a high global warming potential, a relatively small emission can have a considerable impact.

Table 1. The global warming potential of the Kyoto gases

Kyoto gas	GWP*	
carbon dioxide (CO <sub>2</sub> )	1	*Note: the 'global warming potential' of a gas is its relative potential contribution to climate change over a 100 year period, where CO <sub>2</sub> = 1 (see Glossary for a full definition). Source: IPCC (2001).
methane (CH <sub>4</sub> )	23	
nitrous oxide (N <sub>2</sub> O)	296	
sulphur hexafluoride (SF <sub>6</sub> )	22,200	
perfluorocarbons (PFCs)	4,800 – 9,200	
Hydrofluorocarbons (HFCs)	12 - 12,000	

### 2.3 Greenhouse Gases – ATBC Meeting

This Climate Change Impact Assessment covers CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions arising from fuel combustion and CH<sub>4</sub> emissions arising from landfilled waste.

### 2.4 Organisational Boundaries - Overview

When accounting for GHG emissions from companies that are not wholly-owned and/or from companies that have a stake in other companies, it is important to draw clear organisational boundaries. The WBCSD/WRI Greenhouse Gas Protocol sets boundaries that are consistent with the organisational boundaries used for financial reporting purposes. For an event, such as a meeting, organisational boundaries are less important because the assessment is defined by the activities that contribute to the management and fulfilment of the project..

### 2.5 Operational Boundaries – Overview

The WBCSD/WRI protocol provides a three scope reporting framework. Scope 1 covers direct GHG emissions from company owned vehicles and facilities. Scope 2 includes net indirect emissions from energy imports and exports, particularly imported and exported electricity and steam.

Scope 3 includes other indirect GHG emissions such as employee business travel, product transport by third parties, outsourcing of core activities and off-site waste disposal/management activities. Business activities and their associated GHG producing activities are outlined, and classified according to the appropriate scope, as illustrated in Figure 3.

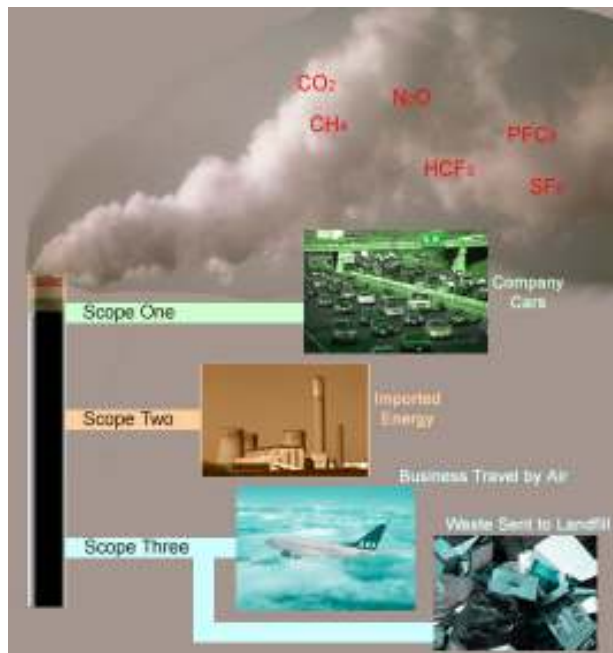


Figure 3. The three scopes of the WBCSD/WRI Protocol

The WBCSD/WRI Protocol recommends that Scopes 1 and 2 are reported as a minimum. For a comprehensive assessment of total climate change impact, relevant Scope 3 activities should also be included.

**2.6 Operational Boundaries – ATBC Meeting**

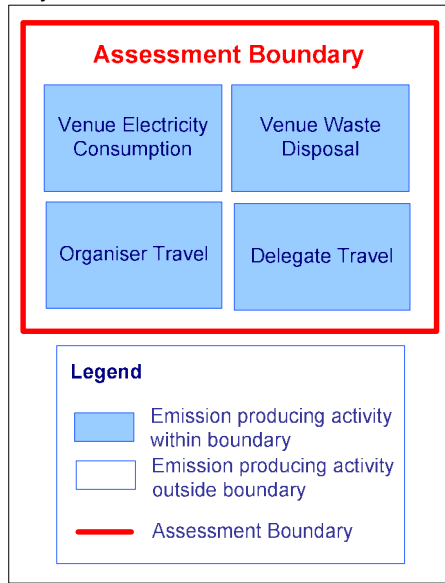
The activities included within the operational boundary are electricity and gas consumption, company owned vehicles and machinery, business travel and waste disposal (Table 2 and Figure 4).

Table 2. Information on activities within the operational boundary

Category	Activities: Energy Inputs	Data	Activities: Waste Outputs	Data
Premises	Electricity consumption	✓	Waste disposal	✓
Transport	Delegate travel			
	• Petrol car	✓		
	• Bus	✓		
	• Air	✓		
	• Hotels	✓		
	Organiser travel			
	• Petrol cars	✓		

Key: ✓ = complete e = estimated ✓/e = combination of complete and estimated data

Figure 4. Operational Boundary



## 2.7 Reporting Approach

ECCM does not base its Climate Change Impact Assessments on direct measurement of emissions, but on estimates of material and energy consumption (principally weight or volume of fuel, but also weight or volume of waste) from which estimates of emissions can be derived, by the application of relevant conversion factors (i.e. amount of CO<sub>2</sub> produced per unit of fuel consumed). This approach is considered the most pragmatic, since the quantity of key greenhouse gases produced in most combustion and manufacturing processes is well understood. The certainty of waste emission estimates is lower, but direct measurement is rarely a realistic option.

The validity of all estimates depends on the accuracy, relevance and completeness of the data provided by the client and on the conversion factors used. ECCM's approach is to set out as clearly as possible all the assumptions and conversion factors used, so that the report is as transparent as possible and the estimate of emissions is founded on 'best evidence'.

ECCM is guided by the precautionary principle. Where there is any doubt over activities undertaken, or where there is a choice of published figures available for calculating greenhouse gas emissions, a conservative 'worst case' scenario is assumed, unless otherwise specified.

## 2.8 Emission factors

In order to establish the tonnes of CO<sub>2</sub> equivalent emitted from the energy consuming activities default conversion factors were applied. These were taken from; 'Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard – Revised Edition' published by the World Business Council for Sustainable Development (WBCSD 2006) and 'Environmental Reporting: guidelines for company reporting on greenhouse gas emissions' published by the UK government (DEFRA 2005).

The WBCSD and DEFRA guidelines do not provide conversion factors for non-CO<sub>2</sub> greenhouse gases arising from fossil fuel combustion. Methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) can make a significant contribution to total emissions depending on the fuel and the combustion technology. Emission factors for these activities are derived from the Intergovernmental Panel on Climate Change (IPCC 2006 and 1996) where appropriate (see Appendix II).

The CO<sub>2</sub> conversion factor for hotel accommodation was derived using an energy model to which the relevant emissions factors were applied. In order to calculate the CH<sub>4</sub> emissions from waste disposal, conversion factors were taken from typical UK waste data in Brown *et al.* (1999) and Smith *et al.* (1999).

### **3. Data**

#### **3.1 Data Sources and Quality**

The collection of the data, upon which the emissions calculations were based, was co-ordinated by Maria Mansfield of the Global Canopy Programme.

All data provided relate to the expected activities of the 2007 meeting.

Where preferred data were missing, estimates were made by the client, and by ECCM based upon information provided by the client, and these are outlined throughout the results and detailed in Appendix II.

#### **3.2 Data Assumptions**

The fundamental assumption underlying the assessment is that all data provided by ATBC meeting personnel are accurate and complete.

The following specific assumption was made:

##### *Premises – waste disposal*

- The composition of waste as provided by ATBC was similar to that of average UK waste data (Brown *et al.* 1999 and Smith *et al.* 1999) so the emissions factor was assumed to be equal.

##### *Delegate and organiser travel – petrol car*

- ECCM assume the cars used for travel will be petrol cars with fuel efficiency equal to that of a typical mid-size US car.

All assumptions underlying the emission calculations are detailed in Appendix II.

#### 4. Results

ECCM estimates that the GHG emissions generated during the 2007 ATBC meeting will be equivalent to **1,069 tonnes of CO<sub>2</sub>**. Figure 5 below displays a breakdown of emissions by activity.

Figure 5. Breakdown of emissions by general activity

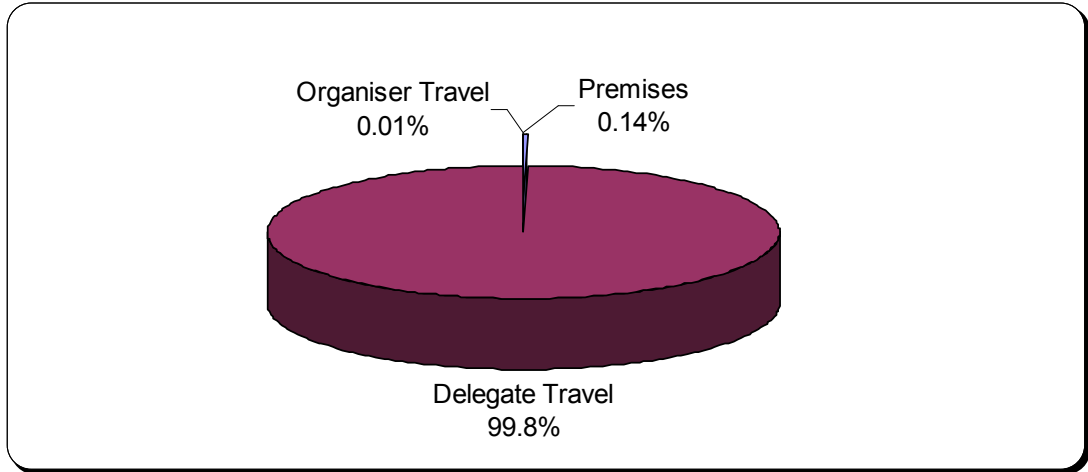


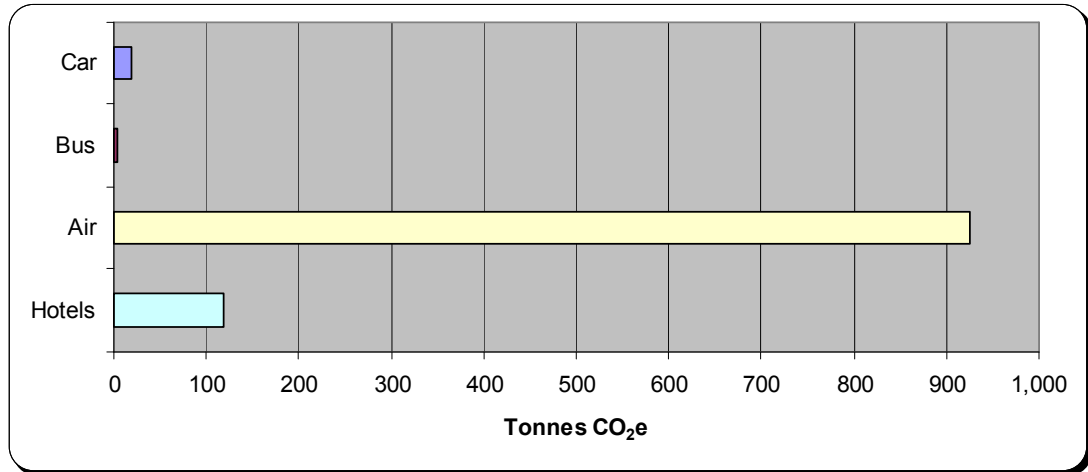
Table 3 breaks down the total emissions by general activity.

Table 3. Breakdown of emissions by general activity

Source of emissions	Equivalent emissions	
	CO <sub>2</sub> (t)	C (t)
Premises - electricity	1.0	0.3
Premises - waste	0.5	0.1
Delegate travel - petrol car	19.2	5.2
Delegate travel - bus	2.9	0.8
Delegate travel - air	926.0	252.6
Delegate travel - hotels	118.9	32.4
Organiser travel - petrol car	0.1	0.0
<b>Total</b>	<b>1,069</b>	<b>291</b>

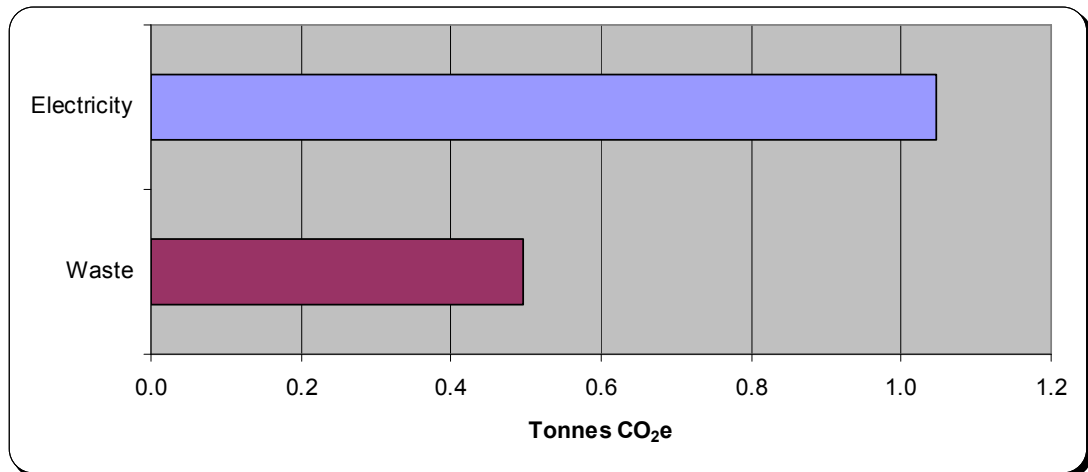
Delegate travel to and from the ATBC meeting made the greatest contribution with 1,067.1 tonnes of CO<sub>2</sub>e. The breakdown of emissions is displayed below in Figure 6.

Figure 6. Breakdown of delegate travel emissions by source



Emissions generated by activities at the venue premises during the meeting gave rise to the next greatest proportion of emissions with 1.5 tonnes of CO<sub>2</sub>e. Premises emissions comprised electricity consumption and waste disposal as illustrated in Figure 7.

Figure 7. Breakdown of premises emissions by source



Travel of meeting organisers by petrol car only contributed the smallest proportion of emissions with 0.1 tonnes of CO<sub>2</sub>e.

Table 4 breaks down emissions by delegate. Normalising emissions using this metric allows underlying changes in emissions to be tracked, as well as changes in absolute emissions resulting from expansion or contraction of the meeting in following years.

Table 4. Emissions normalised by delegate

Source of emissions	Number of delegates	Total emissions (tonnes CO <sub>2</sub> e)	Emissions per delegate (tonnes CO <sub>2</sub> e)
Delegates	900	1,069	1.19

If the ATBC wanted to offset all emissions generated by the meeting in Morelia, they would need to purchase 1,069 tonnes of CO<sub>2</sub>. Projects could include technology offsets such as fuel switching or forestry offset schemes.

Figure 8. Tree planting for offset schemes at Barrow House, Gloucestershire.

Figures 9 & 10. Coconut husks are used to power this Gasifier in India





## **5. Recommendations**

ECCM make the following recommendations:

- The ATBC should review its meeting's emissions profile annually so that any changes in emissions can be monitored. This will allow an emissions baseline to be established, against which targets can be set and progress can be monitored.
- The ATBC should investigate the potential for reducing emissions from the travel of delegates.

## References

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IPCC 2006 Revised IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual. Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge

Smith et al 2001, Waste Management Options and Climate Change, AEA Technology Environment. Luxembourg.

WBCSD 2005 Calculation tool for direct emissions from stationary combustion. Calculations worksheet July 2005 v2

## **Appendix I - Glossary**

## Glossary

**Carbon Dioxide Equivalent (CO<sub>2</sub>e).** The universal unit of measurement used to indicate the global warming potential (GWP) of each of the 6 Kyoto greenhouse gases. It is used to evaluate the impacts of releasing (or avoiding the release of) different greenhouse gases.

**Climate change.** A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability over comparable time periods (Source: United Nations Framework Convention on Climate Change).

**Control.** The ability of a company to direct the operating policies of a facility or organisation. Usually, if the company owns more than 50% of the voting interests, this implies control. The holder of the operating licence often exerts control, however, holding the operating licence is not a sufficient criteria for being able to direct the operating policies of a facility or organisation. In practice, the actual exercise of dominant influence itself is enough to satisfy the definition of control without requiring any formal power or ability through which it arises.

**Direct emissions.** Emissions that are produced by organisation-owned equipment or emissions from organisation-owned premises, such as carbon dioxide from electricity generators, gas boilers and vehicles, or methane from landfill sites.

**Equity share.** The percentage of economic interest in/benefit derived from an organisation.

**Global warming** The continuous gradual rise of the earth's surface temperature thought to be caused by the greenhouse effect and responsible for changes in global climate patterns (see also Climate Change).

**Global Warming Potential (GWP)** The GWP is an index that compares the relative potential (to CO<sub>2</sub>) of the 6 greenhouse gases to contribute to global warming i.e. the additional heat/energy which is retained in the Earth's ecosystem through the release of this gas into the atmosphere. The additional heat/energy impact of all other greenhouse gases are compared with the impacts of carbon dioxide (CO<sub>2</sub>) and referred to in terms of a CO<sub>2</sub> equivalent (CO<sub>2</sub>e) e.g. Carbon dioxide has been designated a GWP of 1, Methane has a GWP of 21.

**Greenhouse gases.** The current IPCC inventory includes six major greenhouse gases. These are Carbon dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>), Nitrous oxide (N<sub>2</sub>O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF<sub>6</sub>).

**IPCC.** The Intergovernmental Panel on Climate Change. A special intergovernmental body established by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) to provide assessments of the results of climate change research to policy makers. The Greenhouse Gas Inventory Guidelines are being developed under the auspices of the IPCC and will be recommended for use by parties to the Framework Convention on Climate Change.

**Indirect emissions.** Emissions that are a consequence of the activities of the reporting company but occur from sources owned or controlled by another organisation or individual. They include all outsourced power generation (e.g. electricity, hot water), outsourced services (e.g. waste disposal, business travel, transport of company-owned goods) and outsourced manufacturing processes. Indirect emissions also cover the activities of franchised companies and the emissions associated with downstream and/or upstream manufacture, transport and disposal of products used by the organisation, referred to as product life-cycle emissions.

**Kyoto Protocol.** The Kyoto Protocol originated at the 3rd Meeting of the Parties (COP) to the United Nations Convention on Climate Change held in Kyoto, Japan in December 1997. It specifies the level of emission reductions, deadlines and methodologies that signatory countries (i.e. countries who have signed the Kyoto Protocol) are to achieve.

## **Appendix II - Emissions Calculations and Assumption**