13. CLIMATIC IMPACT

13.1 Introduction

Emissions to atmosphere will arise as a result of the construction activities associated with the Corrib offshore development. During construction, vessels, vehicles and plant will generate exhaust fumes. These fumes will include carbon dioxide and methane. Emissions of gases such as carbon dioxide and methane are implicated in amplifying the natural greenhouse effect, resulting in potential climate change and global warming (IPCC, 1994).

Climate change is not well understood. Indeed there is still debate as to its occurrence. It is generally agreed, however, that global emissions of carbon dioxide and methane should be reduced to decrease the chance of the phenomenon becoming an environmental problem in the future.

Low-level ozone formation can also result in climatic effects. Unlike carbon dioxide and methane, however, substances with Photochemical Ozone Creation Potential (POCP) can also affect local air quality**.**

13.2 Study Methodology

This section of the EIS aims to identify and assess the sources and potential impacts of substances affecting climate change released from the offshore operations. The information used in the section is from **Section 10**, Air Emissions and published literature.

13.3 Receiving Environment

Carbon dioxide and methane (substances with Global Warming Potential (GWP)) are considered a hazard to the global environment, rather than the local air quality. Substances with Photochemical Ozone Creation Potential can have effects on a local, regional and global scale.

13.4 Characteristics of Proposed Development

13.4.1 Construction

13.4.1.1 Drilling

Drilling activities will take place from a drilling rig, which is serviced by supply vessels providing bulk supplies and helicopters used for crew changes and any emergency equipment and components (see **Section 10**).

13.4.1.2 Field Facilities

These will all be installed on the seabed; using a range of construction vessels (as described in **Sections 3 and 10**). The use of these vessels will result in air emissions.

13.4.1.3 Pipeline and Umbilical and Discharge Pipeline

The pipeline, umbilical and discharge pipeline will be laid using a dynamically positioned lay barge and smaller inshore vessels. The offshore operations will be supported by supply vessels, pipe supply vessels and helicopters. The use of these vessels will result in air emissions.

13.4.1.4 Landfall and Sruwaddacon Crossings

The majority of the onshore plant used to assist with the landfall and Sruwaddacon crossings will be brought in by road. Therefore, the vehicles bringing the plant to the site, the operation of the plant, and the daily transit of machinery and workers will result in the release of combustion products from the vehicle engines.

13.4.2 Operations

There will be no gases with global warming potential (GWP) or photochemical ozone creation potential (POCP), emitted during normal operations. During any maintenance works, combustion emissions from the burning of fuel by vessels will include low volumes of GWP and POCP gases.

13.4.3 Decommissioning

The volumes of GWP and POCP gases emitted during the decommissioning phase of the subsea development will be dependent upon the method of decommissioning selected. Burning of fuel by vessels involved in the work is likely to be the greatest contributing factor.

13.5 Potential Impact of the Proposed Development

Operations to drill the wells, install the subsea facilities, pipelines and umbilical will result in emissions that could contribute to climate change. Carbon dioxide and methane are the only substances to have potential climatic effects that are predicted to be released in any significant quantity. The estimated volumes are provided in **Table 13.1**.

During the operation of the offshore aspects of the development, there are unlikely to be significant emissions of carbon dioxide or methane. In Ireland as a whole, the use of Corrib gas as an alternative to burning other fossil fuels could result in an overall reduction in the volumes of greenhouse gases released.

Table 13.1: GWP emissions (CO_2 equivalents)

Source	Emission (tonnes)		GWP (tonne CO_2 equivalent)
	CO_2	CH_4	
Drilling	21,698	2	21,740
Completion	12,849	1	12,870
Testing	24844	296	31,060
Field installation	12,406	1	12,427
Offshore pipelay	18,119	2	18,161
Nearshore pipelay	1,955	0	1,955
Landfall and crossings	333	0	333
Total	92204	302	**98,546**
Note: CH_4 has 21x GWP of CO_2			

13.6 Do Nothing Scenario

In the absence of the Corrib development, there would be no contribution to potential climate change.

13.7 Mitigation Measures

Combustion emissions associated with transportation will be minimised through vessel selection and vehicle management plans.

Combustion emissions from power generation and construction equipment will be minimised, where possible, through maintenance to manufacturers specifications.

13.8 Predicted Impact of the Proposed Development

13.8.1 Global Warming Potential

It is not scientifically possible to predict the climatic impact of a particular project. It is possible, however, to quantify emissions of substances that have GWP. This allows comparison with other sources of GWP emissions.

GWP provides a means of quantifying the potential contribution to global warming arising from the different process units / activities. GWP is defined as:

"the cumulative radiative forcing between the present and a future time 'horizon' caused by a unit release relative to some reference gas, in this case CO_2." (IPCC 1996)

The only GWP pollutants that are anticipated to be emitted from offshore operations are carbon dioxide and methane. As indicated above, GWP is measured in terms of equivalent emissions of carbon dioxide, with the GWP factor of carbon dioxide being 1. Methane has a GWP factor 21 times higher than that of carbon dioxide i.e. an emission of 1 kg of methane is defined as

having 21 times the GWP of an emission of 1 kg of carbon dioxide. GWP emissions associated with the project are summarised in **Table 13.1.**

To place the total GWP (98,546) into perspective, **Table 13.2** compares this predicted GWP with that of other industrial sources.

Table 13.2: Comparison of GWP with other industrial sources

Source	Emission (tonnes)		GWP (tonne CO_2 equivalent)	Time span of emissions data
	CO_2	CH_4		
Drilling, completion, installation and operations				
Corrib offshore activities[1]	92,204[2]	302	98,546	Predicted total over 5-6 years
Operations				
Corrib Terminal	47,158	70.6	48,641	1 year
Large gas terminal, UK	258,037	912	277,189	1 year (1999)
240 MW oil-fired power station, IRL	190,000	No data	>190,000	1 year (1996)
915 MW coal-fired power station, IRL	5,990,000	No data	>5,990,000	1 year (1996)
350 MW CCGT power station, UK	1,257,000	Below reporting threshold	>1,257,000	1 year (1999)

[1]The majority of emissions arise from the drilling and installation, not operation
[2] Equates to 16,424 – 19,709 T/yr over 5 - 6 years

13.8.2 Photochemical Ozone Creation Potential (POCP)

Although ozone in the stratosphere has a beneficial role, ozone in the lower layers of the atmosphere is considered to act as a 'greenhouse' gas. At sufficient concentrations, low-level ozone is also an irritant gas in the local environment and to human beings.

Low-level ozone formation arises primarily as a result of a series of complicated chemical reactions, initiated by sunlight. The main source of ozone formation occurs through the reaction of oxides of nitrogen and volatile organic compounds (VOCs). Additionally, production can be stimulated by carbon monoxide and methane.

POCP has been defined as:

"the ratio of the change in photochemical ozone production due to an emission of a VOC to the ozone created by the same additional emission of ethylene".

Ethylene (C_2H_4) has a POCP factor of 100.

POCP values arising from the project are summarised in **Table 13.3**. VOC emissions have not been taken into account in the POCP calculation, as a breakdown of VOCs into specific compounds is not available.

Table 13.3: POCP emissions (ethylene equivalents)

Source	Emission (tonnes) and POCP factor				POCP (tonnes ethylene equivalent)
	NO_2	SO_2	CO	CH_4	
	2.8	4.8	2.7	3.4	
Drilling	398	27	73	2	14
Completion	235	16	48	1	9
Testing	125	8	68	296	18
Field installation	228	16	31	1	8
Offshore pipelay	334	23	45	2	12
Nearshore pipelay	36	2	5	0	1
Landfall and river crossings	6	0	2	0	0
Total	1,362	92	272	302	**62**

In order to place the total POCP emissions (ethylene equivalent of 62) into perspective, emissions from a range of other developments are provided in **Table 13.4**.

Table 13.4: Comparison of POCP with other industrial sources

Source	POCP factor and Emissions (tonnes)				POCP (tonnes ethylene equivalent)	Time span of emissions data
	NO_2 2.8	SO_2 4.8	CO 2.7	CH_4 3.4		
Corrib offshore activities [1]	1,365	97	275	305	**62**[2]	Predicted total over 5-6 years
Operations						
Large gas terminal, UK	1241	70	140	912	73	1 year (1999)
240 MW oil-fired power station, IRL	320	3720	No data	No data	>188	1 year (1996)
915 MW coal-fired power station, IRL	23920	41470	No data	No data	>2660	1 year (1996)
350 MW CCGT power station, UK	2083	19	89	Below reporting threshold	>62	1 year (1999)

[1] Covers drilling, construction, completion and installation

[2] Equates to 10-12 tonnes ethylene equivalent per year

It should be emphasized that the POCP assessment and the above comparison table do not include emissions of VOCs, which are the substances that have the highest POCP factors. It should also be noted that there will be practically zero emissions of VOCs from the offshore development during construction, operation or decommissioning.

13.9 Monitoring

No monitoring of substances associated with climate change is proposed.

13.10 Reinstatement and Residual Impacts

The residual impact, if Corrib gas is used to replace other fossil fuels and peat in power generation, could be a reduction in the volumes of carbon dioxide and methane that Ireland as a whole releases to the atmosphere.