Immingham Green Energy Terminal

TR030008

Volume 6

6.2 Environmental Statement

Chapter 19: Climate Change

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

6.2 Environmental Statement

Chapter 19: Climate Change

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19.1 Introduction

19.1.1 This chapter presents the findings of the assessment of the likely significant effects of the Project in relation to climate change.

19.1.2 To align with the requirements of The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (Ref 19-1) and Institute of Environmental Management and Assessment ("IEMA") guidance on assessing climate change mitigation (Ref 19-2) and adaptation (Ref 19-3) consideration of climate change effects is covered by the following three aspects:

a. Lifecycle greenhouse gas ("GHG") impact assessment – Impact of GHG emissions arising from the Project on the climate, including how it would affect the ability of the UK government to meet its planned carbon reduction targets (Ref 19-4).

b. Climate change resilience ("CCR") assessment – The resilience of the Project to climate change impacts, including how the design would consider projected impacts of climate change.

c. In-combination climate change impact ("ICCI") assessment – The combined impact of the Project and potential climate change on the receiving environment.

19.1.3 There are interrelationships related to the Project and climate change, along with other disciplines. Therefore, reference should be made to the following chapters **[TR030008/APP/6.2]**:

a. **Chapter 9: Nature Conservation (Marine Ecology).**

b. **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage.**

19.1.4 This chapter is supported by the following appendices **[TR030008/APP/6.4]**:

a. **Appendix 19.A – Greenhouse Gas (GHG) Assessment.**

b. **Appendix 19.B – Climate Change Resilience (CCR) Assessment.**

c. **Appendix 19.C – In-Combination Climate Change Impact (ICCI) Assessment.**

19.2 Consultation and Engagement

19.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the climate change assessment, and the approach and methods to be followed. The Scoping Report (**Appendix 1.A [TR030008/APP/6.4]**) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria applied in the assessment to identify and evaluate the likely significant effects of the Project on climate change. A Scoping Opinion was adopted by the Secretary of State on 10 October 2022 (**Appendix 1.B [TR030008/APP/6.4]**).

19.2.2 Statutory Consultation took place between 9 January and 20 February 2023 in accordance with the Planning Act 2008 ("2008 Act"). Further information on the consultation is provided within **Chapter 5: EIA Approach [TR030008/APP/6.2]**.

19.2.3 Through consideration of the responses to the first Statutory Consultation, the developing environmental assessments and through ongoing design-development and assessment, a series of changes within the Project were identified. A second Statutory Consultation took place between 24 May 2023 and 20 July 2023 in accordance with the 2008 Act and a Preliminary Environmental Information ("PEI") Report Addendum was publicised to support the consultation.

19.2.4 The consultation undertaken with statutory consultees to inform this chapter, including a summary of comments raised via the formal Scoping Opinion (**Appendix 1.A [TR030008/APP/6.4]**), is summarised in **Table 19-1**. Note that no comments were received in relation to climate change during Statutory Consultation.

Table 19-1: Consultation summary table

Reference/Date	Consultee	Summary of Response	How comments have been addressed in this chapter
Scoping Report August 2022	Planning Inspectorate	The Scoping Report proposes to scope out GHG emissions arising from operational maintenance activities on the grounds that emissions from maintenance works are likely to be minimal in relation to the overall GHG emissions from the Proposed Development. However, the Scoping Report does not provide any supporting evidence for this statement. In the absence of such evidence, and particularly given the uncertainty around dredging requirements, Inspectorate is not in a position to agree to scope these matters from the assessment. Accordingly, the Environmental Statement (ES) should include an assessment of these matters or further justification that the works are likely to give rise to minimal GHG emissions.	Emissions from operational maintenance activities are considered in the GHG assessment. (see **Table 19-20**Table 19-20). Note the GHG assessment has considered the seven Kyoto Protocol gases: Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Sulphur hexafluoride (SF_6), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs); and Nitrogen Trifluoride (NF_3).
		The Scoping Report proposes to scope out the impacts of wind from both the climate change resilience (CCR) assessment and the in-combination climate change impact (ICCI) assessment, on the basis that there is no evidence to suggest that climate change is increasing high wind events (referencing the Met Office (2020) State of the UK Climate report). The Inspectorate notes that Environment Agency guidance (2021) Refineries and fuel: examples for your adapting to climate change risk assessment, specifically considers wind stating "*there is risk to: jetties with higher sideways loadings due to wave and wind action*". In light of this guidance and in absence of agreement with the relevant statutory body, the Inspectorate is not in a position to agree to scope this matter from the assessment.	Consideration of mitigation measures against wind events has been addressed in this assessment (see **Section 19.7**).

Reference/Date	Consultee	Summary of Response	How comments have been addressed in this chapter
		The ES should state which emissions scenario will be applied from the UK Climate Projection 2018 (UKCP18) data as this is not currently clear from the Scoping Report. The ES should be based on up-to-date climate projections at the point of submission.	This has been explicitly stated in the assessment (see **Paragraph 19.6.11**).
		The transportation and disposal of waste is listed as source of emissions but dredging and disposal of dredged material is not explicitly included within this. The ES should consider emissions from these activities.	Data to calculate emissions from dredging was not available for the PEI Report assessment. It has been assessed in the GHG assessment discussed in this chapter (see **Section 19.8**).
	Environment Agency	Paragraph 18.3.7 advises that wind change has been ruled out for the climate change resilience review. Environment Agency guidance on climate change adaption for refineries specifically considers wind stating "*there is risk to: jetties with higher sideways loadings due to wave and wind action*". Accordingly, we would suggest it may be relevant to scope in this issue.	Consideration of mitigation measures against wind events has been included in this assessment (see **Section 19.7**).
		The Applicant may also find it useful to refer to government guidance on Adapting to climate change: industry sector examples for your risk assessment – GOV.UK (www.gov.uk), with specific consideration to the guidance for the 'Chemical' and 'refineries and fuel' sectors, as the closest relevant sectors.	This has been reviewed, and any relevant guidance included in this assessment. Additional climate risks and mitigation relevant to this development are included in **Appendix 19.B [TR030008/APP/6.4]**.
		We would also ask that the EIA is clear about which emissions scenario will be used from the UKCP18 data as this is not currently clear from the Scoping Report	This has been explicitly stated in the assessment (see **Paragraph 19.6.11**).

Reference/Date	Consultee	Summary of Response	How comments have been addressed in this chapter
PEI Report (Statutory Consultation) January – February 2023	No consultation responses relevant to Climate Change were received.		
Second Statutory Consultation May – July 2023	No consultation responses relevant to Climate Change were received.		

19.3 Legislation, Policy and Guidance

19.3.1 **Table 19-2** presents the legislation, policy and guidance relevant to the climate change assessment and details how their requirements have been met.

Table 19-2: Relevant legislation, policy and guidance regarding climate change

Legislation/Policy/Guidance	Consideration within the ES
United Nations Framework Convention on Climate Change Paris Agreement (Ref 19-5)	
The Framework requires all signatories to strengthen their climate change mitigation efforts to keep global warming to below 2°C this century and to pursue efforts to limit global warming to 1.5°C.	Since its withdrawal from the EU, the UK Government declares its own Nationally Determined Contribution ("NDC") setting out its climate change obligations under the Paris Agreement and the climate change target and budgets set under the Climate Change Act 2008 (Ref 19-6). **Section 19.8** presents an assessment to identify the impact of the Project on the UK meeting its climate change target and five-yearly carbon budgets. In support of this the embedded mitigation measures of the Project are set out in **Sections 19.7.**
Climate Change Act 2008 and **Climate Change Act (2050 Target Amendment) Order 2019** (Ref 19-6)	
The Climate Change Act 2008 was amended in 2019 to revise the existing 80% reduction target and legislate for net zero emissions by 2050 (through the Climate Change Act 2008 (2050 Target Amendment) Order 2019). This target is supported by a system of legally binding five-year 'carbon budgets' and an independent body, the Climate Change Committee (CCC), is to advise on budgets and monitor progress. The UK carbon budgets restrict the amount of GHG emissions the UK can legally emit in a defined five-year period. The 6th Carbon Budget (Ref 19-7) is the first budget to reflect the amended trajectory to net zero by 2050 and came into force in June 2021.	An objective of the Project is to deliver port infrastructure needed to facilitate the future transportation of bulk liquids associated with the energy sector that would support the transition to net zero. The new jetty would further support sustainable development by providing additional capacity for the development of the renewable energy and carbon capture sectors. An assessment of the impact of the Project against the Government's carbon target and budgets is set out in **Section 19.8**. Embedded and good practice mitigation measures have been identified in **Section 19.7**.
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations') (Ref 19-8)	
The EIA Regulations state that an EIA (where relevant): "*must include a description of the likely significant effects of the development on the environment resulting from… the impact of the project on climate (for example the nature and magnitude of*	Likely significant effects as a result of the vulnerability of the Project to climate change, following the inclusion of embedded and good practice mitigation measures, are presented in **Section 19.8**.

Legislation/Policy/Guidance	Consideration within the ES
greenhouse gas emissions) and the vulnerability of the project to climate change".	Likely significant effects on the climate as a result of the Project are assessed in **Section 19.8**.
The National Policy Statement for Ports ("NPSfP") (Ref 19-9)	
Paragraph 4.1.1 of Section 4.1 states "*information sought from applicants should be proportionate to the scale of proposed development and associated impacts, including its likely impact on and vulnerability to climate change, as well as all other aspects of conformity with this NPS*".	The principles and methodology of the climate change assessment presented in this chapter are developed in line with the NPSfP. Impact of GHG emissions arising from the Project on the climate, and the resilience of the Project to climate change impacts are considered and both presented in **Section 19.8**.
Para 4.12 provides guidance on how to consider both climate change mitigation and shipping and inland transport emissions. In its guidance 4.12.2 it states that greenhouse gas emissions from ships are by nature international and therefore not included in national targets	The methodology for this assessment considers shipping emissions as they are included within the sixth carbon budget for the UK and Department for Transport's transport decarbonisation plan. Impacts from shipping are discussed in **Section 19.8**.
Paragraph 4.13.6 of Section 4.13 states that "*…applicants must consider the impacts of climate change when planning the location, design, build and operation of new port infrastructure…. The ES should set out how the proposal will take account of the projected impacts of climate change.*"	The principles and methodology of the climate change assessment presented in this chapter are developed in line with the NPSfP. Impact of GHG emissions arising from the Project on the climate, and the resilience of the Project to climate change impacts are considered and both presented in **Section 19.8**.
Paragraph 4.13.7 of Section 4.14 states that "*Applicants should use the latest set of UK Climate Projections to ensure they have identified appropriate adaptation measures. Applicants should apply, as a minimum, the emissions scenario that the independent Climate Change Committee suggests the world is currently most closely following – and the 10%, 50% and 90% estimate ranges.*"	The future baseline for both CCR and ICCI assessment is based on the future UK Climate Projection 2018 ("UKCP18") data from the Met Office (Ref 19-19). The latest set of UK Climate projections have been used in accordance with the principles set out in the NPSfP. This is presented in **Section 19.6**.
Paragraph 4.13.8 in Section 4.13 states that "*In addition, where port infrastructure has safety-critical elements (e,g, storage of gas, petro-chemical) the applicant should apply the high emissions scenario (high impact, low likelihood) to those elements critical to the safe operation of the port infrastructure.*"	The GHG Impact Assessment has adopted a worst-case approach for any uncertainty in the design, in line with suggestions in IEMA guidance (Ref 19-2), as presented in **Section 19.4**.
The National Planning Policy Framework ("NPPF") (Ref 19-10)	
The Framework sets out the Government's planning policies for England. While the NPPF does not set specific policies for Nationally Significant	The GHG emissions methodology and assessment described in the Scoping Report (**Appendix 1.A [TR030008/APP/6.4]**) have been developed in line with the NPPF guidance.

Legislation/Policy/Guidance	Consideration within the ES
Infrastructure Projects (NSIPs), its policies may be of relevance to the decision-making process. Policies of relevance to climate change and sustainability assessment include those aimed at achieving sustainable development and meeting the challenge of moving to a low carbon economy, climate change, flooding and coastal change. The NPPF states that the planning system should support this transition by supporting low carbon energy and associated infrastructure.	Mitigation measures to minimise and mitigate the impacts of GHG emissions on climate change from the Project and embedded adaptation measures to minimise effects of climate change are set out in **Section 19.7**.
National Planning Policy Guidance on Climate Change (Ref 19-11)	
The guidance describes how to identify suitable mitigation and climate adaptation measures to incorporate into the planning process, stating that: "…*effective spatial planning is an important part of a successful response to climate change as it can influence the emission of greenhouse gases… Planning can also help increase resilience to climate change impact through the location, mix and design of development.*"	The guidance sets climate change allowances to be included in flood risk assessments, which have been considered as part of the design as outlined in **Section 19.4**.
Our Green Future: Our 25-year Plan to Improve the Environment (Ref 19-27)	
The plan sets out the Government's proposed action to help the natural world regain and retain good health. It aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats.	Embedded adaptation measures to minimise effects of climate change are set out in **Section 19.9**.
Decarbonising Transport: A Better, Greener Britain (Ref 19-12)	
The plan sets out the Government's commitments and actions needed to decarbonise the transport system in the UK before 2050. The plan proposes to plot a course to net zero for the UK domestic maritime sector, with indicative targets from 2030 and net zero as early as is feasible – public consultation is planned in 2022, followed by strategy 'Course to Zero'; there is also a planned review and refresh of Clean Maritime Plan.	The objective of the Project, as set out in **Chapter 2: The Project [TR030008/APP/6.2]**, is to deliver port infrastructure needed to support the future transportation of liquid bulks associated with the energy sector that would support the transition to net zero. The new jetty would further support sustainable development by providing additional capacity for the development of the renewable energy and carbon capture sectors. Mitigation measures to minimise and mitigate the impacts of GHG emissions on climate change from the Project and embedded adaptation measures to minimise effects of climate change are set out in **Section 19.9**.

Legislation/Policy/Guidance	Consideration within the ES
North East Lincolnshire Council ("NELC") Environmental Policy Statement (Ref 19-13)	
The statement sets out NELC's priorities in taking action towards consuming resources more efficiently, eliminating waste and supporting & developing the green economy & infrastructure, including a commitment to support environmentally responsive local economic growth.	The Project supports the priorities of developing the green economy and infrastructure. It responds to the requirements set out in policy SO2 Climate Change in the NELC Plan (Ref 19-28) which requires development to address the causes and effects of climate change for example by minimising energy and natural resource use and encouraging opportunities for sustainable transport. Mitigation measures to minimise and mitigate the impacts of GHG emissions on climate change from the Project and embedded adaptation measures to minimise effects of climate change are set out in **Section 19.9**.
North East Lincolnshire Council (NELC) Carbon Roadmap (Ref 19-14)	
The roadmap sets out how the Council plans to achieve its aim to cut its carbon emissions to net zero by 2040 and for North East Lincolnshire to be carbon net zero by 2050.	Mitigation measures incorporated into the Project design, construction and operation to minimise and mitigate the impacts of GHG emissions on climate change from the Project are set out in **Section 19.9**.
North East Lincolnshire Council (NELC) Natural Assets Plan (Ref 19-15)	
The plan sets out how the Council and its partners can improve the area's unique natural environment for the benefit of everyone. The plan sets out eight areas that the Council wants to focus on that will help to adapt and mitigate effects of climate change.	Embedded adaptation measures to minimise effects of climate change are set out in **Section 19.9**. Measures to address the eight areas of the plan are considered. In relation to 'biodiversity and special sites' a Habitats Regulations Assessment for impacts on the Humber Estuary European Marine Site is being undertaken; see **Chapter 9: Nature Conservation (Marine Ecology) [TR030008/APP/6.2]**. Measures to address Water Management are covered in **Chapter 18: Water Use, Water Quality, Coastal Protection, Flood Risk and Drainage [TR030008/APP/6.2]**.
IEMA: Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (Ref 19-2)	
The guidance aids with the identification, assessment and subsequent mitigation of lifecycle impacts of GHG emissions throughout the Environmental Impact Assessment (EIA) process.	The approach to assessing the significance of GHG emissions from construction and operation of the Project has been undertaken in accordance with this guidance.

Legislation/Policy/Guidance	Consideration within the ES
IEMA: Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (Ref 19-3)	
The guidance aids with the assessing of the impacts of climate change within project design.	The approach for assessing the significance of climate change risks on the Project has been undertaken in accordance with this guidance.

19.4 Assessment Methodology

Assessment Methodology GHG Assessment

Methodology for Determining Baseline Conditions and Sensitive Receptors

19.4.1 The receptor for GHG emissions is the global climate as the effects of GHG emissions are not geographically constrained. All GHG emissions have the potential to result in a cumulative effect in the atmosphere.

19.4.2 For the GHG assessment, the current and future baseline is the 'business as usual' scenario where the Project is not implemented. The baseline typically considers the GHG emissions from the existing Site operations and the existing carbon stock within the soil and the above- and below-ground vegetation within the Site. The Project description in **Chapter 2: The Project [TR030008/APP/6.2]** has been used to determine the baseline conditions.

Methodology for Determining Demolition, Construction and Operation Effects

19.4.3 The assessment has adopted a Project lifecycle approach to identify 'hot spots' of GHG emissions (i.e. the Project stage(s) likely to generate the largest amount of GHG emissions) and enable priority areas for mitigation to be identified. This approach is consistent with the principles set out in IEMA guidance (Ref 19-2) and PAS 2080 (Ref 19-18).

19.4.4 In line with the World Resources Institute ("WRI") and World Business Council for Sustainable Development ("WBCSD") GHG Protocol guidelines (Ref 19-20), the lifecycle GHG impact assessment has been reported as tonnes of carbon dioxide equivalent (tCO_2e) and has considered the seven Kyoto Protocol gases:

a. Carbon dioxide (CO_2)
b. Methane (CH_4)
c. Nitrous oxide (N_2O)
d. Sulphur hexafluoride (SF_6)
e. Hydrofluorocarbons (HFCs)
f. Perfluorocarbons (PFCs)
g. Nitrogen Trifluoride (NF_3)

19.4.5 Expected GHG emissions arising from Site preparation and construction activities, embodied carbon in materials and operational emissions of the Project have been quantified using a calculation-based methodology as per the following equation and in accordance with the GHG Protocol (Ref 19-20):

Activity data x GHG emissions factor = GHG emissions

19.4.6 A set of standard data quality principles have been applied so that the results from the GHG assessment are as accurate and representative as possible. This has included the selection of emission factors that are representative of the UK construction industry. The Department for Energy Security and Net Zero ("ESNZ") 2023 emissions factors (Ref 19-21) and embodied carbon data from the Inventory of Carbon and Energy V3.0 ("ICE") (Ref 19-22) have been used as the source of emissions factors for calculating GHG emissions. GHG activity data has been gathered directly from the Project's engineering and design teams to enable consistency and completeness of data collection.

19.4.7 The resulting carbon footprint has been compared to the existing baseline condition, details of which are provided in **Section 19.8**, to identify the impact of the Project.

19.4.8 Where GHG activity data was unavailable, assumptions and estimations have been developed. Any assumptions, inclusions and exclusions that inform the GHG emissions calculation have been clearly described in the sections below.

19.4.9 In order to assess the potential impacts of GHG emissions arising from the Project, likely activities have been identified and their associated GHG emissions sources have been estimated. Potential activities related to the Project that could cause GHG emission impacts are presented in **Table 19-3.**

19.4.10 IEMA guidance (Ref 19-2) sets out that projects will sometimes replace existing activity and therefore emissions of a project should be based on its net impact over its lifetime. In **Table 19-3** the displacement of fossil fuel activity from the uptake of imported hydrogen is included to take into account the net impact of the Project.

Table 19-3: Potential sources of GHG emissions

Lifecycle Stage	Activity	Primary Emission Sources
Pre-construction	Onsite pre-construction activity, i.e. enabling works, etc.	GHG emissions from fuel consumption by construction plant and vehicles, generators onsite, and worker commuting
	Transportation and disposal of earthworks/ waste	GHG emissions from transportation and disposal of earthworks/pre-construction waste
	Land clearance	GHG emissions associated with the loss of carbon stock

Lifecycle Stage	Activity	Primary Emission Sources
Product manufacture	Raw material extraction and manufacturing of products/materials	Embodied GHG emissions associated with product and material manufacture
	Transport of products/ materials to Site	GHG emissions from fuel consumption of transportation of products and materials to Site
Construction	Onsite construction activity	Energy (electricity, fuel, etc.) consumption from plant and vehicles, generators onsite, and material consumption
	Transport of construction workers	Energy (electricity, fuel, etc.) consumption from worker commuting
	Transportation and disposal of earthworks/ waste	GHG emissions from transportation and disposal/treatment of earthworks/construction waste. This includes vessel movements associated with dredging and waste disposal in the marine environment.
Operations	Operation of the Project	GHG emissions from energy use, process operations, additional traffic, provision of potable water, and treatment of wastewater. GHG emissions from shipping associated with the import and export of ammonia and CO_2.
	Transportation and disposal of waste	GHG emissions from transportation and disposal of waste
	Building and grounds maintenance /maintenance of marine environment	GHG emissions associated with replacement materials/products. This includes vessel movements associated with dredging and waste disposal in the marine environment.
	Emissions displacement	Avoided or displaced emissions through use of any renewable energy systems, including hydrogen use displacing other fuels, or offsetting.
	Landscaping	Changes in GHG emissions/sinks from landscaping and re-vegetation

Lifecycle Stage	Activity	Primary Emission Sources
Decommissioning (of the hydrogen production facility)	Removal and/or renewal of the hydrogen production facility part of the Project	GHG emissions arising from fuel consumption for plant and vehicles and disposal of materials.

Lifecycle GHG Impact Assessment Significance Criteria

Sensitivity of Receptor

19.4.11 The sensitivity of the climate to GHG emissions is considered to be 'high'. The rationale is as follows:

a. GHG emission impacts could compromise the UK's ability to reduce its GHG emissions and therefore the ability to meet its future legally binding carbon budgets.

b. The importance of limiting global warming to below 2°C above industrial levels, while pursuing efforts to limit such warming to 1.5°C as set out in the Paris Agreement (Ref 19-23), is clear. Additionally, a recent report by the Intergovernmental Panel on Climate Change ("IPCC") (Ref 19-24) highlighted the importance of limiting global warming below 1.5°C.

c. Disruption to the global climate is already having diverse and wide-ranging impacts to the environment, society, the economy and natural resources. Known effects of climate change include increased frequency and duration of extreme weather events, temperature changes, rainfall and flooding, and sea level rise and ocean acidification. These effects are largely accepted to be negative, profound, global, likely, long-term to permanent, and are transboundary and cumulative from many global actions.

Magnitude of Impact

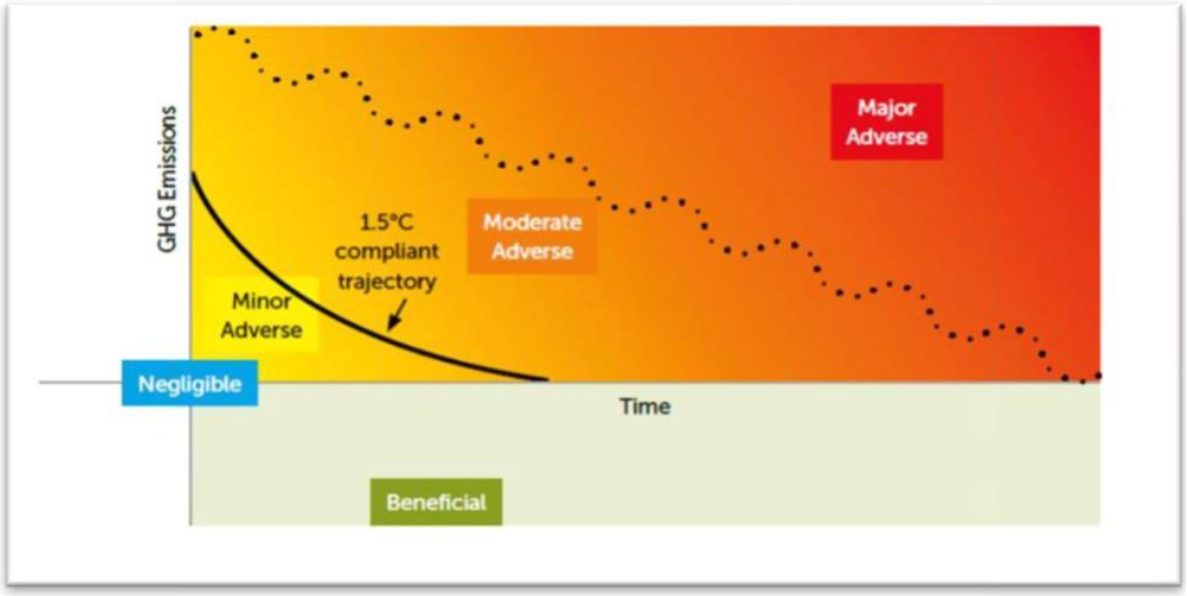
19.4.12 In February 2022, IEMA (Ref 19-2) published a revision of the 2017 IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance. The revision of the guidance has been driven by changes arising from legislation and policy since 2017.

19.4.13 IEMA's publication provides updated and improved guidance, developed by leading practitioners from the past five years of practice on complex projects. The guidance builds on the previous IEMA guidance and reinforces the need to use competent experts for specialist topics such as GHG assessment.

19.4.14 In the revised guidance, mitigation is no longer an element to be considered towards the later stage of the EIA process. Instead, mitigation should be considered from the outset and throughout the Project's lifetime whilst also helping to deliver proportionate EIAs. Once the magnitude of emissions has been determined, mitigation measures should be proposed. Any mitigation measures that are committed to within a proposed development need to be included within the assessment.

19.4.15 The updated guidance describes five distinct levels of significance which are not solely based on whether a project emits GHG, but also how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero. The different levels of significance are plotted against the UK's net zero compatible trajectory as presented in **Plate 19-1** to determine the Project's significance.

Plate 19-1: Different levels of significance plotted against the UK's net zero compatible trajectory (Ref 19-2)



19.4.16 **Table 19-4** presents the different significance levels as per the latest version of IEMA guidance. The guidance emphasises that "*a project that follows* a *'business-as-usual' or 'do minimum'* approach *and is not compatible with the UK's net zero trajectory, or accepted aligned practice or area-based transition targets, results in a significant adverse effect. It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g. '**moderate'** or '**major'** adverse effects.*" Moderate and Major adverse impacts are considered to be significant, while all other significance levels are deemed to be not significant.

19.4.17 A 'minor adverse' or 'negligible' non-significant effect does not necessarily refer to the magnitude of GHG emissions being carbon neutral (i.e. zero on balance) but refers to the likelihood of avoiding severe climate change, aligning project emissions with a science-based 1.5°C compatible trajectory and achieving net zero by 2050.

19.4.18 A project's impact can shift from significant adverse to non-significant effects by incorporating mitigation measures that substantially improve on business-as-usual and meet or exceed the science-based emissions trajectory of ongoing but declining emissions towards net zero. Where projects cause GHG emissions to be avoided or removed, those projects can be considered beneficial.

Table 19-4: Definition of levels of significance (Ref 19-2)

Significance Level	Effects	Description	Example in the guidance
Significant	Major adverse	A project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero trajectory, or accepted aligned practice or area based transition targets. It is down to the practitioner to differentiate between the 'level' of significant adverse effects, e.g. 'moderate' or 'major' adverse effects.	The project's GHG impacts are not mitigated or are only compliant with do-minimum standards[1] set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
	Moderate adverse		The project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
Not significant	Minor adverse	A project that is compatible with the budgeted, science based 1.5°C trajectory	The project's GHG impacts would be fully consistent with applicable existing and

[1] Minimum standards here simply indicates that the project aligns with existing regulations, but do not make any further reductions or contribution towards net zero.

Significance Level	Effects	Description	Example in the guidance
		(in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that. It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects.	emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.
	Negligible	A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory and has minimal residual emissions. This project is playing a part in achieving the rate of transition required by nationally set policy commitments.	The project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.
Significant	Beneficial	A project that causes GHG emissions to be avoided or removed from the atmosphere. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged	The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects

Significance Level	Effects	Description	Example in the guidance
		as having a beneficial effect.	substantially exceeds net zero requirements with a positive climate impact.

19.4.19 As noted previously, in accordance with IEMA guidance, it is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact. In GHG accounting, it is considered good practice to contextualise emissions against pre-determined carbon budgets. The UK has defined national carbon budgets, which have been determined as being compatible with net zero and international climate commitments.

19.4.20 To assess the impact of GHG emissions from the Project, the UK carbon budgets (Ref 19-25) have been used as a proxy for the climate (**Table 19-5**). As this is a Nationally Significant Infrastructure Project ("NSIP"), placing the Project into this context is deemed appropriate. UK carbon budgets are in place to restrict the amount of GHG emissions the UK can legally emit in a five-year period. The UK is currently in the 4th carbon budget period, which runs from 2023 to 2027. The 3rd, 4th and 5th carbon budgets reflect the previous 80% reduction target by 2050. The 6th carbon budget aligns with the legislated 2050 net zero commitment.

19.4.21 To put future emissions from the Project into context with UK's trajectory to net zero by 2050, the Climate Change Committee's ("CCC") balanced net zero pathway is utilised post-2037, in the absence of any nationally legally binding carbon budgets after the subsequent 6th carbon budget.

19.4.22 The CCC balanced net zero pathway is divided into five-year periods post-2037 to match the previous six legally binding UK National Carbon Budgets. The proposed carbon budget periods derived from the net zero pathway encompass the 7th, 8th and 9th indicative budget periods up to 2050 in line with the UK's 1.5°C trajectory as detailed in **Table 19-5**.

19.4.23 However, the supplementary carbon budgets beyond 2037 have not been formally adopted by the Government or ratified by parliament and can only be used as an indicative measure to contextualise the Project's progress compared to the national net zero trajectory.

19.4.24 While national carbon budgets can provide context on the scale of the Project's GHG emissions, this assessment appraises significance of effects based on the combined measures of embedded mitigation, the emissions trajectory, and policy alignment of the Project.

Table 19-5: UK Carbon Budgets and indicative UK carbon budgets based upon the CCC's balanced net zero pathway

Carbon budget	UK Carbon Budget ($MtCO_2e$)	Indicative Carbon Budgets based upon the CCC's balanced net zero pathway ($MtCO_2e$)
3rd (2018–2022)	2,544	-
4th (2023–2027)	1,950	-
5th (2028–2032)	1,725	-
6th (2033–2037)	965	-
7th (2038–2042)	-	526
8th (2043–2047)	-	195
9th (2048–2050)		17

Assessment Methodology CCR Assessment

Methodology for Determining Baseline Conditions and Sensitive Receptors

19.4.25 The receptor for the Climate Change Resilience ("CCR") review is the Project during construction and operation, including both workers and infrastructure.

19.4.26 The current baseline has been established by understanding the historic/current climate in the location of the Project by reviewing climate data obtained from the Met Office website. The climate baseline has been developed using Met Office data obtained from the meteorological station closest to the Project (Cleethorpes) (Ref 19-16).

19.4.27 The future baseline has been established using UKCP18 (Ref 19-19). UKCP18 data for the 25km grid cell where the Project is located has been used to examine future climate parameters. This climate projection data provides a probabilistic indication of how global climate change is likely to affect the Project using defined climate variables and time periods.

Methodology for Determining Effects of Climate Change on the Project

19.4.28 Climate parameters considered in the CCR assessment during the demolition, construction and operation of the Project include the following:

a. Extreme weather events.
b. Flood risk.
c. Sea level rise ("SLR").
d. Temperature change.
e. Rainfall change.

19.4.29 The CCR assessment has qualitatively reviewed the Project's resilience to climate change considering the UKCP18 projections (Ref 19-17) for the geographical location and timeframe of the Project (including demolition, construction and operation).

19.4.30 The CCR assessment has been undertaken for the Project to identify potential climate change impacts on the Project and associated receptors, and to consider their potential consequence and likelihood of occurrence, taking account of the measures incorporated into the design of the Project.

19.4.31 Climate change projections for the Project during the enabling works and construction phase have been examined against receptors during this stage. Construction phase receptors of the Project include the workforce, plant, machinery and materials.

19.4.32 For the operational phase of the Project, potential climate change impacts have been identified using relevant projections from UKCP18 and the CCR assessment considers their potential consequence to receptors and likelihood of occurrence, taking account of the measures incorporated into the design of the Project. Receptors when the Project is complete may include the workforce, Project assets and their operation, maintenance and refurbishment.

19.4.33 The following key terms and definitions relating to the CCR assessment have been used:

a. Climate event – a weather or climate related event, for example increased winter precipitation.

a. Climate hazard – a weather or climate related event, which has potential to do harm to environmental or community receptors or assets.

b. Climate change impact – an impact from a climate hazard which affects the ability of the receptor or asset to maintain its function or purpose.

c. Consequence – any effect on the receptor or asset resulting from the climate hazard having an impact.

19.4.34 A stepped approach is used to assess the impacts of climate change on the Project.

a. Identify climate events.

b. Identify likelihood of climate hazard occurring.

c. Identify likelihood of climate impact occurring.

d. Identify consequence of impact on the Project.

e. Identify significance of impact (likelihood of impact occurring x consequence of impact).

19.4.35 The likelihood of a climate event occurring would be identified based on data extracted from UKCP18 for the climate parameters identified in **Paragraph 19.4.28**.

19.4.36 The criteria which have been used to determine the likelihood of a climate change hazard occurring as a result of a climate event are detailed in **Table 19-6**. The event is defined as the climate event (such as heatwave), while the hazard is defined as an impact on the Project caused by the climate event (such as overheated electrical equipment).

Table 19-6: Probability of likelihood of climate change hazard occurring

Likelihood of event	Description (probability of occurrence)
High	90–100% probability that the hazard will occur.
Moderate	33–90% probability that the hazard will occur.
Low	10–33% probability that the hazard will occur.
Negligible	0–10% probability that the hazard will occur.

19.4.37 Following identification of climate hazards, the likelihood and consequences of the impact have been assessed according to **Table 19-7** and **Table 19-8** respectively**.** The categories and descriptions provided below are based on the IEMA climate change resilience and adaptation guidance (Ref 19-3).

19.4.38 **Section 19.7** presents mitigation measures (based on those identified by each technical discipline) to demonstrate how the Project has been or will be adapted to increase its resilience to future climate conditions.

Table 19-7: Description for the likelihood of the climate-related impact occurring

Likelihood category	Description
High	Likelihood of climate hazard occurring is high and impact is always/almost always going to occur.
Moderate	Likelihood of climate hazard occurring is moderate and impact of the climate hazard is as unlikely as it is likely to occur.
Low	Likelihood of climate hazard occurring is low, impact rarely occurs.
Negligible	All other eventualities – highly unlikely but theoretically possible.

Table 19-8: Description of consequences

Consequence of impact	Description
High	Significant disruption to construction and operations, unable to deliver services, resulting in high financial losses.
Moderate	Disruption to construction and operations and ability to deliver services, resulting in some financial losses/cost implications.
Low	Minor disruption to construction and operations but does not significantly impact ability to deliver services.

Consequence of impact	Description
Negligible	Negligible disruption to construction and operations, does not impact ability to deliver services.

CCR Assessment Significance Criteria

19.4.39 The CCR Review has assessed the significance of effects by evaluating the combination of the likelihood of the climate-related impact occurring, and the consequence, as per the risk assessment matrix in **Table 19-9**. The assessment has taken into account confirmed design and mitigation measures (referred to as embedded mitigation).

19.4.40 Following identification of climate hazards, the likelihood and consequences have been assessed according to **Table 19-7** and **Table 19-8** respectively. The categories and descriptions provided below are based on the IEMA climate change resilience and adaptation guidance (Ref 19-3).

Table 19-9: Significance of effect matrix (where 'S' is significant and 'NS' is not significant)

		Likelihood of climate-related impact occurring			
		Negligible	Low	Moderate	High
Measure of consequence	Negligible	NS	NS	NS	NS
	Low	NS	NS	NS	S
	Moderate	NS	NS	S	S
	High	NS	S	S	S

Assessment Methodology ICCI Assessment

Methodology for Determining Baseline Conditions and Sensitive Receptors

19.4.41 The ICCI assessment has considered the ways in which projected climate change will influence the significance of the effect of the Project on receptors in the surrounding environment. The approach is consistent with the principles set out in the IEMA guidance (Ref 19-2).

19.4.42 The ICCI assessment has considered the existing and projected future climate conditions for the geographical location and assessment timeframe. It identifies the extent to which identified receptors in the surrounding environment are potentially vulnerable to and affected by these factors. The receptors for the ICCI assessment are those that will be impacted by the Project. These impacts have been assessed in liaison with the technical specialists responsible for preparing the applicable technical chapters **[TR030008/APP/6.2]**, listed below:

a. Chapter 6: Air Quality

b. Chapter 7: Noise and Vibration
c. Chapter 8: Nature Conservation (Terrestrial Ecology)
d. Chapter 9: Nature Conservation (Marine Ecology)
e. Chapter 10: Ornithology
f. Chapter 11: Traffic and Transport
g. Chapter 12: Marine Transport and Navigation
h. Chapter 13: Landscape & Visual Impact
i. Chapter 14: Historic Environment (Terrestrial)
j. Chapter 15: Historic Environment (Marine)
k. Chapter 16: Physical Processes
l. Chapter 17: Marine Water and Sediment Quality
m. Chapter 18: Water Use, Water Quality, Coastal Protection, Flood Risk and Drainage
n. Chapter 20: Materials and Waste
o. Chapter 21: Ground Conditions and Land Quality
p. Chapter 22: Major Accidents and Disasters
q. Chapter 23: Socio-economics
r. Chapter 24: Human Health and Well-being

19.4.43 Once potential ICCIs have been identified in relation to the Project, the likelihood of their occurrence during construction, operation, and decommissioning phases is categorised. This is the same process as was undertaken for the CCRA, as detailed in **Paragraphs 19.4.25** to **19.4.40**.

19.4.44 Taking account of the likelihood of the climate risk occurring, and the sensitivity of the receptor, the likelihood of an impact occurring to the receptor is then defined. This includes consideration of any embedded mitigation measures and good practice. These classifications are defined in **Table 19-7.**

19.4.45 Once the likelihood of an ICCI has been identified, the assessment then considers how this will affect the significance of the identified effects.

19.4.46 The ICCI consequence criteria are defined in **Table 19-10** and are based on the change to the significance of the impact already identified by the environmental discipline. To assess the consequence of an ICCI each discipline has assigned a level of consequence to an impact based on the criteria description and their discipline assessment methodology.

Table 19-10: Consequence criteria for ICCI assessment

Consequence	Consequence criteria
High	The climate change parameter in-combination with the effect of the Project causes the significance of the effect of the Project on the resource/receptor, as defined by the topic, to increase from negligible, low or moderate to high.
Moderate	The climate change parameter in-combination with the effect of the Project causes the significance of the effect defined by the topic, to increase from negligible or low, to moderate.
Low	The climate change parameter in-combination with the effect of the Project, causes the significance of the effect defined by the topic, to increase from negligible to low.
Very Low	The climate change parameter in-combination with the effect of the Project does not alter the significance of the effect defined by the topic.

ICCI Assessment Significance Criteria

19.4.47 The significance of effects is determined using the matrix in **Table 19-11**. This assesses the significance by evaluating the combination of the likelihood of the impact occurring and the consequence (where 'S' is significant and 'NS' is not significant).

Table 19-11: Significance of effect matrix (where 'S' is significant and 'NS' is not significant)

Significance		Likelihood of climate-related impact occurring			
		Negligible	Low	Moderate	High
Level of consequence	Very Low	NS	NS	NS	NS
	Low	NS	NS	NS	S
	Moderate	NS	NS	S	S
	High	NS	S	S	S

Limitations and Assumptions

19.4.48 The information presented in this assessment reflects that obtained and evaluated at the time of reporting and is based on the proposed parameters/ plans for the Project and the maximum likely extents of land required for its construction and operation to define a reasonable worst case for assessment.

Limitations of the Lifecycle GHG Impact Assessment

19.4.49 The information gathered to date is considered sufficient to provide the basis for a robust EIA. However, the assessment has taken into consideration assumptions and limitations, as outlined in **Table 19-12**. For each limitation, an explanation of the possible impact of the limitation has been provided, as well as a description of any corrective actions that have been taken to adjust for any limitations.

Table 19-12: Limitations within the Lifecycle GHG Impact Assessment

Limitation	Impact of limitation	Correction for limitation
The GHG impact assessment is taking place before construction has begun. There will be some uncertainty regarding the types and quantities of materials to be used in construction, which will require assumptions to be applied.	The construction emissions estimate may not reflect the final detailed design. Planning for the construction phase will continue to develop, and therefore a worst-case approach has been taken to account for any uncertainty, in line with suggestions in IEMA guidance (Ref 19-2).	A worst-case approach (e.g. assumed diesel is used for all plant equipment) has been taken to deal with any uncertainty in parameters throughout assessment.
There is currently no specific guidance specifying a quantified threshold of carbon emissions, which if exceeded, is considered significant.	Assessment of significance of emissions cannot be judged objectively.	The assessment has used a combination of approaches. The GHG emissions are put into context using the national carbon budgets. In addition to this, using the latest version of IEMA guidance (Ref 19-2) the significance of emissions will be assessed based on "*whether* [the Project] *contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".
The GHG impact assessment is taking place before all of the likely users of the Project are identified.	The origin, quantity and transport distance of ship movements may vary throughout the Project's lifecycle.	It has been assumed that the shipping movements will reflect the full capacity of the Project at 292 shipping movements, in order to be conservative as in practice this is unlikely to be achieved due to requirements in docking time.

19.4.50 Some details of the construction methodology of the Project have not been finalised at this stage. As a result, data is not available to provide a fully quantified assessment of the GHG emissions from the enabling/construction and operation of the Project. Accordingly, appropriate industry estimates and averages have been used for the purposes of this assessment, all of which are detailed below.

Assumptions Made in the Lifecycle GHG Impact Assessment

19.4.51 The following assumptions, inclusions and exclusions, have been used in the calculation of GHG emissions for the construction and operation phases:

a. Materials quantities were provided by the design team to inform the quantified GHG assessment for the Project. These quantities reflected a number of assumptions (e.g. mileage incurred by worker transport, energy usage for buildings) which were incorporated into the GHG assessment. These assumptions were based on the design information at the time this assessment was undertaken.

b. The quantity of material waste has been estimated based on the construction material quantities provided. Aligned with **Chapter 20: Materials and Waste [TR030008/APP/6.2]**, a 2.5% wastage rate has been applied for asphalt and concrete, and a 5% wastage rate has been applied for other materials. For steel used for structural and piles, no wastage rate has been applied. An overall recovery rate of 90% has been assumed for all waste. A landfill emission factor has been used to assume a worst-case scenario for the remaining 10% of waste.

c. The assumed distance for worker transport is 15 miles each way per day for local personnel and 115 miles each way per day for non-local personnel. The assumed distance for worker transport for the jetty construction is 50km round-trip per worker. It is assumed all transport for all workers would be by an average petrol car. There are commitments to using minibuses and encouraging cycling in the Construction Traffic Management Plan, however this assumption of petrol car is used as a worst case scenario.

d. There are a series of assumptions for shipping sizes, imported material and origin as follows:

    i. 660,000 tonnes of capacity would be used for the import of green ammonia for the hydrogen production facility (comprising 12 ships each transporting 55,000 tonnes) from the Middle East and Netherlands.

    ii. It is also assumed that there would also be approximately 9,800,000 tonnes of CO_2 which are imported from a distance of approximately 500 nautical miles.

    iii. It is also assumed that would be a domestic (UK) re-export likely to occur to three port destinations (Teesport, Port Talbot, Cardiff) with an assumed 5,000,000 tonnes re-exported to the furthest distance port (Port Talbot). Only 100,000 tonnes of the exports are likely to be related to Air Products shipping of ammonia.

iv. All distances travelled are assumed as one-way only, with ship fuel type assumed as Liquefied Petroleum Gas. The future origins and destinations are however likely to vary substantially based on individual future jetty users and their patterns of operation. The current shipping assumptions are considered to be a realistic worst case, based on current knowledge available.

e. The manufacturing process for green ammonia, including the electrolysis of water into hydrogen and the synthesis of ammonia itself is powered by renewable electricity. The overall greenhouse gas impact of the manufacturing process is therefore very low.

f. Material transport: assumptions are based on the distance construction materials are likely to be transported to the Project from estimates provided by Air Products. Specific distances were provided for different types of materials ranging from 10km (e.g. pipe supports, gravel) to 3,000km (shipping equipment).

g. The assumption for operation energy and water usage are based on estimates provided by Air Products. The Terminal and hydrogen production facility are assumed to be running 24 hours per day, seven days a week and 365 days a year.

h. It is assumed that operational dredging requirements are minor and therefore are not quantified as part of the assessment.

i. The 300MW hydrogen produced from the site is assumed to displace the equivalent energy from diesel in Heavy Goods Vehicle (“HGV”) transport, however there is potential for local industrial use.

Limitations of the CCR and ICCI Assessment

19.4.52 The information gathered to date is considered sufficient to provide the basis for a robust EIA. The assessment has taken into consideration assumptions and limitations, as outlined in **Table 19-13**. For each limitation, an explanation of the possible impact of the limitation has been provided, as well as a description of any corrective actions that will be taken to adjust for any limitations.

Table 19-13: Limitations within the CCR and ICCI Assessment

Limitation	Impact of limitation	Correction for limitation
The CCR assessment is taking place before construction has begun. There will be some uncertainty regarding the selection of materials and design to be used for the Project, which will require assumptions to be applied.	Whilst a full assessment based on final designs is not possible at this stage, it is possible to consider the impacts of climate change taking into account the location and type of Project.	The impact of climate change on the Project has been assessed to reflect worst-case circumstances and account for potential design changes. The CCR and ICCI assessment are conducted as per the latest design data available.

19.4.53 There are uncertainties within the climate change projections in the CCR and ICCI assessment due to the complexity of the climate system, natural climate variability, uncertainty over future GHG emission levels and modelling uncertainties. Climate change projection data from the UKCP18 has been used to identify climate hazards, trends and magnitude of change at the regional scale. To account for uncertainties, climate projections at the 10%, 50% and 90% probability levels have been considered.

19.4.54 Information on climate change effects on wind speed is not available in UKCP18 for probabilistic data and therefore a qualitative assessment has been provided based on professional judgement.

19.5 Study Area

19.5.1 The Study Area for the Lifecycle GHG impact assessment includes:

a. Direct GHG emissions arising within the Site Boundary.

b. Direct GHG emissions arising from shipping associated with the import and export of green ammonia and carbon dioxide.

c. Indirect GHG emissions occurring offsite such as embodied carbon in construction materials. It is not known where the materials will be sourced therefore this could be global.

d. Indirect GHG emissions displacement from use of hydrogen replacing fossil fuels that would be used in the 'without proposed development' scenario.

19.5.2 The Study Area for the CCR assessment comprises the Project (temporary and completed works).

19.5.3 The ICCI assessment considers sensitive receptors identified by other environmental disciplines. The Study Area for the ICCI assessment is therefore as identified by each discipline for their individual assessments.

19.6 Baseline Conditions

Current Baseline

Lifecycle GHG Impact Assessment

19.6.1 The current baseline for the lifecycle GHG impact assessment is a 'business as usual' scenario where the Project does not go ahead.

19.6.2 The existing Project conditions are explained in **Chapter 2: The Project [TR030008/APP/6.2]**. The terrestrial parts of the Project are a mosaic of brownfield uses and former arable land. There is also woodland present, some of which will need to be removed to form the jetty access road and the pipeline corridor. Any emission resulting from this land use change are calculated in the assessment.

19.6.3 Emissions from the operation of the existing Project are negligible, however the wider whole life carbon of the baseline is assumed to include diesel which will be displaced by Hydrogen. The baseline emissions are those related to generating 300MW of diesel which would continue in a business as usual case without the Project going ahead.

CCR Assessment

19.6.4 The baseline for the CCR assessment considers how resilient the Project is to current and projected future climate hazards.

19.6.5 The existing baseline for the CCR assessment is based on climate data obtained from the Met Office recorded by the closest meteorological station to the Project (namely Cleethorpes, located approximately 16km from the Project) for the period 1981–2010 (Ref 19-16) (refer to **Table 19-14**).

Table 19-14: Climate data for the climate station: Cleethorpes (1981–2010) (Ref 19-16)

Climatic Variable	Month	Value
Average annual maximum daily temperature (°C)	-	13.6
Warmest month on average (°C)	July, August	20.7
Coldest month on average (°C)	January	1.7
Mean annual rainfall levels (mm)	-	587.9
Wettest month on average (mm)	November	60.2
Driest month on average (mm)	February	38.0

ICCI Assessment

19.6.6 The baseline for the ICCI assessment is founded upon the climate data detailed in the CCR assessment combined with the baseline for topic assessments.

Future Baseline

Lifecycle GHG Impact Assessment

19.6.7 The future baseline for the lifecycle GHG impact assessment is a ‘business as usual’ scenario where the Project does not go ahead. There are no future baseline emissions from the Project site, the wider emissions considered in a scenario where the project does not go ahead include emissions from 300 MW of diesel in HGV transport.

CCR and ICCI Assessment

19.6.8 The future baseline for both CCR and ICCI assessment is based on the future UKCP18 data from the Met Office (Ref 19-19-19). The latest set of UK Climate projections has been used in accordance with the principles set out in NPSfP (Ref 19-9). This projection data provides probabilistic indications of how global climate change is likely to affect areas of the UK using pre-defined climate variables and time periods.

19.6.9 For the purpose of the assessment, UKCP18 probabilistic projections for pre-defined 30-year periods for the following average variables have been obtained and analysed:

a. Mean annual temperature.
b. Mean summer temperature.
c. Mean winter temperature.
d. Maximum summer temperature.
e. Minimum winter temperature.
f. Mean annual precipitation.
g. Mean summer precipitation.
h. Mean winter precipitation.
i. Sea Level Risk (SLR).

19.6.10 Projected temperature and precipitation variables are presented in **Table 19-15**, **Table 19-16** and **Table 19-17**, respectively. UKCP18 probabilistic projections (RCP 8.5) have been analysed for the 25km grid square in which the Project is located. These figures are expressed as temperature/precipitation anomalies relative to the 1981–2010 baseline.

Table 19-15: Projected changes in temperature variables (°C), 50% probability (10% and 90% probability in parentheses)

Climate Variable	Time Period	
	2020–2049	2040–2069
Mean annual air temperature anomaly at 1.5m (°C)	1.04 (0.49, 1.61)	1.82 (0.95, 2.73)
Mean summer air temperature anomaly at 1.5m (°C)	1.25 (0.45, 2.02)	2.20 (0.99, 3.41)
Mean winter air temperature anomaly at 1.5m (°C)	0.92 (0.17, 1.72)	1.62 (0.49, 2.82)
Maximum summer air temperature anomaly at 1.5m (°C)	1.37 (0.28, 2.37)	2.39 (0.85, 3.95)

Climate Variable	Time Period	
	2020–2049	2040–2069
Minimum winter air temperature anomaly at 1.5m (°C)	0.94 (0.11, 1.87)	1.72 (0.42, 3.14)

Table 19-16: Projected changes in precipitation variables (%), 50% probability (10% and 90% probability in parentheses)

Climate Variable	Time Period	
	2020–2049	**2040–2069**
Annual precipitation rate anomaly (%)	0.50 (-6.63, 7.52)	-2.36 (-11.3, 6.73)
Summer precipitation rate anomaly (%)	-4.04 (-21.43, 14.36)	-14.31 (-36.47, 8.49)
Winter precipitation rate anomaly (%)	4.13 (-4.29, 13.37)	7.32 (-4.23, 20.52)

Table 19-17: Projected changes in sea level variables, 50% probability (10% and 90% probability in parentheses)

Climate Variable	Time Period	
	2020–2049	**2040–2069**
Time-mean sea level anomaly (m)	0.18 (0.13, 0.23)	0.29 (0.22, 0.41)

19.6.11 UKCP18 uses a range of possible scenarios, classified as Representative Concentration Pathways ("RCPs"), to inform differing future emission trends. These RCPs "… specify concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to pre-industrial levels." RCP8.5 has been used for the purposes of this assessment as a worst-case scenario.

19.6.12 Total radiative forcing is the difference between the incoming and outgoing radiation at the top of the atmosphere. Radiative forcing targets for 2100 have been set at 2.6, 4.5, 6.0 and 8.5 watts per square metre (Wm-2) to span a wide range of plausible future emissions scenarios and these targets are incorporated into the names of the RCPs: RCP2.6, RCP4.5, RCP6.0 and RCP8.5. Each pathway results in a different range of global mean temperature increases over the 21st century.

19.6.13 As the design life of the Project is at least 25 years, the CCR assessment has considered scenarios that reflect a high level of GHG emissions at the 10%, 50%, and 90% probability levels of the climate variables up to 2069 to assess the impact of climate change over the lifetime of the Project.

19.6.14 It is generally concluded that extreme weather events, including intense and/or prolonged precipitation, storm events and poor sea conditions, will increase in frequency, but the low confidence in the climate change projections means that it is difficult to predict the likely changes with confidence (Ref 19-17). Under the assumptions adopted for this assessment, it is considered that extreme weather will become more frequent.

19.7 Development Design and Impact Avoidance

Lifecycle GHG Impact Assessment

Embedded Mitigation Measures

19.7.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to climate through the process of design development, and by embedding mitigation measures into the design.

19.7.2 Best available techniques for energy management will be required to be adopted as part of compliance with the Environmental Permit including:

a. Plant advanced control and optimisation.

b. Use of insulation and superinsulation to minimise heat leak into the system.

c. Predictive maintenance systems to ensure optimal compressor and equipment running.

d. All plant at the installation to be subject to the preventative maintenance programme which ensures that operational efficiency is maintained.

e. High integrity plan to minimise fugitive emissions.

f. High plant reliability for optimal plant performance reducing start up and shut down.

g. Use of energy efficient lighting.

CCR and ICCI Assessment

Embedded Mitigation Measures

19.7.3 The Project has been designed, as far as possible, to avoid and minimise impacts and effects of climate change through the process of design development, and by embedding mitigation measures into the design.

19.7.4 The following embedded mitigation measures will be secured through the design development of the Project and are addressed in **Appendix 18.A [TR030008/APP/6.4]** Flood Risk Assessment (“FRA”):

a. Flood resistant/resilient design.

b. Raising external ground levels.

c. Elevating critical plant equipment and/or internal finished floor levels above the peak flood inundation level.

Standard Mitigation Measures

19.7.5 A risk assessment of severe weather impacts on the construction process will be produced by the main contractor to inform the need for construction mitigation measures. Any receptors and/or construction-related operations and activities potentially sensitive to severe weather events will be considered in the risk assessment. Climate change projections will also be considered in the risk assessments. The mitigation measures will be secured through the Construction Environment Management Plan ("CEMP") which must be produced (an Outline CEMP has been provided as part of the Development Consent Order ("DCO") Application **[TR030008/APP/6.5]**).

19.7.6 As detailed in the CEMP, the contractor will implement and maintain an 'Environmental Management System ("EMS"), which will consider all measures deemed necessary and appropriate to manage severe weather events and would as a minimum cover training of personnel and prevention and monitoring arrangements. These would include (as required):

a. Use of storm defences (e.g. walls, riprap).

b. Designing the Project with refuges and storm-resilient materials and form.

c. Ensuring appropriate storage of plant and materials.

19.7.7 As appropriate, construction method statements will also consider severe weather events where risks have been identified. The design of tall structures and jetties will be reviewed to ensure stability of tall structures in stronger wind and wave actions.

19.7.8 Risk for crane work will be assessed to make sure the impact of increased wind speeds and gusts are adequately covered.

19.7.9 Prevention measures and health and safety plans will be developed to prevent worker exhaustion due to heat, and manage flood risk during construction.

19.7.10 Regular maintenance of assets will be undertaken to detect deterioration and damage during operation.

19.8 Assessment of Likely Impacts and Effects

Lifecycle GHG Impact Assessment

19.8.1 When assessing the GHG effects of the Project consideration has been given to the emissions and emissions displacement identified in **Paragraph 19.5.1**. The assessment has identified that in alignment with IEMA criteria from **Table 19-4**, construction and operation of the Project is likely to result in **beneficial, significant** effects on the climate.

19.8.2 As discussed in **Paragraphs 19.8.10** to **19.8.25**, the direct emissions of constructing and operating the Project will be exceeded by the carbon reduction benefits the Project will bring in its contribution to the UK achieving its net zero targets by 2050. There is likely to be additional benefits from carbon sequestration, though this is less certain so is not included in the quantitative assessment of the project.

Effects During Construction

19.8.3 The construction works are divided into two parts, terrestrial and marine, anticipated to last a total of 11 years. The terrestrial components are anticipated to be constructed in phases and comprise land-side infrastructure (including pipeline areas, liquid storage tanks, converters and other supporting infrastructure). The marine components include a jetty with a single berth, to be constructed over three years. Details of the construction works can be found in **Chapter 2: The Project [TR030008/APP/6.2]**.

19.8.4 In order to assess the magnitude of the impact of the Project on the climate, GHG emissions associated with the construction of the Project have been calculated based on the methodologies discussed in **Section 19.4**.

19.8.5 As detailed in **Table 19-18**, the total GHG emissions estimated to be emitted from the 11-year construction period associated with the Project have been calculated to be 830,306 tCO_2e. The construction programme is set out in **Chapter 2: The Project [TR030008/APP/6.2]** and it is assumed all of the phases, both marine and terrestrial, are built out in accordance with that programme. For the purpose of putting emissions into context with carbon budget periods, construction emissions have therefore been averaged out per annum. Average annual emissions are expected to be 67,442tCO_2e for terrestrial construction and 29,480tCO_2e for marine construction.

19.8.6 All these emissions are considered ‘additional’ and are included in the impact assessment of the Project as they would not occur if the Project did not go ahead.

19.8.7 The majority of marine component GHG emissions (approximately 79%) are associated with embodied carbon in construction materials. Around half of terrestrial emissions (approximately 56%) are associated with construction activities.

Table 19-18: Enabling works and construction estimated GHG emissions

Emission Source	Terrestrial		Marine	
	GHG Emissions (tCO_2e)	GHG Emissions as a proportion of emissions generated throughout the construction (11 years)	GHG Emissions (tCO_2e)	GHG Emissions as a proportion of emissions generated throughout the construction (3 years)
Preconstruction (A0)	16,797	2.3%	N/A	-
Construction Materials (A1-A3)	288,550	38.9%	70,140	79.3%
Transportation of Materials (A4)	2,121	0.3%	850	1.0%
Worker Transport (A4)	17,924	2.4%	846	1.0%
Waste (A4-A5)	118	0.0%	6,748	7.6%
Construction Activities (A5)	416,357	56.1%	9,856	11.1%
Total GHG emissions over construction period (tCO_2e)	741,866	-	88,360	-
Average annualised GHG emissions during construction (tCO_2e)	**67,422**	-	**29,453**	-

Significance of GHG Emissions during Construction

19.8.8 As stated in **Section 19.4**, all GHG emissions are considered to contribute to climate change. To contextualise the level of significance for the Project the total estimated annual GHG emissions during the construction period for both the terrestrial and marine components is compared to the percentage contribution of the annual budget within each Carbon Budget period. With reference to the UK national carbon budgets, the construction programme falls within three carbon budgets (4th, 5th and 6th), and equates to less than 0.02% of each budget (**Table 19-19**).

Table 19-19: Contribution of construction GHG emissions to the UK Carbon Budgets

Carbon Budget	UK Carbon Budget (tCO_2e)	Potential Project Emissions (tCO_2e)	Percentage Contribution of Construction Emissions to the UK Budget
4th (2023–2027)	1,950,000,000	358,209	0.018%
5th (2028–2032)	1,765,000,000	337,212	0.019%
6th (2033–2037)	965,000,000	134,885	0.014%

19.8.9 Based on **Table 19-4** and **Table 19-5,** the significance of construction GHG emissions is considered to be minor adverse and therefore not significant, as per the latest version of IEMA guidance. The Project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.

Effects During Operation of Project

19.8.10 The overall lifetime operational emissions, including energy consumption, port transport, commuting, and shipping (import and export), are calculated to be a total of **4,141,333 tCO_2e** over an assumed 25-year operating lifespan (see **Table 19-20**) taking account of the assumptions set out in **paragraph 19.4.51** above.

19.8.11 Diesel in road transport results in the emission of approximately 94g CO_2e per MJ, Therefore, if the 300MW of hydrogen were to be used solely in fuel for vehicles replacing diesel, there would be an estimated emissions saving of 704,634tCO_2e/year totalling a 21,757,414 tCO_2e emission reduction over 25 years.

19.8.12 An additional benefit of fuel switching for diesel road vehicles would be a reduction in emissions of other atmospheric pollutants. Applying the assumptions above, this could cut emissions of particulate (PM_{10}) (26 tonnes/year) and NO_x emissions (1050 tonnes/year), based on replacement vehicles complying with the latest Euro VI standards. In practice the actual savings could be substantially greater as cleaner engine technologies are developed.

19.8.13 Shipping emissions were calculated using the Department for Energy Security and Net Zero (“ESNZ”) emission factors for LPG tankers (Ref 19-21). It is expected that shipping will decarbonise with net-zero and low-carbon shipping fuels in the near future, as the International Maritime Organization (“IMO”), the UN body responsible for shipping, has set a target to reduce emissions per transport work by 40% by 2030 Ref 19-29, compared to 2008 baseline. In their Fourth Greenhouse Gas Study, they found that 29.4% reduction had already been made, meaning a further 10.6% reduction will be made by 2030. Further to that, the UK has committed to including shipping in its sixth carbon budget and set a target of net zero shipping by 2050 Ref 19-12. Based on this shipping

emissions have been reduced in line with the committed trajectories in **Table 19-20**.

19.8.14 The ammonia imports relate to an anticipated 12 out of 292 shipping movements at the jetty, and the shipping emissions related to ammonia transport, imports and exports, are estimated at 328,070tCO_2e over the 25-year lifecycle of the Project. The landside emissions associated with the hydrogen production are 105,988tCO_2e/year or 2,649,693tCO_2e over 25 years. The hydrogen is likely to be used locally for industrial uses or sold as a renewable transport fuel. In terms of emission displacement, the emissions factor (i.e. the rate of greenhouse gas emissions) of the green hydrogen produced by the Project if used directly for industrial uses locally (distributed by pipeline) will be compliant with the UK's standard for low carbon hydrogen, i.e. less than 20 gCO_2e/MJ (Ref 19-26) or, if distributed and sold as a renewable transport fuel, less than 32.9gCO_2e/MJ compliant with the Renewable Transport Fuel Obligation ("RTFO") (Ref 19-30) at the refuelling station.

19.8.15 Additional potential uses of the jetty for carbon dioxide imports and exports to facilitate storage will also assist the transition towards a net zero trajectory. This is not included in the quantitative assessment. With an expected shipping import of 9.8 million tonnes a year there is likely to be enablement of additional reductions in GHG. These benefits have not been quantified, however the shipping emissions are quantified as detailed in **paragraph 19.4.51**.

19.8.16 Shipping emissions presented in **Table 19-20** account for total estimated shipping use for the proposed terminal over the Project assessment period.

Table 19-20: Estimated emissions from operational energy use of Project (25-year period)

Emissions Source	Emissions (tCO_2e)	% of Operation Emissions
B1 – Use		
Sea Freight Transport (Ammonia Imports) (B1)	320,324	7.7%
Sea Freight Transport (Non-ammonia Imports)	518,810	12.5%
Sea Freight Transport (Ammonia Exports) (B1)	7,747	0.2%
Sea Freight Transport (Non-ammonia Exports) (B1)	379,583	9.2%
Port Transport (B1)	218,995	5.3%
B6&7 – Operational Energy Use		
Operational Energy Use – Port Facilities (Electricity, Gas, Water)	2,649,693	64.0%

Emissions Source	Emissions (tCO_2e)	% of Operation Emissions
(B6&7) and hydrogen production facility		
B9 – Utilisation of infrastructure		
Worker Commuting	46,181	1.1%
Total GHG Emissions (tCO_2e)	**4,141,333**	-
Total GHG Emissions Annualised (tCO_2e)	**165,653**	-
Benefits from hydrogen displacement of HGV fuel	**21,757,174**	
Net Emissions (tCO_2e)	**-17,615,842**	

Significance of GHG Emissions from Operation

19.8.17 Overall the impact of the Project is **beneficial** due to the benefits from hydrogen displacing fossil fuels. As stated in **Section 19.4**, all GHG emissions are considered to contribute to climate change. To contextualise the level of significance for the Project, these emissions have been compared to UK national carbon budgets (**Table 19-21**).

19.8.18 The total estimated annual GHG emissions during the operational period for both the terrestrial and marine components is compared to the UK Carbon Budget within each Carbon Budget period. It is assumed that the Project is fully operational in 2035. With reference to the UK national carbon budgets, the period of construction falls within three carbon budget (4th, 5th and 6th) and equates to less than 0.1% of each relevant budget.

19.8.19 Note that whilst the contribution of Project emissions to the 9th carbon budget total for the period 2048–2050 is significant, it would be expected that the major emission sources would likely decarbonise by 2050. The majority of emissions associated with operational energy (98%) come from natural gas, this would be expected to be displaced by low carbon fuels such as hydrogen or electricity at least by 2048. Similarly transport associated with worker commuting and port transport, which is predominantly fossil fuel based today, would likely be displaced by electric vehicles or hydrogen vehicles at least by 2048.

Table 19-21: Contribution of operation GHG emissions to the UK Carbon Budgets

Carbon Budget (7th, 8th and 9th budgets are not committed in law but forecasts)	UK Carbon Budget (tCO_2e)	Potential Project Emissions (tCO_2e)	Percentage Contribution of Operation Emissions to the UK Budget
6th (2033–2037)	965,000,000	779,047	0.08%
7th (2038–2042)	526,000,000	1,094,000	0.21%
8th (2043–2047)	195,000,000	838,487	0.43%
9th (2048–2050)	17,000,000	380,445	2.24%

19.8.20 As discussed in **Section 19.4**, the updated guidance from IEMA should be used when assessing the significance of GHG emissions from the Project. This takes into account the embedded mitigation, the wider benefits of the Project, the carbon emissions trajectory, and the policy alignment of the Project to gauge overall impact. As noted previously, it is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact.

19.8.21 Furthermore, the greenhouse gas assessment includes the emission reductions achieved through the use of hydrogen as a replacement of fossil fuel energy sources and qualitatively considers the CO_2 capture and storage that could be enabled in the future by the Project.

19.8.22 For these reasons, and based on **Table 19-4**, it is assessed that the significance of operational GHG emissions is **beneficial** and **significant,** due to the GHG benefits of using hydrogen to displace fossil fuels. Further consideration was given to the potential future CO_2 sequestration contributing to UK's Net Zero trajectory.

19.8.23 The green hydrogen the Project is producing for distribution and use in the UK will contribute towards the UK achieving net zero emissions by 2050, by providing, for example, fuel for heavy transport vehicles including HGVs and buses, leading to operational savings of 704,634tCO_2 a year. Other potential applications for hydrogen are possible such as heavy industry and the end use would determine the net emissions and benefits achieved.

19.8.24 The emissions resulting from the operations would be significantly less than the avoided emissions of the Project (even ignoring the possibility of the reduction of the emissions themselves with implementation of appropriate mitigation as outlined in **Section 19.7**), noting the overall role the Project will play in reducing the UK carbon emissions.

19.8.25 Further use of the terminal for import of CO_2 for example will also contribute to the UK's net zero aims, as that CO_2 can be captured at source and fed into a carbon capture network for permanent storage. This is not quantifiable as a benefit at this stage but the expected capacity for additional imports of 9.8 million tonnes a year gives potential to enable large CO_2 sequestration.

Decommissioning

19.8.26 Decommissioning of the NSIP (the jetty) has been scoped out from this assessment. The Project does not make any provision for the decommissioning of the main elements of the marine infrastructure above and below water level. This is because the jetty, jetty head, loading platforms, access ramps and the jetty access road would, once constructed, become part of the fabric of the Port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. It is anticipated that plant and equipment on the jetty topside would be decommissioned in parallel with the decommissioning of the related landside elements.

19.8.27 While it is likely that some GHG emissions would arise as part of the decommissioning of the landside hydrogen production facilities, it is not possible to say with any certainty what they are likely to be. Methods of deconstruction and disposal are not known at this time.

19.8.28 It should also be noted that by the time the hydrogen production facilities are decommissioned, the UK is expected be achieving net zero emissions and therefore any impacts are likely to be reduced and considered immaterial compared with construction impacts.

CCR Assessment

19.8.29 As introduced in **Section 19.6**, baseline climate conditions have been identified. Construction and operation of the Project will potentially be subjected to adverse impacts from climate change before adaptation measures are introduced.

19.8.30 The assessment of potential climate events and the potential impacts on the Project are presented in **Appendix 19.B [TR030008/APP/6.4]**. These impacts on the Project are associated with:

a. Increased frequency and severity of extreme weather events.

b. Increased frequency and intensity of heavy precipitation events.

c. Increased summer temperatures.

d. Sea level rise.

Construction

19.8.31 During enabling works and construction, unless appropriate measures are applied, receptors such as the construction work force, construction plant, vehicles, materials and the construction programme may be vulnerable to a range of climate risks. These could include:

a. Extreme weather events (severe flooding, storms, snow, wind and ice) could impact the site's accessibility, restricting working hours and delaying the construction schedule.

b. Health and safety could be at risk during extreme weather events, potentially resulting in severe injury and/or death.

c. The higher peak temperatures and increased frequency and intensity of heatwaves, particularly in the summer, could create unsuitable working conditions for construction Project workers, plant, and equipment use.

d. Increased risk of extreme weather events could potentially damage construction materials, plant equipment, assets, and infrastructure.

Operation

19.8.32 During the operation, unless appropriate measures are applied, the Project may be vulnerable to a range of climate risks. These could include:

a. Extreme weather events could impact the Project's accessibility, restricting working hours and interrupting the operational schedule.

b. Operational workers' health and safety could be at risk, potentially resulting in severe injury and/or death from adverse weather.

c. The higher peak temperatures and increased frequency and intensity of heatwaves, particularly in the summer, could create unsuitable working conditions for operational site workers, plant and equipment use.

d. Increased risk of extreme weather events could potentially cause damage to land and marine based structures (e.g. jetties, buildings) and vehicles.

e. Extreme weather events could cause disruption to power and water services which may impact the operation of the Project.

f. The increased frequency of extreme weather events might increase the requirement for dredging and maintenance, leading to additional costs.

g. The increased risk in frequency and intensity of heatwaves could potentially result in damaging infrastructure and services through the increased risk of thermal expansion beyond the design tolerance of the materials.

h. Damage to drainage systems, gutters and downpipes due to flooding from intense rainfall.

i. Potential damage to equipment and infrastructure due to prolonged exposure to high intensity temperatures resulting in overheating of equipment/machinery.

ICCI Assessment

19.8.33 The ICCI assessment as presented in **Appendix 19.C [TR030008/APP/6.4]** has identified how the resilience of various receptors in the surrounding environment (such as local waterways or local heritage assets, etc.) are affected by the Project in combination with the future climatic conditions.

19.8.34 The impacts are assessed for the construction and operation of the Project. UKCP18 projections (Ref 19-19) for the geographical location and lifetime of the Project, and the receptors identified by technical specialists.

19.9 Mitigation and Enhancement Measures

Lifecycle GHG Impact Assessment

19.9.1 Whilst additional measures could be adopted to reduce the lifecycle GHG emissions, these are not included in the calculations or significance criteria assessment. These are given in **Appendix 19.A [TR030008/APP/6.4].**

CCR and ICCI Assessment

19.9.2 There are a range of additional measures that could help mitigate the effects of climate change on the development, listed in **Appendix 19.A [TR030008/APP/6.4]**. These are not considered as part of the assessment.

19.9.3 All new assets, structures and buildings would either be designed for projected climatic conditions, e.g. increased average temperatures using appropriate design guidance where available, or adaptive capacity will be built into the designs.

19.10 Assessment of Residual Effects

GHG Assessment

19.10.1 The assessment considers a project lifecycle approach with PAS2080 lifecycle stages set out in **Table 19-3**.

19.10.2 Following the updated IEMA guidance, all GHG emissions are classified as being significant because all emissions contribute to climate change. However, to contextualise the significance level, the GHG emissions from construction and operation of the Project were compared to the UK Carbon Budgets (**Table 19-19** and **Table 19-21** of this chapter). The effect of the emissions during construction is considered **minor adverse** and therefore **not significant**, while during the operational phase, it is considered **beneficial** due to the emissions saving from hydrogen, and the wider benefits of carbon sequestration.

19.10.3 As discussed in **Paragraphs 19.8.10** to **19.8.25** the Project will facilitate potential national emissions reductions through its contribution towards decarbonisation of UK industry including particularly heavy transportation from the use of hydrogen derived from green ammonia import. It is considered that any adverse effects of constructing and operating the Project will be outweighed by the carbon reduction benefits the Project will bring in its contribution to the UK achieving its net zero targets by 2050.

19.10.4 In line with IEMA guidance, the GHG assessment adopts a ‘worst-case' approach and does not take into account the UK’s Transport and Maritime Decarbonisation Plans, which aim for net zero by 2050. Hence, assuming these decarbonisation plans are successfully implemented, the Project will have a considerably smaller carbon footprint by 2050, as these emissions sources represent the majority of the Project’s GHG emissions.

CCR and ICCI Assessment

19.10.5 A number of climate resilience measures have been embedded within the design of the Project as set out in **Section 19.7**. As summarised in **Appendix 19.B**

[TR030008/APP/6.4], residual effects of climate impacts are considered **not significant.**

19.11 Summary of Assessment

GHG Assessment

19.11.1 IEMA criteria have been used to assess the significance of the impact of GHG emissions from the Project. The assessment concluded that the Project has a **beneficial** effect.

19.11.2 The Project's residual emissions will be outweighed by the savings of emissions resulting from the use of low carbon hydrogen energy produced by the Project which aligns with and will contribute to the UK net zero transition scenario.

19.11.3 The Project is anticipated to produce up to 300MW of hydrogen once fully operational at full capacity, the equivalent of up to 9.5 billion MJ per annum. Depending on market demand, it is estimated that this could meet up to 3% of Government's hydrogen production capacity target.

19.11.4 The hydrogen could be used in alternative ways such as displacing natural gas used in industrial processes, all of which are likely to result in similar or higher carbon savings. The ultimate carbon saving will depend on the fossil fuel being displaced. This would mean there is a **significant benefit** to the Project.

19.11.5 Additionally, whilst not taken into account in the assessment, potential use of the jetty for carbon dioxide imports and exports to facilitate carbon capture and storage will also assist the transition towards a net zero trajectory. One hundred and forty-two ships carrying 35,000 tonnes of CO_2 each (i.e. less than 3% of the total shipping assessed in this chapter), would suffice to sequester the overall emissions of the Project including the overall shipping over 25 years and construction of the Project.

CCR Assessment

Construction

19.11.6 A summary of the identified construction phase impacts, the adaptation methods to increase the resilience of the Project and likely effects of climate change on the Project is provided in **Appendix 19.B [TR030008/APP/6.4]**.

19.11.7 While the majority of impacts of climate change on the construction of the Project are considered to have a low to moderate impact prior to the inclusion of mitigation measures, following the addition of embedded and standard mitigation, all impacts from climate change on construction are considered to be **low** and **not significant**.

Operation

19.11.8 A summary of the identified operational phase impacts, the adaptation methods to increase the resilience of the Project and likely effects of climate change on the Project is provided in **Appendix 19.B [TR030008/APP/6.4]**.

19.11.9 While the majority of impacts of climate change on the operation of the Project are considered to have a low to moderate impact prior to the inclusion of mitigation measures, following the addition of mitigation, all impacts from climate change on operations are considered to be **low** and **not significant**.

ICCI Assessment

Construction

19.11.10 **Appendix 19.C [TR030008/APP/6.4]** provides a summary of the identified construction phase impacts and the adaptation methods to increase the resilience of receptors in the surrounding environment to the likely combined effects of climate change and the Project.

19.11.11 While the majority of impacts of climate change on receptors are considered to be low, following the mitigation and good practice measures embedded in the Project, no significant ICCIs have been identified.

Operation

19.11.12 **Appendix 19.C [TR030008/APP/6.4]** provides a summary of the identified operational phase impacts and the adaptation methods to increase the resilience of receptors in the surrounding environment to the likely combined effects of climate change and the Project.

19.11.13 While the majority of impacts of climate change on the receptors are considered to be low, following the mitigation and good practice measures embedded in the Project, no significant ICCIs have been identified.

19.12 References

Ref 19-1 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

Ref 19-2 IEMA (2022). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.

Ref 19-3 IEMA (2020). Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation.

Ref 19-4 UK Government (2021). The Carbon Budget Order 2021.

Ref 19-5 UNFCCC (2016). Conference of the Parties, Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015.

Ref 19-6 Climate Change Act 2008.

Ref 19-7 Climate Change Committee (2020) The Sixth Carbon Budget - The UK's path to Net Zero.

Ref 19-8 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended by The Town and Country Planning and Infrastructure Planning (Environmental Impact Assessment) (Amendment) Regulations 2018).

Ref 19-9 Department for Transport (2012). National Policy Statement for Ports.

Ref 19-10 Ministry of Housing, Communities and Local Government (MHCLG) (2021). National Planning Policy Framework (NPPF).

Ref 19-11 MHCLG (2014, updated March 2019). National Planning Practice Guidance: Climate Change.

Ref 19-12 Department for Transport. (2021b). Decarbonising transport: a better, greener Britain.

Ref 19-13 North East Lincolnshire Council (2016). Environmental Policy Statement.

Ref 19-14 North East Lincolnshire (2021). Net Zero Carbon Roadmap.

Ref 19-15 North East Lincolnshire Council (2021). Natural Assets Plan.

Ref 19-16 Met Office (2020). Historic Climate Data.

Ref 19-17 Met Office (2018b). UKCP18 Guidance: Caveats and limitations.

Ref 19-18 ICE (2023). Guidance Document for PAS 2080.

Ref 19-19 Met Office (2018). UK Climate Projections (UKCP) 2018.

Ref 19-20 World Resources Institute (WRI) & World Business Council for Sustainable Development (WBCSD) (2004). The GHG Protocol: A Corporate Accounting and Reporting Standard.

Ref 19-21 Department for Energy Security and Net Zero (2023). Greenhouse gas reporting: conversion factors 2023.

Ref 19-22 ICE Database (2019). Embodied Carbon.

Ref 19-23 UNFCC (2015). Paris Agreement.

Ref 19-24 IPCC (2018). Global warming of 1.5°C - Special Report.

Ref 19-25 Committee on Climate Change (2017). UK Carbon Budgets.

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Ref 19-27 Department for Environment, Food and Rural Affairs, 2018. A Green Future: Our 25 Year Plan to Improve the Environment, London: UK Government

Ref 19-28 North East Lincolnshire Council (2018). Local Plan 2013 to 2032.

Ref 19-29 International Marine Organization (2023). 2023 IMO strategy on reduction of GHG emissions from ships.

Ref 19-30 Department for Transport, 2023. Renewable Transport Fuel Obligation: Compliance Guidance, London: UK Government.