Greenhouse Accounting and Methodology Background

Greenhouse Gas Accounting Methodology

In order for your company to manage the impact of its greenhouse gas emissions, it must first quantify them. The Carbon Reduction Institute (CRI) does this by conducting an emissions audit. The methodology underpinning this audit has been adapted from the World Business Council for Sustainable Development's (WBCSD) Greenhouse Gas (GHG) Accounting Protocol[1]. The methodology is explained in detail in the sections below.

GHG Protocol

The protocol contains universally recognised accounting methods and boundaries that can be applied to different levels, sizes and types of organisations when creating their GHG inventory. This includes multinational organisations, energy intensive primary industry, as well as small to medium enterprises (SME). The protocol defines boundaries and emissions scopes to ensure that emissions do not become double counted when many companies start accounting for their emissions on a national, state or industry level. On an organisational level, emission scopes and boundaries are important when compiling a GHG inventory, as they give organisations consistency and clarity when charting their emissions liabilities.

Emissions Boundaries

There are two 'types' of boundary that must be set when compiling a GHG inventory; an organisational boundary and an operational boundary. *Organisational boundaries* allow an entity to distinguish between GHG emitting activities that are attributable to their organisation, and those that are not. *Operational boundaries* allow an entity to define the emissions that they own or control and categorise them into different scopes (as either direct or indirect). Dividing emissions up into different scopes allows an organisation to determine opportunities for emission reductions, as well as providing knowledge as to where their emissions are occurring along the value chain.

Organisational boundaries

When setting organisational boundaries, CRI applies a *control rationale*, which states that organisations/entities account for emissions generated from activities over which they have direct control, rather than an equity share.[2] The GHG protocol prescribes 2 methods when defining control; operational and financial. CRI defines control using the operational control method. The GHG protocol defines:

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[1]WBCSD, WRI, (2004), *The Greenhouse Gas Protocol*, World Resources Institute and World Business Council for Sustainable Development, Conches-Geneva, Switzerland. Available online: http://www.ghgprotocol.org

[2] ibid, p17-18

Operational Control. A company has operational control over an operation if the former or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation.[3]

Operational control covers activities where an organisation has authority to directly alter its emissions patterns, be it through the implementation of technology change, direct authority or policy (be it a purchasing policy, staff travel, OH&S, recruitment etc).

CRI uses this rationale as it casts a net over all inputs into Your company's operations that it can exert authority over. In following this methodology, the emissions from any spend made directly by Your company in its operations have been assigned to Your company greenhouse gas inventory.

In some instances however, Your company will have elements of control over activities without evidence of a dollar spend within its financial accounts. A good example of such an instance is staff travel, where Your company can encourage a greater use of public transport and carpooling systems by providing yearly public transport passes for staff, or linking employees that live close together for car-sharing. CRI includes staff travel because of this; and because of the educational benefit gained by staff by incorporating their travel behaviour into the audit.

The emissions accounting methodology described above are applied to all organisations audited within CRI's NoCO2 certification scheme.

Operational Boundaries

The main function of operational boundaries is to create different scopes for organisations to separate and define the emissions produced from their operations. The 3 scopes are described in detail below.

- **Scope 1: Direct GHG emissions** - Emissions that occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces and vehicles.[4]
- **Scope 2: Electricity indirect GHG emissions** - Emissions from the generation of purchased electricity consumed by the company.[5]
- **Scope 3: Other indirect GHG emissions –** Emissions that are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. These include emissions from waste, the extraction and production of purchased materials; transportation of purchased fuels and transportation of employees to and from work.[6]

The NoCO2 emissions chart overleaf graphically depicts the three scopes of emissions.

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[3] Ibid, p 18
[4] WBCSD, WRI, (2004), *The Greenhouse Gas Protocol*, World Resources Institute and World Business Council for Sustainable Development, Conches-Geneva, Switzerland. Available online: http://www.ghgprotocol.org pp25-31
[5] Ibid
[6] Ibid

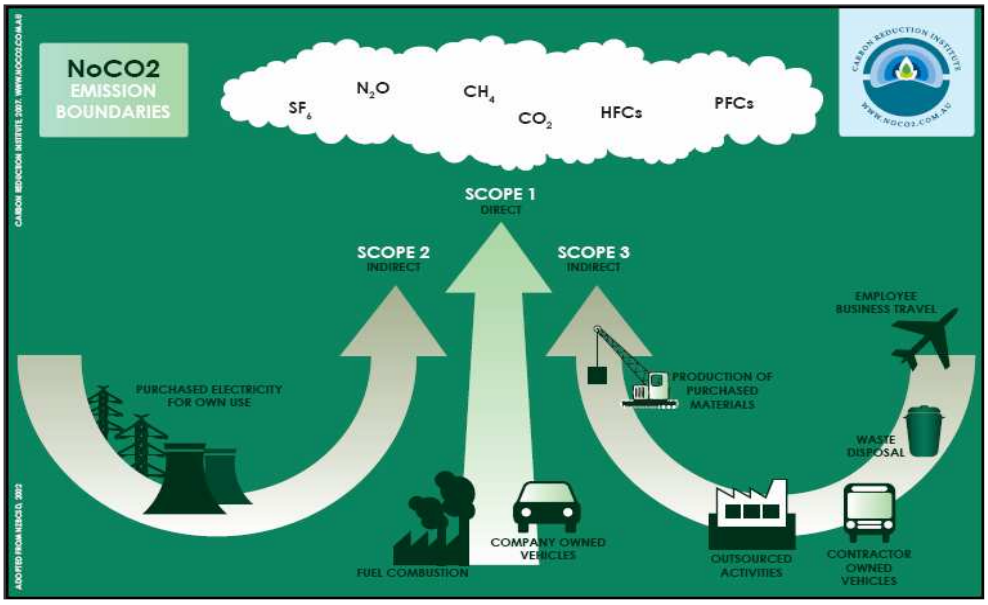

Figure 1: NoCO2 Emissions Chart

The GHG protocol describes Scopes 1 and 2 as mandatory reporting categories, and Scope 3 as a voluntary reporting category. Scopes 1 and 2 are defined within the protocol to ensure that 2 or more companies will not account for the same emissions under the same scope.[7]

NoCO2 Certification Program

The NoCO2 Certification program is a logo certification system that rewards organisations that take action against climate change.

NoCO2 Certification is awarded to organisations that force their carbon footprint to zero (otherwise known as carbon neutral) through internal emission reductions and through the purchase of carbon credits. 'Carbon Neutrality", as termed by the Carbon Reduction Institute and defined through its NoCO2 certification program, makes it mandatory for the organisation or entity being measured to include the embodied emissions within all products and services that they sell, as well the embodied emissions from all products and services used to deliver their service.

"Embodied emissions" refer to the emissions generated from the extraction of raw materials, to the manufacture and finally to the distribution of a product. All products require energy for production and distribution which is most commonly provided through the combustion of fossil fuels, which results in a greenhouse emissions impact. Embodied emissions from the products and services that Your company has bought and used have been measured in order to calculate their impact toward climate change.

[7] WBCSD, WRI, (2004), *The Greenhouse Gas Protocol*, World Resources Institute and World Business Council for Sustainable Development, Conches-Geneva, Switzerland. Available online: http://www.ghgprotocol.org, p 25

Through the use of operational control rationale, and through including all emissions sources as shown on the above charts, communications and claims of carbon reduction that are made in association with the Carbon Reduction Institute are beyond criticism.

This audit is for Your company's NoCO2 certification and includes the emissions boundaries shown in Figure 2 above.

Calculation Methodology

In calculating the emissions impact for sites based within Australia, the Carbon Reduction Institute utilises a combination of published life cycle emissions factors (for categories such as electricity usage, gas usage, transport and waste) and input output tables produced from a CSIRO triple bottom line analysis of the Australian economy.[8]

The emission amounts detailed in the calculations below are expressed in units of CO2 equivalents (CO2e). This unit scales the impact of the emission of all greenhouse gases, including CO2 (carbon dioxide), CH4 (Methane), N2O (Nitrous Oxide), Sulphur Hexafluoride (SF6) as well as fluorocarbons PFCs and HCFCs and expresses their varying global warming impacts in terms of a weighted CO2 equivalent (CO_2e).

Scope 1

Fuel Usage

The emissions due to onsite and company vehicle fuel combustion are a Scope 1 emissions sources. Greenhouse gas emissions were calculated from information the organisation provided on the amount of fuel used. The emissions quantities were determined with reference to factors outlined in the Department of Climate Change's *National Greenhouse Account Factors.***Error! Bookmark not defined.**

Scope 2

Scope 2 emissions are those indirectly emitted by the organisation through its electricity usage. Electricity generation is the world's largest source of greenhouse gas emissions, which is due to the global economy's heavy reliance upon cheap electricity from coal and gas reserves. Frameworks and data sets exist both within Australia and internationally that enable simple calculations of emissions from electricity, which follow the formulae below:

Equation 1: Emissions from Electricity Usage

$$Scope\ 2\ Electricity\ Emissions = N.O\ of\ Units\ (kWh)\ Consumed \times Emissions\ Factor\left(\frac{kgCO_2e}{kWh}\right)$$

The Department of Climate Change's *National Greenhouse Accounts Factors* detail the emission factors for electricity used in each state. For example, electricity produced in QLD has a scope 2 emissions factor of 0.91 kgCO2/kWh and a scope 3 emissions factor of 0.13 kg-CO2/kWh. The appropriate emissions factors were then used in the total emissions calculation summarised in the reassessment report.

[8] Foran, B., Lenzen, M., Dey, C., 'Balancing Act: A Triple Bottom Line of the Australian Economy', Australian Government Department of Environment and Heritage, 2005

Scope 3

Scope 3 emissions are defined as indirect emissions that occur from sources offsite. Scope 3 emissions sources are assessed through the application of life-cycle emissions coefficients in the case of travel and waste. The emissions impact and the calculations behind all scope 3 sources are depicted below (with the exception of the scope 3 impacts from electricity consumption which were shown above).

Waste

The organisation provided information to CRI detailing the quantity of waste to landfill annually as a result of business operation. Different waste types have different associated emissions depending on the specific composition. The Department of Climate Change's National Greenhouse Accounts state that sending one tonne of cardboard waste to landfill, for example, results in the emission of 2.5 tonnes of CO_2-equivalent greenhouse gas and that on average 100 cubic meters of cardboard weights 9 tonnes.[9] Hence it can be seen below that the amount of CO_2 equivalent generated from sending 15 m^3, for example, of cardboard waste to landfill annually would equal 3.38 tonnes CO_2e.

Kilograms of CO_2 annually = cubic meters of waste x 0.09 x 1.215 x 2.5

Air Travel

The emissions from flights taken by The organisation were calculated with reference to the World Business Council for Sustainable Development's data for the emission factors per passenger kilometre, and are scaled for short haul, medium haul and long haul as shown below.

Kilograms of CO_2e per passenger.km[10]

Description	Distance Travelled	Unit	CO2 emissions factor kg/ unit
Short Flight	0-600	km	0.15
Medium Flight	600-1500	km	0.12
Long Flight	>1500	km	0.11

This figure is then multiplied by 2.7 to take into account the average extra global warming impact from flying that occurs when greenhouse gases are released directly into the upper atmosphere. This increases their apparent lifetime in the stratosphere, and hence their ability to accelerate global warming. This factor (2.7) is known as the radiative forcing index.[11] The figures used to determine these emissions can be checked (or alternatively the emissions of other routes not examined can be evaluated) at our website (https://secure.noco2.com.au/).

[9] Department of Climate Change (2008) *National Greenhouse Accounts Factors,* Australian Government, available online at http://www.greenhouse.gov.au/workbook/index.html

[10] World Business Council for Sustainable Development and World Resources Institute (2004), ***CO2 from Business Travel – Distance Travelled Approach***, available online at: http://www.ghgprotocol.org/DocRoot/eREkf8QAsTj3KntJSX0l/Business_Travel_ServiceSector_v2.0_Final.xls

[11] Intergovernmental Panel on Climate Change (IPCC), (2001), *Climate Change 2001: The Scientific Basis, "Aviation and the Global Atmosphere – Chapter 8.3.3*, available online: http://www.grida.no/climate/ipcc/aviation/126.htm

Fuel Usage

The fuel consumed by the organisation led to scope 1 emissions detailed earlier in this report as well as scope 3 emissions described here.

The organisation's fuel usage from business ground travel or stationary energy is accounted for in litres of fuel or distance travelled by a particular vehicle whose fuel consumption per distance characteristics are known. The extraction, refinement, and transport of this fuel creates emissions accounted for under scope 3. Emissions factor corresponding to these scope 3 emissions were used in the same manner as in scope 1 described above.

In addition, employee ground travel, when it is a personal expense is considered a scope 3 impact. The calculations are performed in the same way as in scope 1 & 3 for company fuel usage but are reported cumulatively under scope 3, as required by the Sustainable Development's (WBCSD) Greenhouse Gas (GHG) Accounting Protocol.[12]

Assets

When accounting for embodied emissions of assets, CRI scales the impact from an object over the same timeframe in which it is depreciated and reported for tax purposes. For example, if an object has a total embodied emissions impact of 4 tonnes, and is depreciated at a rate of 50%, then each year, the object's emissions impact on the overall GHG inventory will register as 2 tonnes CO_2e for each of the 2 years after it was purchased. This will ensure that the organisation can update its' emissions inventory at the same time that it lists new purchases on its books for tax. Purchases that have been written off are not included in this assessment.

Where an industry backed Life Cycle Assessment (LCA) report is unavailable for a particular asset type, or conducting an in house LCA is unfeasible, CRI refers to an Australian government report of a triple bottom line analysis of the Australian economy. This report provides the Greenhouse Gas Intensity per dollar spend over 135 different industry sectors within the Australian economy.

CRI uses the organisation's Assets Register to calculate the embodied emissions from the organisation's assets. The embodied emissions calculations for the depreciated assets by the organisation this year are shown in Table 15 below. The references refer to volume and page numbers in the *Balancing Act: A triple bottom line of the Australian economy, Foran B, Lenzen M and Dey C, Australian Government Department of Environment and Heritage, 2005.* The input output tables from this report presents greenhouse intensities per dollar spend from 135 different sectors of the economy. The input output data presented in this table is configured from 1995 census data, and is presented in $kgCO_2$-e per dollar spent in that sector. In 1995, the emissions intensity per dollar of GDP was 1 kg CO_2-e per dollar.[13] In 2005, the emissions intensity per dollar of GDP was 0.7 kilograms of CO_2-e per dollar. This reduction is due to inflation and the reduction in the intensity of greenhouse gas emissions across many sectors of the economy. To improve the accuracy of its calculations, CRI has adjusted the "per dollar" emission factors by a multiplier of 0.7. The

[12] WBCSD, WRI, (2004), The Greenhouse Gas Protocol, World Resources Institute and World Business Council for Sustainable Development, Conches-Geneva, Switzerland. Available online: http://www.ghgprotocol.org

[13] Foran, B., Lenzen, M., Dey, C., 'Balancing Act: A Triple Bottom Line of the Australian Economy', Australian Government Department of Environment and Heritage, 2005, Vol 1, p11

attached reassessment report details how the emissions spread across different sections of the organisation' assets.

Expenses

Calculations of total emissions from expenses were similarly calculated using emission coefficients per dollar spend from the input/output tables found in the *Balancing Act Report*. As in the case in the calculation of emissions from assets, a multiplier of 0.7 was applied to increase the accuracy of calculations. Line items that represented a product or service that has had its emissions impact calculated in previous sections of this report were removed from this analysis to avoid double counting. Adjusted emissions from expenses totalled tCO_2e and are detailed in full in the table below.

Summary

Through the calculation methodology outlined by scope and source above, GHG emissions of the organisation have be quantified and presented numerically and graphically in the attached NoCO2 reassessment report. The methodology used in our calculations represents our current approach which adheres to the Sustainable Development's (WBCSD) Greenhouse Gas (GHG) Accounting Protocol.[14] As the methodology used to quantify GHG emissions is evolving to become more refined and accurate, so too is the auditing performed by CRI in creating the organisation's reassessment report. For an expanded explanation of methodology and the NoCO2's boundaries of analysis, see the attached reassessment methodology document.

[14]WBCSD, WRI, (2004), *The Greenhouse Gas Protocol*, World Resources Institute and World Business Council for Sustainable Development, Conches-Geneva, Switzerland. Available online: http://www.ghgprotocol.org