Greenhouse Gas Emissions

Greenhouse gases (GHG) are naturally occurring gases in the earth's atmosphere that absorb and radiate infrared radiation (heat) reflected from the earth's surface. The most abundant of these gases are carbon dioxide (CO_2) and water (H_2O). Other naturally occurring greenhouse gases such as methane (CH_4) and nitrous oxide (N_2O) are present in much smaller amounts in the atmosphere.

The less abundant greenhouse gases (e.g. CH_4 and N_2O) are much more efficient in trapping infrared radiation than CO_2. The measure of how "efficient" a greenhouse gas is in trapping infrared radiation is called the Global Warming Potential, defined as the ratio of infrared radiation trapped by one kilogram of non-CO_2 greenhouse gas compared to one kilogram of CO_2, over a defined time frame. For example, over a 100 year time-frame, methane traps approximately 21 times as much infrared radiation from the earth as CO_2 and nitrous oxide traps approximately 310 times as much infrared radiation as CO_2 (Commonwealth Department of Climate Change and Energy Efficiency (DCCEE), 2010a). When compiling greenhouse gas inventories, this difference in Global Warming Potential is accounted for by converting one tonne of non-CO_2 greenhouse gas into a CO_2 equivalent (CO2-e) amount using the Global Warming Potential for that particular non-CO_2 gas.

The NTG aims to minimise greenhouse gas emissions from new and expanding operations is minimised to a level that is as low as practical (NRETAS, 2009), by assessing the impact of greenhouse gas emissions from proposed projects. Accordingly, a greenhouse gasses assessment was completed for the project (refer **Appendix J**), as summarised below.

12.1 Existing Environment

Existing accounts of greenhouse gases provided by the (DCCEE, 2010b) show an approximate contribution of approximately 575 Mt CO2-e by Australia for the 2007-08 financial year. A breakdown of the individual state and territory contributions is shown in Table 12-1 below. As expected NSW, Queensland and Victoria contribute the highest percentage to the national accounts whilst the NT contributes 16.3 Mt CO2-e or approximately 2.8% of the national inventory.

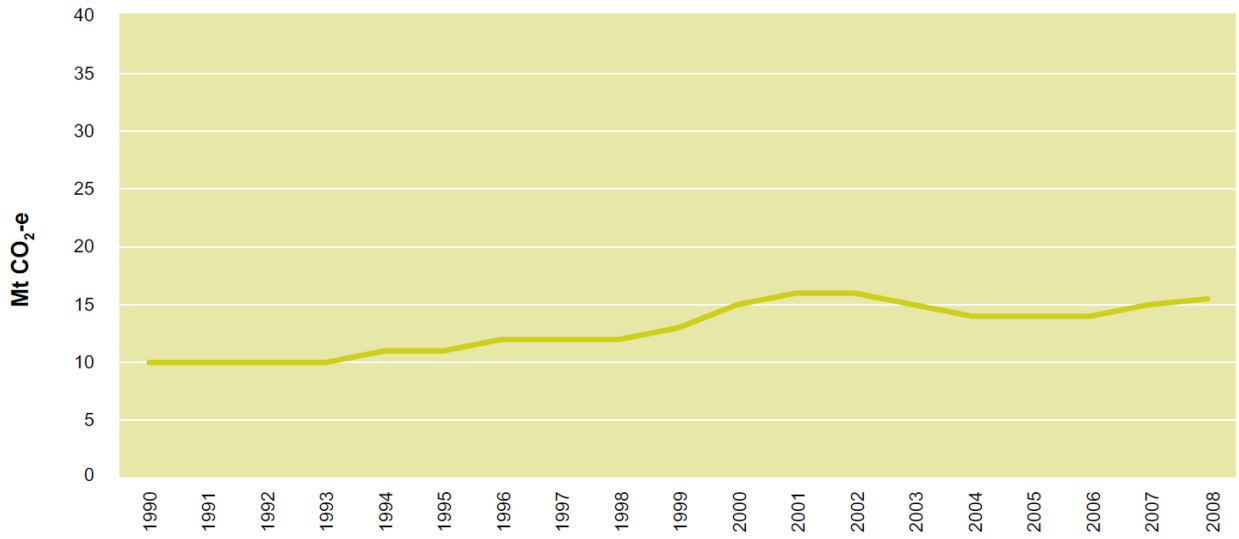
Table 12-1 Australian Greenhouse Gas Emissions for 2008

State or Territory	Total Emissions (Mt $CO_{2\text{-}e}$) and % of Total
New South Wales	164.7 (28.6 %)
Queensland	160.3 (27.9 %)
Victoria	119.1 (20.7 %)
Western Australia	72.8 (12.7 %)
South Australia	31.7 (5.5 %)
Northern Territory	16.3 (2.8 %)
Tasmania	9.1 (1.6 %)
Australian Capital Territory	1.2 (0.2 %)
External Territories	0.03 (< 0.1 %)
Total	**575.2**

Source: Department of Climate Change and Energy Efficiency, 2010a

Greenhouse gas accounts for the Northern Territory from 1990 have shown an increase from approximately 10 Mt $CO_{2\text{-}e}$ to the 16.3 Mt $CO_{2\text{-}e}$ accounted for in 2008 as depicted within Figure 12-1.

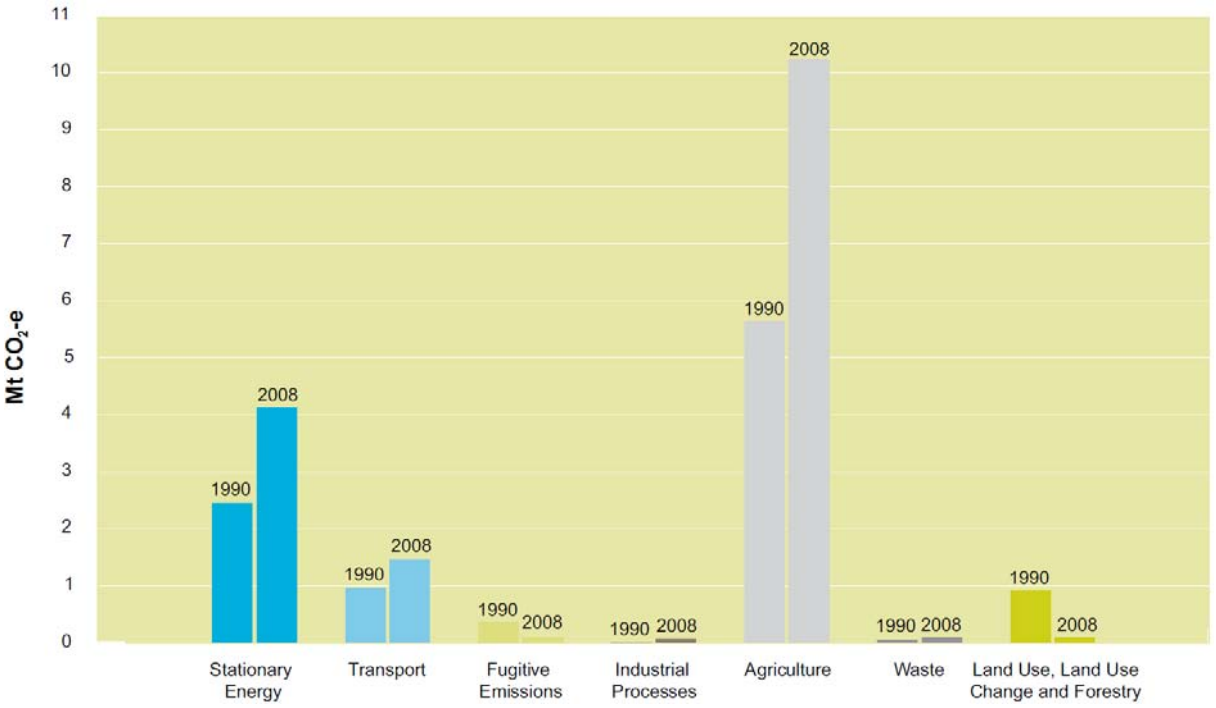
12 Greenhouse Gas Emissions



Source: DCCEE, 2010b

Figure 12-1 Greenhouse Gas Emissions by Sector for the NT

Accounting of greenhouse gas emissions by activity sector for the NT shows that agriculture and stationary energy are the prime contributors to GHG emissions for 1990 and 2008. This is shown in Figure 12-2.



Source: DCCEE, 2010b

Figure 12-2 Greenhouse Gas Emissions by Sector for the NT

Existing sources of greenhouse gases within the EAW and surrounding areas comprise the following:

- Fuel combustion for energy supply, industrial processes, and transportation (including importing and exporting by marine vessels) and other combustion sources
- Waste
- Fugitive emissions from industrial processes or similar
- Loss of vegetation through land use change.

12.2 Potential Impacts

In determining the potential impacts of greenhouse gas emissions for the project, specific boundaries have been defined as follows:

- **Construction**: The boundary of the construction phase of the assessment has been defined as those areas that are to be constructed as summarised within the EIS. Construction projects to be conducted within sub-divided land not assessed under the EIS will require assessment under a separate approval. The four additional areas to be provided are not expected to be constructed at the same time hence GHG emissions will be drawn out over the entire construction period.
- **Operational**: The boundary of the operation phase of the assessment has been defined as those key areas where operational works involved in maintenance and general wharf upkeep are required (i.e. areas directly attributable to the DPC).

The greenhouse gas emissions have been estimated based upon the methodologies outlined in the following documents:

- The World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD) Greenhouse Gas Protocol (WRI/WBCSD, 2005)
- National Greenhouse and Energy Reporting (Measurement) Determination 2010
- The Australian Government National Greenhouse Accounts (NGA) Factors 2010 (DCCEE, 2010a).

Emissions have been defined as Scope 1, Scope 2 or Scope 3 as described below:

- **Scope 1 Direct GHG Emissions:** Direct greenhouse gas emissions are defined as those emissions that occur from sources that are owned or controlled by the entity. Direct greenhouse gas emissions principally result from the following types of activities.
  - Generation of electricity, heat or steam i.e. combustion of fuels in stationary sources.
  - Physical or chemical processing i.e. manufacture of cement, aluminium, etc.
  - Transportation of materials, products, waste and employees i.e. combustion of fuels in mobile combustion sources, e.g. motor vehicles, trains, ships, aeroplanes.
  - Fugitive emissions i.e. intentional or unintentional releases from equipment.
- **Scope 2 Energy Product Use Indirect GHG Emissions:** Scope 2 emissions are indirect emissions from the use of energy products (e.g. electricity, steam/heat) purchased or otherwise brought into the Project boundary. Scope 2 emissions physically occur at the facility where electricity is generated.
- **Scope 3 Other Indirect GHG Emissions:** Emissions are defined as those emissions that are a consequence of the Project activities but do not occur from sources owned or controlled by the project initiator.

12 Greenhouse Gas Emissions

Some examples of Scope 3 activities provided in the Greenhouse Gas Protocol are:

- Extraction, processing and transport of materials or fuels
- Use of sold products and services.

Scope 3 emissions associated with the construction phase of the Project are reportable as Scope 1 emissions from facilities that manufacture or transport the products.

It is usual that for compliance purposes the focus is on direct (Scope 1) emissions from the Project and / or indirect (Scope 2 emissions from energy consumption) rather than Scope 3 emissions. This assessment has therefore predominantly focused on Scope 1 and 2 emissions.

The GHG inventory comprises of Scope 1, Scope 2 and Scope 3 emissions for the construction and operational phase of the project. Table 12-2 presents a summary of identified emissions sources.

Table 12-2 Summary of Greenhouse Gas Emissions - Construction and Operation

Scope	Construction	Operation
Scope 1	Combustion of diesel fuel for construction vehicles Combustion of diesel fuel for trucks delivering construction materials Land clearing (associated with the rail loop)	Combustion of fuel for site vehicles. Combustion of fuel for additional dredging through the life of the wharf
Scope 2	Electricity use[1]	Electricity use
Scope 3	Fuel and electricity use Embodied emissions from concrete use (upstream emissions) Embodied emissions from steel use (upstream emissions) Emissions from generated waste	Fuel and electricity use Upstream emissions from any material utilised by the Port Authority Emissions from generated waste

Notes: [1] Electricity use during construction is expected to be immaterial

12.2.1 Construction Phase

GHG emissions associated with the construction phase of the project are predominantly associated with combustion of diesel fuel in construction equipment with some emissions from land clearing (loss of vegetation) for the rail loop. Scope 1 emissions are of prime concern with this project and are the focus of the construction inventory.

GHG emissions from land clearing associated with the railway loop have been estimated using the FullCAM carbon accounting model. Table 12-3 provides summary of emissions from land clearing.

Table 12-3 Greenhouse Gas Emissions from Land Clearing

Area	Area (ha)	Emission Factor (tonnes $CO_{2\text{-}e}$/ha)	Land Clearing Emissions (tonnes $CO_{2\text{-}e}$)
Railway loop (Bleesers Creek)	62.5	206.34	12,896
Total Scope 1 Emissions – Land Clearing			**12,896**

Greenhouse gas emissions from the estimated fuel consumption have been established from appropriate emission factors and are summarised in Table 12-4. A total of 28,976 t CO_{2-e} has been calculated to be emitted from the combustion of fuel during construction.

Table 12-4 Greenhouse Gas Emissions from Fuel Combustion during Construction

Emission Factor (kg CO_{2-e} / kL)			Emissions (t CO_{2-e})		
CO_2	CH_4	N_2O	CO_2	CH_4	N_20
2671.12	7.72	19.3	28686	83	207

Notes: Emission factors for diesel oil adopted.

The total greenhouse gas emissions associated with the construction phase represents approximately 0.26 % of the NT Inventory for 2008 (DCCEE, 2010b), or approximately 41,872 t CO_{2-e}. Annual greenhouse gas emissions for the construction phase are estimated at 10,468 t CO_{2-e}, based on a four year construction timetable. This represents a small account of the Northern Territory's inventory and a negligible quantity of the national accounts.

12.2.2 Operational Phase

The operational phase of the project would involve greenhouse gas emissions from the sources outlined previously from the DPC infrastructure provision. Specific emissions associated with the industrial developments at the wharf are expected to incorporate the following:

- Electricity use and or supply (i.e. equipment, lighting etc);
- Maintenance and equipment supply;
- Waste generation; and
- Fuel use (i.e. site vehicles or equipment, vessels associated with each industry).

Actual greenhouse gas quantities for the operational phase is difficult to account at this stage given operational uncertainties, but could be incorporated into the accounting and reporting mechanisms described within the EAW EMP.

12.3 Management of Impacts

12.3.1 Objectives and Standards

The objective of managing greenhouse gas emissions during construction would focus on minimising fuel used in construction equipment. Specifically, the objective would be to:

- Minimise greenhouse gas emissions through appropriate construction management practices.
- The objective of managing greenhouse gas emissions during operation would focus on ensuring efficient use of energy, as outlined within the EMP for EAW.

Legislative instruments that specifically relate to GHG management include:

- The Commonwealth Government's proposed Carbon Pollution Reduction Scheme.
- National Greenhouse and Energy Reporting Act 2007.

12.3.2 Management Requirements

Opportunities for minimising greenhouse gas emissions for the construction phase of the project are summarised below. The options incorporate the philosophy of Reduce, Reuse, and Recycle.

Reduce:

- Reduce fuel use through equipment fitted with efficient engines.
- Reduce fuel use by utilising material from local and not regional areas (i.e. reduce haul distances).
- Reduce fuel use by minimising idling time of construction equipment.
- Reduce fuel use by using appropriately sized equipment for construction activities.
- Reduce fuel use by minimising vehicle kilometres travelled during construction.
- Reduce fuel use by incorporating scheduled equipment maintenance procedures.
- Reduce fuel use through efficient planning. Construction activities could potentially be planned to reduce fuel use through transportation of equipment from one area to another. (i.e. conducting all dredging in one area prior to starting another).
- Reduce the amount of cleared land to the extent practicable. This has been achieved by reducing the vegetation clearing required for the railway loop to only the bund footprint.

Reuse:

- Reuse of dredge spoil wherever feasible.

Recycle:

- Recycling of waste generated where reasonable.

The CEMP will consider areas where greenhouse gas emissions could be reduced. Furthermore an EMP will consider operational GHG reductions, including energy efficiency initiatives. Carbon sequestration through vegetation planting will be limited, however vegetation planting could be investigated. During the operational phase the DPC will strive to meet targeted reductions for office energy consumption and investigate additional energy savings elsewhere in its operations. Furthermore the following measures would be undertaken in relation to activities at the EAW.

- DPC and port users will endeavour to reduce consumption of resources through good operational practices and making environmentally sound choices where procuring new equipment and infrastructure.
- Energy and water consumption will be monitored to determine usage and efficiency.

12.3.3 Monitoring and Reporting

The construction phase of the project would incorporate a CEMP detailing the need for GHG and energy efficiency reporting. The operational phase of the project would report in accordance with the National Greenhouse and Energy Reporting Act 2007.

12.4 Commitments

A CEMP would be developed incorporating greenhouse gas saving initiates using mechanisms described within the GHG assessment (i.e. regular vehicle engine inspections)

The CEMP would incorporate areas where greenhouse gas emissions can be reduced and detail requirements for GHG and energy efficiency reporting. .

An EMP will be prepared (or an update to existing EMP) that will consider requirements for GHG reductions, including energy efficiency initiatives and requirements for reporting.

References

Coffey Environments, 2010, *East Arm Wharf Environmental Management Plan*, prepared for DPC, December 2010.

DCCEE, 2010a, *Department of Climate Change and Energy Efficiency – National Greenhouse Accounts (NGA) Factors*.

DCCEE, 2010b, *Department of Climate Change and Energy Efficiency – Australian National Greenhouse Accounts, State and Territory Greenhouse Gas Inventories 2008*.