

LOCAL GOVERNMENT GREENHOUSE GAS INVENTORY WORKSHEET

Introduction

This guide has been created by BalanceCarbon® to assist Councils in calculating the energy and greenhouse gas (GHG) emissions associated with their operations for the purpose of internal reporting or public disclosure. It is intended as an accompanying 'quick guide' to the document entitled 'LGASA Emissions Measurement and Management Workbook', which is located on the LGA website at www.lga.sa.gov.au.

Throughout this worksheet there is reference to specific page numbers in the National Carbon Offset Standard 2009 (NCOS) at <http://www.climatechange.gov.au/government/initiatives/national-carbon-offset-standard.aspx>. Please refer to these pages for more detailed information. All factors have been sourced from the National Greenhouse Accounts (NGA) Factors, July 2011 unless otherwise sourced.

All **terms and definitions** throughout this worksheet can be referred to page iii – v in the **National Carbon Offset Standard (NCOS)**

Boundary Setting

Setting the boundary of your emissions inventory involves determining the inclusions and exclusions of the footprint. There are two key steps:

Step 1: Determining the organisational boundary; and

Step 2: Determining the operational boundary

Organisational boundary

An organisational boundary defines the entities/facilities that will be included in your energy and emissions inventory. The NGER Act requires reporting organisations to consolidate energy and greenhouse gas emissions utilising the **Operational Control** approach. While NCOS also specifies additional consolidation approaches, it is recommended that councils adopt the operational control approach thereby satisfying the requirements of the NGER Act and NCOS simultaneously.

Operational control: The greatest authority to introduce and implement any or all of the following for the Facility: (i) operating policies; (ii) health and safety policies; (iii) environmental policies. Only one corporation can have operational control over a Facility at any time. Some key questions to consider in determining the organisational boundary for your inventory include:

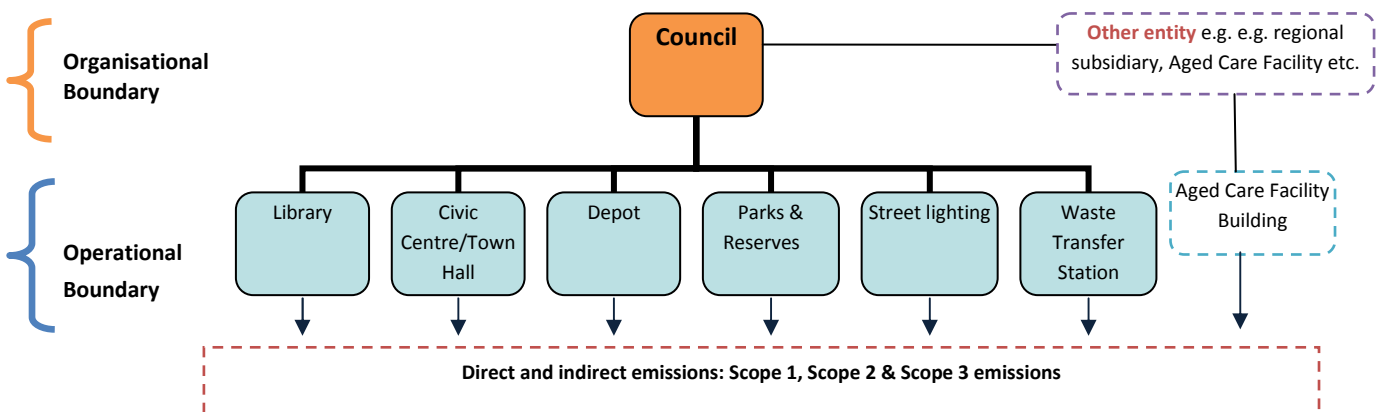
- Does your organisation have an ownership stake in any subsidiary companies?
- Is your organisation part of a joint venture?
- How many facilities does your organisation control?
- Does your organisation lease or sublease space to another organisation?

Operational boundary

The operational boundary incorporates all of the emissions generating activities associated with your council. (Defining the boundary of an organisation can be found in section 4.2.1 of the National Carbon Offset Standard)

Consider creating a diagrammatical representation of your inventory boundaries (See Figure 1 below).

Figure 1: Example Organisational and operational boundaries of a council



Step 3: Determine what emissions generating activities occur within your council

Scope 1: Direct GHG emissions

(See section 4.2.2 Emissions sources associated with the organisational boundary in NCOS)

The release of greenhouse gas into the atmosphere as a direct result of activities at a Facility (occur from sources that are owned or controlled by the Council)

Common examples include:

- Liquid Fuels (ULP, Diesel, LPG)
- Natural Gas
- Fugitive gas release from air-conditioning & refrigeration systems
- Emissions released from the onsite storage and/or treatment of wastewater

Scope 2: Electricity indirect GHG emissions

The release of greenhouse gas as a result of electricity generation, heating, cooling or steam that is consumed by a facility.

Scope 3: Other indirect GHG emissions

The release of greenhouse gas into the atmosphere that is generated in the wider economy as a consequence of a facility's activities but that are physically produced by another Facility.

The National Carbon Offset Standard (NCOS) requires at a minimum that an organisation include scope 3 emissions from the following sources in its inventory:

- Business travel of its employees
- disposal of waste generated by the organisation
- use of paper in the course of its business

Note – Street lighting

In South Australia, Councils are responsible for various types of street lighting (e.g. parks/reserves, major roads etc). However, Councils do not have **Operational Control** over these streetlights. The determination of Operational Control over street lighting assets is a complex issue and will depend on the lighting tariff and contractual arrangements with the supplier. This means that while some of the energy consumption that occurs through the powering of street lighting will fall into scope 2. Some will be classified as scope 3. Questions surrounding this issue should be directed to the Local Government Association for assistance.

Whilst, NCOS does require mandatory Scope 3 reporting for business travel, waste generation and paper consumption, Councils should consider other Scope 3 emissions sources based on their materiality. The concept of materiality outlines the significance of emission generating activities to your organisation

- Key criteria in determining materiality include:
 - Carbon risk
 - Ability to influence
 - Perception of stakeholders (i.e. community)
 - Significant compared to the remainder of the emissions profile
 - An activity that would normally be carried out within council's operations (i.e. not usually subcontracted)

Step 4: Collection of Data

Ensure that the emissions data (under Scope 1, 2 & 3) collected has (a) relevance (b) completeness (c) consistency (d) transparency and (e) accuracy (see 4.1 Carbon footprint calculation principles for definitions under NCOS)

Step 5: Calculate Emissions

For each emissions source identified in step two, you will need to locate the appropriate data and (**emissions factor**) in order to estimate the tonnes of CO₂ equivalent (tCO₂-e) produced during the reporting period. The following section provides you with examples of the common data for the emissions sources detailed above and formulae for estimating emissions. (Please refer to

section 4.1 & 4.2 of the NCOS – Carbon footprint calculation, and section 4.2.3 for Emissions factors and calculation methodology under the NCOS)

Liquid fuels

- **Formula:** Kilolitres (KL) consumed x emissions factor = tCO₂-e

Liquid fuels are used in corporate vehicles, equipment and machinery. Data on fuel consumption can generally be sourced from transaction receipts or directly from your council’s fuel provider. The most commonly used fuels and their associated emissions factors include:

Table 1: Liquid fuel (transport) emissions factors

Fuel type	Emissions factor (tCO ₂ -e/kL)
Unleaded petroleum (ULP)	2.4
Diesel	2.7
Liquefied Petroleum Gas (LPG)	1.6

Note: There is also a scope 3 emission associated with the consumption of fuels which takes into account up-stream ‘full fuel cycle’ emissions. The factor for calculating these emissions is detailed in table 38 of the NGA Factors, July 2011

Tip – Estimating fuel consumption from expenditure records

Fuel consumption in litres or kilolitres can be estimated from expenditure records by utilising the \$/L price paid at the time of the transaction.

For example: Litres consumed= Total cost (\$) / Fuel cost (\$/L)

Utilise an average fuel price (\$/L) for the inventory period you are examining. This can be obtained through a sample set of your total transactions or a published resource. The Australian Institute of Petroleum (AIP) maintains information on the annual average retail petrol/diesel price for each state and territory in Australia. This information is freely available on their website (www.aip.com.au/pricing/retail).

Natural Gas

- **Formula:** Mega joules (MJ) consumed x emissions factor = tCO₂-e

The most common source of natural gas consumption data is provider invoices that are issued at monthly or quarterly intervals. Consumption data (MJ) for the account period is usually detailed on the reverse side of the invoice.

The emissions factor for Natural Gas is **0.00005 tCO₂-e/MJ**. As with liquid fuels above, there is also a scope 3 emission associated with the consumption of Natural Gas. It is referred to as ‘Line Loss’ and can be found in Table 37 of the NGA Factors, July 2011.

Fugitive emissions of synthetic gas (air-conditioning & refrigeration systems)

- **Formula:** Charge size (kg) x GWP x Leakage rate (9%/Year) / 1000 = tCO₂-e

In order to calculate the CO₂ equivalent emissions associated with fugitive emissions of synthetic gas, the following information is required:

- The type of gas present in a given air-conditioning or refrigeration unit
- The global warming potential (GWP) of that gas
- The total quantity of gas that has escaped (calculated by applying a standard leakage rate to the kg charge size)

This information is printed on the unit itself or available from the manufacturer. The operations or maintenance manager/contractor may also be able to provide it.

Table 2: Commonly found gas types and their global warming potentials:

Gas	GWP
R22	1810
R123	77
R134A	1430
R404A	3921.6
R407C	1773.9
R410A	2087.5

Table 3: Average gas charge sizes for residential and light commercial air-conditioning systems

Equipment type	Average charge size (kg)
Wall hung split systems	1.7
Split systems	4.7
Window/wall units	0.84
Portable	0.56

Electricity

- **Formula:** kilowatt hours (kWh) x Emissions factor (South Australia = 0.00072 tCO₂-e/kWh) = tCO₂-e

The activity data you need to calculate the emissions generated by your organisation's electricity consumption is kilowatt hours (kWh). All the information you need can be obtained from your provider invoices. You will need to identify consumption of Greenpower™ and renewable electricity separately from regular grid electricity. In addition to the scope 2 emissions generated through the consumption of electricity, there is also a scope 3 emissions component from line loss. The factor is 0.00013 tCO₂-e/kWh as detailed in Table 39 of the NGA Factors, July 2011.

Tip – Estimating electricity consumption for a shared building

If your organisation does not occupy the entire building or if it occupies leased office space, you will need to estimate your electricity use based on information from your property manager:

- Total area of the building
- Total area occupied by your organisation
- Total building electricity consumption in kWh for the inventory period

Using this information and the following formula, you can estimate the approximate kWh of electricity consumption attributable to your organisation:

$$(\text{Area of organisation's space} \div \text{total building area}) \times \text{Total building electricity consumption (kWh)} = \text{kWh used by your organisation}$$

Note – GreenPower™ and Renewable Energy Certificates (RECs) reporting requirements

Under the NGER Act, reporters may opt to additionally identify their individual GreenPower™ purchases and voluntarily surrendered renewable energy certificates (RECs). The provision of this information is voluntary, as it is not required under the Act. Under the National Carbon Offset Standard (NCOS), the purchase of GreenPower™ and the voluntary cancellation of RECs is considered to be equivalent to the direct use of renewable energy. On that basis, GreenPower™ and voluntary cancellation of eligible RECs are treated as a zero-emissions electricity source in an organisation's GHG Inventory.

Waste generation

- **Formula:** Quantity (Tonnes) x Emissions Factor = tCO₂-e

Emissions from waste to landfill are most easily estimated utilising factors for broad waste streams. Before this can be done, you will need to estimate the total quantity of waste output from your council during the reporting period. The following table contains the unit conversion and emissions factors for each of the broad waste streams.

Table 4: Waste volume to weight and emissions factors for broad waste streams

Material type (Stream)	m ³ per Litre	Tonnes per m ³	tCO ₂ -e per Tonne
Municipal solid waste (residential waste)	0.001	1.1	1
Commercial and industrial waste	0.001	1.1	1.1
Construction and demolition waste	0.001	1.1	0.3

Note: Use the Commercial and industrial waste factor for office and operational waste from council. Recycled waste is considered a zero emission.

Tip – Estimating volume of waste produced

If your organisation has not been monitoring the weight or volume of waste output from its operations over the selected inventory period, it will be necessary to estimate this data.

This can be achieved utilising the following information:

- Number of waste receptacles (bins) at the facility
- The capacity of each receptacle (litres or m3)
- The number of times each receptacle was collected during the reporting period

Assuming each receptacle is 100% full at the time of collection, the equation is as follows:

$$\text{Waste volume} = \text{Sum of capacities} \times \text{Number of collections}$$

Flights

- **Formula :** Distance travelled (km) x emissions factor = tCO₂-e

The most common and emissions intensive source of business travel is flights. You will need to source information on the numbers and distance of flights taken by staff during the reporting period broken down by destination.

Table 5: Types of flights and emissions factors

Flight type	Emission factor (tCO ₂ -e per km per person)
Short haul (less than 500km)	0.00015
Medium haul (500 to 1600km)	0.00012
Long haul more than 1600km)	0.00011

Source: EPA Victoria – Worksheet 3: Calculating your greenhouse gas emissions from flights

Paper consumption

- **Formula:** Reams of paper purchased / Weight of an average ream of paper (2.4-2.8 kg/ream) x Emission factor = tCO₂-e

The emissions associated with paper here are 'up-stream' supply chain emissions. Emissions from paper are calculated based on published factors that specify the emissions per ream of paper.

Table 6: Key emissions factors

Paper type	Emissions factor (tCO ₂ -e/kg of paper consumed)
100% recycled content	0.001907
Virgin fibre content	0.001867

Source: EPA Victoria – Worksheet 4: Calculating your greenhouse gas emissions from paper

Additional Notes

While this worksheet is intended to assist councils in meeting corporate emissions disclosure requirements, you should consider your organisation's goals more broadly in relation to emissions measurement and reporting. The National Carbon Offset Standard specifies the minimum requirements for best practice carbon accounting and reporting in Australia. Particularly with regard to scope 3 emissions sources, some of which have been covered here. You should consult NCOS if your council wishes to report publically on its emissions profile or make a carbon claim (i.e. carbon neutral).