

Section 7**Gas Transmission Pipeline Environmental Values and Management of Impacts****7.9 Greenhouse Gas Emissions****7.9.1 Introduction**

Introductory information pertaining to the GLNG Project is presented in Section 6.9.1.

7.9.2 Methodology

Relevant information pertaining to methodology is presented in Section 6.9.2.

7.9.3 Regulatory Framework

Relevant information pertaining to the regulatory framework is presented in Section 6.9.3.

7.9.4 Existing Environmental Values

The majority of this section is identical to Section 6.9.4, with the exception of the sources and factors used for the gas transmission pipeline Greenhouse Gas (GHG) emissions.

7.9.4.1 Emissions Sources

The GHG Scope 1 emission sources resulting from the construction of the gas pipeline arise from land clearing and on-site equipment use. Scope 2 emissions have been included for worker accommodation during construction of the pipeline. Scope 3 emissions during the pipeline construction are due to transport of construction materials, either by truck (base case) or by a combination of rail and truck (rail option).

All greenhouse gas emissions during operation of the gas transmission pipeline are assumed to be immaterial, as the gas transmission pipeline will be fully welded and there will be no regular process emissions from the gas transmission pipeline. Carbon sequestration due to rehabilitation of cleared areas has not been included in the inventory.

Land Clearing

Trees and other vegetation metabolise carbon and store a portion of it as permanent, woody biomass as they grow. When this vegetation is cleared the stored carbon is typically lost to the atmosphere as CO₂ along with small amounts of CO and CH₄. Estimates of the area of cleared land have been combined with vegetation studies of the pipeline corridor and used as input for a carbon loss model. The model used was FullCAM, from the Department of Climate Change's National Carbon Accounting Toolbox.

Emissions from land clearing have incorporated worst-case assumptions about the amount of land to be cleared, and the types of vegetation present along the gas transmission pipeline alignment. For the gas transmission pipeline, it was assumed that Santos will clear all vegetation along a 435 km pipeline easement 30 m wide at all points with no regard to the type or amount of vegetation present. The evaluation of vegetation types has assumed that the entire route is characterised by the vegetation types that are present close to the main watercourses, which results in a conservative estimate of the greenhouse gas emissions compared to previously cleared agricultural land. Nevertheless route selection criteria and construction procedures seek to minimise the extent of vegetation clearing.

Once the gas transmission pipeline is operational, some revegetation of the gas transmission pipeline alignment will be undertaken, consistent with operational safety requirements. Likewise, decommissioning of the pipeline will entail rehabilitation of the pipeline alignment. These activities have not been taken into account.

Section 7

Gas Transmission Pipeline Environmental Values and Management of Impacts

Fuel Consumption in Vehicles

Diesel fuel is consumed for operation of construction equipment and vehicles that are operated by Santos, which has been included in the Scope 1 emissions for the gas transmission pipeline construction.

Vehicle emissions from equipment and material deliveries for the pipeline construction have been accounted as Scope 3, as these are operated by contractors. Likewise, the possible use of rail to transport materials to the central laydown areas along the gas transmission pipeline route has been included in the Scope 3 inventory for construction.

Accommodation

Worker accommodation during the gas transmission pipeline construction will be in workforce accommodation facilities. These facilities are estimated to consume 3 MWh of electricity per person per year, which has been included in the Scope 2 emissions for the project.

7.9.4.2 Emission Factors

Direct measurement of GHG at the emission source can give the most accurate and precise assessment of GHG emissions but this is not feasible for the gas transmission pipeline as it is still in the design phase. Emission factors have been used instead in accordance with GHG Protocol methodology. Emission factors are a factor expressed as the amount of GHG emissions per unit of activity, which can be used to determine inventories for a site and remove the need for site specific testing of emissions.

Emission factors for the carbon loss associated with land clearing activities specific to locations along the gas transmission pipeline were obtained using the FullCAM model in combination with data on vegetation types. A value of 36.7 t C/ha (135 t CO₂-e/ha) was calculated for the gas transmission pipeline by modelling several points along the pipeline with representative types and amounts of vegetation and averaging the results. Estimates of release rates for elemental carbon (C) were converted to CO₂-e by using the molecular weights of CO₂ and C (44 and 12, respectively).

Emission factors used to calculate GHG emissions for combustion of diesel, electricity consumption and freighting of equipment by rail have been sourced from the Department of Climate Change NGA Factors Workbook, 2008 and from the Queensland Rail Greenhouse Challenge Cooperative Agreement, 2000 as presented in Table 7.9.1.

Table 7.9.1 Emission factors used in the Formation of the Project GHG Inventory

Emission Source	Emission Factor	Units	Source
Scope 1 Emissions			
Combustion emission factor diesel	2.7	t CO ₂ -e/kL	NGA Factors. Table 4, (fuel combustion for transport)
Scope 2 Emissions			
Electricity Consumption - Queensland	0.91	kg CO ₂ -e/kWh	NGA Factors. Table 5 (consumption of purchased electricity)
Scope 3 Emissions			
Transport of freight by rail – Queensland Rail	0.26	g CO ₂ -e/net tonne km	Queensland Rail Greenhouse Challenge Cooperative Agreement, 2000

7.9.4.3 Summary of Scope 1 and Scope 2 Emissions

Relevant information pertaining to Scope 1 and 2 emissions is presented in Section 6.9.4.3.

Section 7

Gas Transmission Pipeline Environmental Values and Management of Impacts

7.9.5 Potential Impacts and Mitigation Measures

Relevant information pertaining to potential impacts and mitigation measures is presented in Section 6.9.5.

7.9.6 Summary of Findings

Relevant information pertaining to the summary of findings is presented in Section 6.9.6.