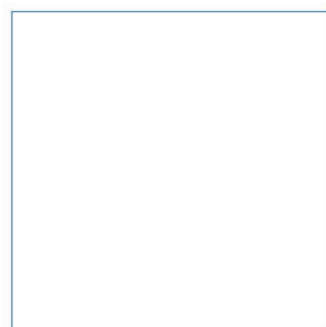
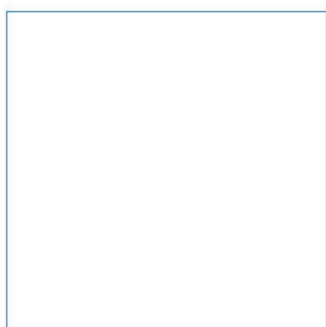
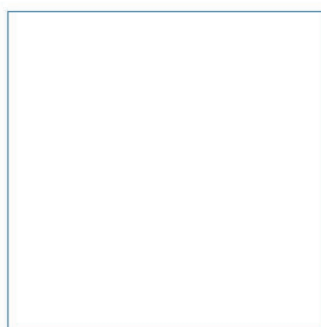


Associated British Ports

Immingham Eastern Ro-Ro Terminal

Preliminary Environmental Information Chapter 19: Climate Change

January 2022



Innovative Thinking - Sustainable Solutions

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Preliminary Environmental Information
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Authors

Aecom

ABPmer

Quayside Suite, Medina Chambers, Town Quay, Southampton, Hampshire SO14 2AQ
T: +44 (0) 2380 711844 W: <http://www.abpmer.co.uk/>

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19 Physical Processes

19.1 Introduction

19.1.1 This chapter provides a preliminary assessment of the potentially significant effects of the proposed Immingham Eastern Ro-Ro Terminal (IERRT) in relation to climate change. This chapter has been prepared by AECOM Ltd.

19.1.2 Consideration of climate change effects is divided into three aspects:

- **Impact of the proposed development on climate (greenhouse gas (GHG) emissions):** considers the impact on the climate of GHG emissions arising from the proposed development during its lifetime, including how the proposed development will affect the ability of the Government to meet its planned carbon reduction targets;
- **Climate change resilience (CCR) review of the proposed development to climate change:** considers climate change risks, possible impacts to the proposed development and embedded design and mitigation measures to mitigate these risks; and
- **In-combination climate change impacts (ICCI):** an assessment of the influence of climate change on the project-related impacts to receptors in the receiving environment.

GHG Impact Assessment

19.1.3 The following receptor has been considered as part of the GHG assessment:

- The global climate is the receptor for the lifecycle GHG impact assessment, with the UK Carbon Budgets being used as a proxy for the climate.

CCR Review

19.1.4 The following receptor has been considered as part of the CCR assessment:

- The receptor for the review of climate change resilience is the proposed development itself, including all infrastructure, assets, and workers on-site during construction and operation.

ICCI Assessment

19.1.5 The receptors of the ICCI assessment include receptors outlined in the Coastal Protection, Flood Defence and Drainage (Chapter 11).

19.2 Definition of the study area

19.2.1 The study area for this assessment is the area over which potential direct and indirect effects of the IERRT project are predicted to occur during the construction and operational periods.

GHG Impact Assessment

19.2.2 Direct GHG emissions arising as a result of land clearance, construction, and operational activity within the boundary of the proposed development will be assessed.

19.2.3 Indirect GHG emissions occurring offsite such as embodied carbon in materials, transportation, waste disposal and vessel emissions within UK waters and international shipping associated with the operation of the proposed development will be assessed.

19.2.4 Directly and indirectly, GHG emissions could compromise the UK's ability to reduce its GHG emissions, in line with international and national future carbon targets. As broadly identified by the climate science community and by the Paris Agreement, which aims to keep global temperature rise this century below two degrees above pre-industrial levels (United Nations Framework Convention on Climate Change (UNFCCC), 2016). Additionally, a recent report by the Intergovernmental Panel on Climate Change (IPCC) highlighted the importance of limiting global warming below 1.5°C (IPCC, 2018).

19.2.5 Potential GHG emissions sources for the lifecycle GHG impact assessment are summarised in Table 19.1

Table 19.1. Potential GHG emissions sources considered for the lifecycle GHG Impact Assessment

Lifecycle stage	Activity	Primary emission sources
Preconstruction	Demolition	Plant emissions from equipment used during the demolition and waste disposal emissions
	Land Clearance	Land clearance is expected to have an insignificant impact on the overall emissions from the proposed development as there is minimal natural vegetation being removed
	Enabling works	Emissions associated with dredging activities
Construction	Materials	Embodied carbon in materials
	Transport of Materials	Emissions from fuel combusted in vehicles/plant
	Fuel use	GHG emissions from fuel consumed by construction vehicles and plant use.
	Commuting	GHG emissions arising from the fuel used by vehicles transporting workers to the construction site.

Lifecycle stage	Activity	Primary emission sources
	Waste	Emissions arising from the treatment of waste.
	Transport of waste	Emissions arising from the transportation of the waste to the place of treatment.
Operation	Commuting	GHG emissions arising from the fuel used by vehicles transporting workers to the operational site
	Fuel use	GHG emissions from grid electricity use during operation. GHG emissions from fuel consumed by operational vehicles and plant use.
	Water & Wastewater	GHG emissions from the provision and treatment of water.
	Vessels	Vessel emissions associated with the Project
	Maintenance	Emissions from maintenance during the operational stage are likely to be minimal in proportion to the overall proposed development GHG footprint
	Vehicle use	Operational emissions from vehicle use associated with the operational phase of the Project.
	Waste	Emissions arising from the treatment of waste.
	Waste Transportation	Emissions arising from the transportation of the waste to the place of treatment.

19.2.6 Factors that affect the extent of the study area include vessel shipments during the operation of the IERRT, which will be considered in the GHG impact assessment.

CCR Review and ICCI Assessment

19.2.7 The proposed development's resilience to climate change was considered within the proposed development boundary across the timeframe of the project (from construction through to operation).

19.2.8 The climate's direct effects include damage to assets as a result of projected climate change, and the associated costs in terms of loss of time, loss of function, repairs, etc.

19.2.9 The indirect effects include climate change impacts to supply chains, potable water supply and 3rd party energy providers, which may impact the project resulting in operational downtime resulting in monetary loss.

19.2.10 The summary of climate parameters assessed in the CCR and ICCI are detailed in Table 19.2.

Table 19.2. Climatic parameters Considered for the CCR Review and ICCI Assessment

Climatic Parameter	In Scope of the CCR?	In Scope of the ICCI?	Rationale for inclusion
Extreme weather events	Yes	Yes	The proposed development may be vulnerable to extreme weather events such as storm damage to structures and assets.
Temperature	Yes	No	Increased temperatures may increase the cooling requirements of the proposed development and could impact the structural integrity of infrastructure and affect safe working conditions for site workers.
Sea-level rise	Yes	Yes	The proposed development could be vulnerable to sea-level rise, causing damage to assets and infrastructure.
Precipitation	No	Yes	The proposed development may be vulnerable to changes in precipitation, for example, pressure on water supply during periods of reduced rainfall and damage to structures and drainage systems during periods of heavy precipitation.

19.3 Assessment methodology

Data and information sources

- 19.3.1 A desk-based review of available information has determined current baseline conditions. A project-specific survey was not required for the climate assessment.
- 19.3.2 The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the proposed development include:
- Historical climate data obtained from the Met Office;
 - UK Climate Projections 2018 (UKCP18) (Met Office, 2018a);
 - Clean Maritime Plan (Department for Transport (DfT), 2019); and
 - Associated British Ports (ABP) Climate Change Adaptation Report (ABP, 2016).

Determining significance of effects

GHG Impact Assessment

- 19.3.3 Construction and operational data were being assembled but were not available at the Preliminary Environmental Information Report (PEIR) stage. Therefore, a qualitative approach to assessing the GHG impacts was

followed according to the Institute of Environmental Management and Assessment (IEMA) guidance (2017). Due to the unavailability of data at this stage, the GHG emissions cannot yet be quantified. Thus, the significance of the effect of the proposed development on the climate cannot be identified at this stage. A quantitative GHG impact assessment will be undertaken for the Environmental Statement (ES).

- 19.3.4 At the ES stage, when construction data and operational information is available, the GHG emissions will be calculated in line with Publicly Available Specification (PAS) 2080 (British Standards Institute (BSI), 2016) and the GHG protocol methodology, which is consistent with guidance from a range of sources, including IEMA guidance (IEMA, 2017), World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) GHG Protocol guidelines (WBCSD/ WRI, 2013).
- 19.3.5 The GHG impact assessment will take a project lifecycle approach that will identify GHG emissions hotspots (i.e. emissions sources likely to generate the largest amount of GHG emissions) and correspondingly enable the identification of priority areas for mitigation. This approach is consistent with the principles set out in IEMA guidance (IEMA, 2017).
- 19.3.6 In line with the WBCSD and WRI GHG Protocol guidelines (WBCSD/ WRI, 2013), the lifecycle GHG impact assessment will be reported as tonnes of carbon dioxide equivalent (tCO₂e) and has considered the seven Kyoto Protocol gases:
- Carbon dioxide (CO₂);
 - Methane (CH₄);
 - Nitrous oxide (N₂O);
 - Sulphur hexafluoride (SF₆);
 - Hydrofluorocarbons (HFCs);
 - Perfluorocarbons (PFCs); and
 - Nitrogen Trifluoride (NF₃).
- 19.3.7 IEMA (2017) recommends that local, sectoral, or national carbon budgets are used to contextualise emissions. The GHG emissions will be contextualised against the UK carbon budget in the absence of local or sectoral carbon budgets. Table 19.3. shows UK's carbon budgets up to 2037 (UK Government, 2021). The effect of GHG emissions from the proposed development on the global climate will be assessed in terms of the contribution of the emissions to these budgets and whether they will impact these budgets being met.

Table 19.3. Relevant carbon budgets

Carbon budget	National Carbon budget (MtCO ₂ e)
3 rd (2018-2022)	2,544
4 th (2023-2027)	1,950
5 th (2028-2032)	1,725
6 th (2033-2037)	965

- 19.3.8 There is currently no published standard definition for receptor sensitivity of GHG emissions. All GHG emissions are classed as being capable of being significant on the basis that all emissions contribute to climate change (IEMA, 2017). The global climate has been identified as the receptor for the purposes of the GHG assessment. The sensitivity of the climate to GHG emissions is considered to be 'high'. The rationale supporting this includes:
- GHG emission impacts could compromise the UK's ability to reduce its GHG emissions, in line with international and national future carbon targets; and
 - The need to reduce GHG emissions to reduce the risks and impacts of climate change, as broadly identified by the climate science community and the Paris Agreement, aims to keep global temperature rise this century below two degrees above pre-industrial levels (UNFCCC, 2016). Additionally, a recent report by the IPCC highlighted the importance of limiting global warming below 1.5 °C (IPCC, 2018).
- 19.3.9 Specification (BSI, 2012) allows emissions sources of <1 % contribution to be excluded from emission inventories, and these inventories to still be considered complete for verification purposes. This exclusion of emission sources that are <1 % of a given emissions inventory is on the basis of a 'de minimis' (relatively minimal) contribution. On this basis, where GHG emissions from the proposed development are equal to or more than 1 % of the relevant UK Carbon Budget, the effect of the proposed development on the climate is considered to be of major significance. This is summarised in Table 19.4.

Table 19.4. Significance criteria for the GHG emissions impact assessment

Significance	Magnitude Criteria
Major adverse	GHG emissions represent an increase of equal to or more than 1 % of total emissions from the relevant 5-year UK carbon budget in which they arise
Minor adverse	GHG emissions represent an increase of less than 1 % of total emissions from the relevant 5-year UK carbon budget in which they arise
Major beneficial	GHG emissions represent a reduction of equal to or more than 1 % of total emissions from the relevant 5-year UK carbon budget in which they arise
Minor beneficial	GHG emissions represent a reduction of equal to or more than 1 % of total emissions from the relevant 5-year UK carbon budget, which they arise

CCR Review and ICCI Assessment

- 19.3.10 The CCR review and ICCI assessment have qualitatively reviewed the proposed development's resilience (including the proposed design mitigation measures) to climate change. This has been completed in liaison with the project design team and other Environmental Impact Assessment (EIA)

technical disciplines, considering the UKCP18 (Met Office, 2018a) projections for the geographical location and timeframe of the proposed development (from construction through to operation).

- 19.3.11 The risks associated with a climate variable have been evaluated through understanding the associated likely impact, the tolerable risk threshold, the sensitivity of the risk assessment (i.e. would using different climate change scenarios change the hazards), and highlighting areas where risks are unacceptable.

19.4 Consultation

- 19.4.1 The comments received as part of the scoping exercise are summarised in Table 19.5. These comments have been taken into account in the chapter of the PEIR and will be used to inform the final ES, as may be supplemented by such consultation with external bodies as may be required.

Table 19.5. Summary of consultation to date

Consultee	Reference, Date	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate (PINS)	Scoping Opinion, October 2021 Table ID 4.15.1	The Inspectorate agrees that greenhouse gas (GHG) emissions from pre-construction activities can be scoped out of further assessment; if the situation changes or if the development consent order (DCO) would allow pre-construction activities, then the ES should include the emissions from these activities.	Further information will be presented in the ES.
PINS	Scoping Opinion, October 2021 Table ID 4.15.2	The ES should include an assessment of GHG emissions from maintenance works or further justification that the works are likely to give rise to minimal GHG emissions.	Further information will be presented in the ES.
PINS	Scoping Opinion, October 2021 Table ID 4.15.3	It is not clear to the Inspectorate if the Proposed Development would have a fixed life and would be decommissioned at the end of its life.	Decommissioning will be clarified in the ES.

Consultee	Reference, Date	Summary of Response	How comments have been addressed in this chapter
		If the DCO makes provision for the decommissioning of the Proposed Development then the ES should provide an assessment of the associated GHG emissions.	
PINS	Scoping Opinion, October 2021 Table ID 4.15.4	In light of the duration of operation and predicted increases in future storm frequency, intensity and precipitation, the Inspectorate considers that impacts of precipitation and wind should be addressed in the ES.	Precipitation will be addressed in the ES. In the UKCP18 Wind Factsheet, the Met Office states (Met Office, 2020): “ <i>There are no compelling trends in storminess, as determined by maximum gust speeds, from the UK wind network over the last four decades.</i> ” and “ <i>Wind speed is not available for the probabilistic projections as they did not pass our credibility checks.</i> ” While reference could be made to the winter wind speed anomaly data from the 12 km land projections dataset, the climate models do not show any clear trends. Due to this uncertainty, projected wind speed cannot be addressed in the ES.
PINS	Scoping Opinion, October 2021	The ES should include an assessment of exclusion of temperature and wind parameters from the in-combination climate change impact (ICCI) assessment, or	Temperature will be considered in the ES as part of the ICCI.

Consultee	Reference, Date	Summary of Response	How comments have been addressed in this chapter
	Table ID 4.15.5	the information referred to demonstrating agreement with the relevant consultation bodies and the absence of a likely significant effect.	As noted on the row above, as the climate models do not show any clear trends, projected wind speed cannot be addressed in the ES.
PINS	Scoping Opinion, October 2021 Table ID 4.15.6	The Scoping Report states that ICCI assessment has been scoped out of the climate change chapter on the grounds that any identified ICCIs would be addressed in the coastal protection, flood defence and drainage chapter. The Inspectorate agrees with this approach but advises that the other relevant sections of the ES should be signposted in this chapter.	Signposting will be provided in the ES chapter.
PINS	Scoping Opinion, October 2021 Table ID 4.15.7	The ES should consider emissions from Heavy goods Vehicle (HGV) or rail movements to and from the proposed development site or provide a justification as to why a likely significant effect would not arise. The Inspectorate recognises that definition of the study area may be problematic but suggests that the assessment should consider the number of new or lengthened movements on the road and rail networks which can be attributed to the Proposed Development.	HGV and railway movements were not scoped out of the chapter and will be considered in the ES.
Natural England	Appendix 2 Natural England response	The England Biodiversity Strategy published by Defra establishes principles for the consideration of biodiversity and the effects of climate change.	This will be taken into consideration in the Preliminary Ecological Appraisal at Appendix 6.1 in the PEIR.

Consultee	Reference, Date	Summary of Response	How comments have been addressed in this chapter
		<p>The ES should reflect these principles and identify how the development's effects on the natural environment will be influenced by climate change, and how ecological networks will be maintained. The National Planning Policy Framework (NPPF) requires that the planning system should contribute to the enhancement of the natural environment '<i>by establishing coherent ecological networks that are more resilient to current and future pressures</i>' (NPPF Para 174), which should be demonstrated through the ES.</p>	

19.5 Implications of policy legislation and guidance

19.5.1 This section of the chapter sets out key aspects and implications of policy and guidance relevant to the assessment of likely impacts on the climate. It builds upon the overarching chapter covering the Legislative and Consenting Framework (Chapter 5). This will be kept under review as the assessment progresses.

International legislation

United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement

19.5.2 The Paris Agreement is a legally binding agreement within the UNFCCC dealing with GHG emissions mitigation, adaptation and finance starting in the year 2020. It requires all signatories to strengthen their climate change mitigation efforts to keep global warming to well below 2 °C this century and to pursue efforts to limit global warming to 1.5 °C (UNFCCC, 2016).

UK legislation and regulation

EIA Regulations

19.5.3 The EIA Directive still applies to UK law through the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018 (SI 2018/1232). The EIA Directive 2011/52/EU sets out

the requirement to undertake an EIA. Directive 2011/52/EU was amended by Directive 2014/92/EU. The amendments included the introduction of an express requirement to describe the likely significant effects resulting from the impact of a development on climate change. The amendment also requires the vulnerability of the proposed development to climate change to be considered.

Climate Change Act 2008/ Climate Change Act (2050 Target Amendment)

- 19.5.4 In June 2019, the Climate Change Act was amended, requiring the government to reduce the UK's net emissions of GHGs by 100 % (net zero) relative to 1990 levels by 2050 (UK Government, 2021).
- 19.5.5 The sixth Carbon Budget, the first to align with the amended carbon reduction target, was published by the Climate Change Committee for consideration by the government in November 2020. In April 2021, the government accepted the Climate Change Committee's 965 MTCO_{2e} recommendation and laid the Carbon Budget Order 2021 before parliament. The new target was enshrined in law at the end of June 2021 (Committee on Climate Change, 2020).

National policy

The National Policy Statement for Ports (NPSfP)

- 19.5.6 The National Policy Statement for Ports (NPSfP) is part of the planning system established under the 2008 Act to deal with nationally significant infrastructure proposals. It is a National Policy Statement and provides the framework for decisions on proposals for new port development. It is also a relevant consideration for the Marine Management Organisation, established in the Marine and Coastal Access Act 2009, which decides other port development proposals, and for local planning authorities where they have a role to play. In paragraph 3.3.3 the NPSfP planning policy sets out *"in order to help meet the requirements of the Government's policies on sustainable development, new port infrastructure should also: minimise emissions of greenhouse gases from port related development and be adapted to the impacts of climate change"* (DfT, 2012).

National Planning Policy Framework (NPPF)

- 19.5.7 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England. Policies of relevance to climate change and sustainability assessment presented include those relating to achieving sustainable development and meeting the challenge of climate change. Paragraph 152 of the NPPF states that: *"the planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk.... It should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support*

renewable and low carbon energy and associated infrastructure” (Ministry for Housing, Communities and Local Government (MHCLG), 2021).

Transport Decarbonisation Plan, Decarbonising Transport: a better, greener Britain

- 19.5.8 The Transport Decarbonisation Plan (DfT, 2021) sets out the government’s commitments and actions needed to decarbonise the transport system in the UK before 2050. The Plan expands the government commitments to reduce and remove fossil fuels from road transport and set phase-out dates for every type of new fossil-fuelled road vehicle, including maritime vehicles.
- 19.5.9 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 in 2022, followed by strategy ‘Course to Zero’; also planned review and refresh in 22 of Clean Maritime Plan (DfT, 2019).

Local policy

North East Lincolnshire Local Plan

- 19.5.10 The North East Lincolnshire Local Plan, adopted in 2018 (North East Lincolnshire Council, 2018), provides a spatial vision for North East Lincolnshire with strategic objectives and a development strategy.
- 19.5.11 On paragraph 3.5 the Plan outlines that The Humber Estuary is promoted as *“the UK’s energy estuary and particularly as a focus for renewable energy”* and that (paragraph 12.104) *“the presence of the port, combined with the Borough’s infrastructure network associated with a long history of industry and energy production provides excellent foundations for a range of onshore renewable energy technologies to continue to be developed”*.
- 19.5.12 On page 71 in the North East Lincolnshire Local Plan the S02 Climate Change policy seeks to: *“Address the causes and effects of climate change by promoting development that minimises natural resources and energy use; reduces waste and encourage recycling; reduces pollution; brings about opportunities for sustainable transport use; responds to increasing flood risk; and, incorporates sustainable construction practices. Promote appropriate distribution of development and the role of green infrastructure in mitigating aspects of flood risk. Recognise the increased stress on habitats and species that climate change causes.”*

19.6 Preliminary description of the existing environment

GHG Impact Assessment

- 19.6.1 For the purpose of assessment of the GHG emissions, the baseline is a ‘business as usual’ scenario where the proposed development does not go ahead. The baseline comprises existing carbon stock and sources of GHG emissions within the boundary of the existing site activities.

CCR Review and ICCI Assessment

19.6.2 The existing baseline for the CCR review and ICCI assessment is based upon historical climate data obtained from the Met Office recorded by the closest meteorological station to the proposed development (Cleethorpes; 8 miles from the proposed development) for the period 1981-2010 (Table 19.6.Table 19.6).

Table 19.6. Historical Climate Data for climate station: Cleethorpes, 1981-2010 (Met Office, 2021)

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	7.4
Mean annual rainfall levels (mm)	-	587.9
Wettest month on average (mm)	November	60.2
Driest month on average (mm)	February	38

19.7 Future baseline environment

GHG Impact Assessment

19.7.1 The future baseline for the assessment of the impact of the proposed development on climate is a 'business as usual' scenario where the proposed development is not constructed.

CCR Review and ICCI Assessment

19.7.2 UKCP18 provides probabilistic climate change projections for pre-defined 30-year periods for annual, seasonal, and monthly changes to mean climatic conditions over land areas. The future baseline is expected to differ from the present-day baseline described above. For the purpose of the assessment, UKCP18 probabilistic projections for pre-defined 30-year periods for the following average climate variables were obtained and have been further analysed:

- Mean winter temperature;
- Maximum summer temperature;
- Minimum winter temperature;
- Extreme weather events and; and
- Sea level rise.

19.7.3 UKCP18 probabilistic projections for precipitation was taken into account as part of the climate change allowances to be made within the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11).

19.7.4 Projected temperature variables are presented in Table 19.7. UKCP18 probabilistic projections have been analysed for the 25 km² grid square within which the site is located. These figures are expressed as temperature anomalies in relation to the 1981-2010 baseline data.

- 19.7.5 UKCP18 uses a range of possible scenarios, classified as Representative Concentration Pathways (RCPs), to inform differing future emission trends. These RCPs “...specify the concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to preindustrial levels.” RCP8.5 has been used for the purposes of this assessment, which represents a high emissions scenario.
- 19.7.6 As the design life of the proposed development is assumed to be at least 50 years, the CCR assessment has considered a scenario that reflects a high level of GHG emissions at the 10 %, 50 % and 90 % probability levels up to the ‘2070’s time period (2060 to 2089, as defined by UKCP18) to assess the impact of climate change over the lifetime of the site.

Table 19.7. Projected changes in temperature variables (°C)

Climatic Variable	Time Period	
	2020-2049	2060-2089
Mean annual air temperature anomaly at 1.5 m (°C)	+1.0 (+0.4 to +1.7)	+2.8 (+1.4 to +4.3)
Mean summer air temperature anomaly at 1.5 m (°C)	+1.2 (+0.5 to +2.0)	+3.4 (+1.4 to +5.5)
Mean winter air temperature anomaly at 1.5 m (°C)	+0.9 (+0.0 to +2.0)	+2.5 (+0.8 to +4.2)
Maximum summer air temperature anomaly at 1.5 m (°C)	+1.3 (+0.4 to +2.3)	+3.0 (+1.4 to +4.6)
Minimum winter air temperature anomaly at 1.5 m (°C)	+0.9 (-0.1 to +2.0)	+2.5 (+0.7 to +4.4)

- 19.7.7 Given an assumed design life of 50 years from 2023, using the latest UKCP18 relative sea-level research and assuming an RCP8.5 95 % percentile scenario, the sea level is projected to increase by 0.52 m by 2073 (Met Office, 2018a). Projected increases in sea level rise are taken into account as part of the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11).
- 19.7.8 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 any changes (Met Office, 2018b). Under these assumptions in this PEIR assessment, it is considered that extreme weather will become more frequent. Projected increases in the frequency of extreme weather events are taken into account as part of the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11).
- 19.7.9 Wind was scoped out of the assessment. In the UKCP18 Wind Factsheet (Met Office, 2020), the Met Office states: “There are no compelling trends in storminess, as determined by maximum gust speeds, from the UK wind network over the last four decades.” and “Wind speed is not available for the probabilistic projections as they did not pass our credibility checks.” While reference could be made to the winter wind speed anomaly data from the

12 km land projections dataset, the climate models do not show any clear trends.

- 19.7.10 UKCP18 predicts the UK can expect an increase in the frequency and severity of long-term droughts, with droughts at least as severe as seen in 2010 with the number of droughts increasing by 146 %, at a 4.0 °C level of global warming.

19.8 Preliminary Consideration of Likely Impacts and Effects

GHG Impact Assessment

- 19.8.1 This section qualitatively outlines the likely potential effects on the GHG emission receptors from construction and subsequent operation of the IERRT project, which were assumed at this preliminary stage based on average industry data and generic information.
- 19.8.2 Due to the early concept design of the proposed development at this stage of writing the PEIR, no GHG emission calculations have yet been undertaken but these will be presented in the ES when more construction and operational data is available. Therefore, the GHG assessment was based upon qualitative statements in line with the GHG Protocol guidelines (WBCSD/ WRI, 2013).
- 19.8.3 Climate change is inherently cumulative as the global climate receptor. The approach to the cumulative effects assessment is explained further in Chapter 20 of this PEIR.

Construction phase

- 19.8.4 Due to the concept design for the proposed development being at the early stage, there has been no data available to undertake the calculation of GHG emissions to date. In order to assess the magnitude of the impact of the proposed development on the climate, GHG emissions associated with the construction of the proposed development will be calculated and presented in the ES. Embodied emissions from the construction phase are likely to contribute only a small proportion of overall lifetime emissions for the proposed development. The operational phase is expected to make up a large majority of whole life emissions.
- 19.8.5 Construction emissions will be calculated in line with the PAS2080 lifecycle approach and the GHG protocol methodology in the final ES across the following lifecycle stages:
- Demolition;
 - Land clearance;
 - Enabling works;
 - Products;
 - Transport of products;

- Fuel use / energy consumption;
- Water consumption and wastewater treatment;
- Transportation of workers;
- Freight and Vessel Transport; and
- Waste.

Operational phase

- 19.8.6 This section contains a qualitative assessment of the potential impacts to the climate as a result of the operational phase of the IERRT project. The following impact pathways will be assessed in the final ES across the following PAS2080 lifecycle stages:
- Fuel use/ energy consumption;
 - Water consumption and wastewater treatment;
 - Transportation of workers;
 - Freight and vessel transport; and
 - Waste – emissions related to waste production during the operational phase.
- 19.8.7 The proposed development will service the embarkation and disembarkation of principally wheeled cargo taken on or off a Ro-Ro vessel usually by its stern ramp, together with provision for a small element of passengers. Therefore, it is expected that the major source of GHG emissions arising from the proposed development will be the freight and vessel transport within UK waters and international shipping. However, the UK's share of international aviation and shipping emissions has been only incorporated into the sixth carbon budget for years 2033-37 (UK Government, 2021). Therefore, GHG emissions arising from international shipping will be calculated in ES from 2033 onwards.
- 19.8.8 The proposed development will be designed to allow ships to plug into the port's electrical infrastructure for power while at the berth. Therefore, GHG emissions arising from electricity use are likely to have a significant contribution to the overall GHG emissions from the proposed development. Calculations for the ES will incorporate a forecast of the grid decarbonisation, meaning that the GHG emissions from electricity use will reduce per kilowatt-hour (kWh).
- 19.8.9 The proposed development will also include a number of buildings, which will be a source of GHG emissions arising from energy consumption, water consumption and wastewater treatment and waste treatment.
- 19.8.10 Other emissions will arise from the transportation of workers and maintenance activities, although they are likely to contribute a small proportion of overall lifetime emissions for the proposed development.
- 19.8.11 Although GHG emissions arising from the proposed development have not been quantified for this PEIR, the proposed development will likely increase GHG emissions in comparison to the existing baseline.

Overall significance of effect (construction and operation)

- 19.8.12 All GHG emissions are classed as being capable of being significant on the basis that all emissions contribute to climate change (IEMA, 2017).
- 19.8.13 The assessment of GHG emissions in the ES will quantify the magnitude of a proposed development's emissions and put these into context against national and sectoral carbon budgets to assess their significance.

CCR Review

- 19.8.14 This section identifies the likely potential effects of climate change on the proposed development during its construction and subsequent operation that have been identified at this preliminary stage.
- 19.8.15 A full technical assessment of the site's vulnerability to sea-level rise, extreme weather events and intense precipitation is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11).
- 19.8.16 As the CCR review is only concerned with the assets of the proposed development and the broader consideration of existing interdependent infrastructure, a cumulative assessment is not required.

Construction phase

- 19.8.17 This section contains an assessment of the potential climate change impacts to the proposed development during its construction. The following impact pathways have been assessed:
- Inaccessibility to the site;
 - Health and safety risks;
 - Unsuitable site conditions; and
 - Damage to construction materials, plant equipment, assets, and infrastructure.

Inaccessibility to site

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

Health and safety risks

- 19.8.19 Construction workers' health and safety would be at risk during extreme weather events, potentially resulting in severe injury and/ or death under a worst-case scenario.

Unsuitable site conditions

- 19.8.20 Under the RCP8.5 scenario, year-round temperatures are projected to increase, resulting in higher peak temperatures. The higher peak temperatures, particularly in the summer, could potentially create unsuitable working conditions for construction site workers and plant equipment to operate in.

Damage to construction materials, plant and equipment, assets, and infrastructure

- 19.8.21 Increased risk of extreme weather events and heatwaves could potentially damage construction materials, plant equipment, assets, and infrastructure. A full technical assessment of the site's risks to extreme weather events is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11).
- 19.8.22 Under the assumption that the construction phase is completed by mid-2025, sea-level rise is forecasted to be marginal across this time period under the RCP8.5 scenario. Therefore, sea-level rise is not expected to impact the construction phase of this project. Further consideration of the site's risks to sea level rise is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11).

Operational phase

- 19.8.23 This section contains an assessment of the potential climate change impacts to the proposed development during its operation. The following impact pathways have been assessed:

- Inaccessibility to the site;
- Health and safety risks;
- Unsuitable site conditions;
- Damage to construction materials, plant equipment, assets, and infrastructure; and
- Increased operational cooling requirements.

Inaccessibility to site

- 19.8.24 During the project's operational phase, extreme weather events could impact the site's accessibility, which could restrict working hours and interrupt the operational schedule.

Health and safety risks

- 19.8.25 Operational workers health and safety would be at risk during extreme weather events, potentially resulting in severe injury and/ or death under a worst-case scenario.

Unsuitable site conditions

- 19.8.26 Under the RCP8.5 scenario, year-round temperatures are projected to increase, resulting in higher peak temperatures. The higher peak temperatures, particularly in the summer, could potentially create unsuitable working conditions for operational site workers, plant, and equipment to operate in.

Damage to floating assets, plant and equipment, land-assets, and infrastructure

- 19.8.27 Increased risk of extreme weather events could potentially cause damage to structures (e.g. jetties, breakwaters, buildings) and damage to land-based infrastructure, transport, and floating assets. Furthermore, extreme weather events could cause disruption to power and water services which may

impact the operation of the port. Additionally, extreme weather events could cause timetabling delays because of the greater incidence of unsafe navigational conditions, which may cause further financial costs. The port might suffer reputational damage due to damage to floating assets docking at the port during an extreme weather event. Additionally, the increased frequency of extreme weather events might increase the requirement for dredging and maintenance, leading to additional costs. The Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) provides further consideration of the proposed development's risks to extreme weather events.

- 19.8.28 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.
- 19.8.29 Sea-level rise projections for the future are uncertain and largely dependent upon changes in human GHG emissions. A full technical assessment of the risk of the proposed development to sea-level rise is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11).

Increased operational cooling requirements

- 19.8.30 Higher year-round temperatures could increase operational cooling requirements for operational vessels, plant equipment and infrastructure.
- 19.8.31 Increased risk of droughts could potentially impact the proposed development's operational requirements where fresh water is required.

ICCI Assessment

- 19.8.32 This section identifies the likely potential ICCI on the proposed development as a result of its construction and subsequent operation that have been identified at this preliminary stage.
- 19.8.33 This assessment has been conducted through liaison with the various disciplines assessed in the PEIR to understand climate change's potential impacts and effects on the identified receptors in the IERRT project as summarised in Table 19.8.
- 19.8.34 As the ICCI assessment is only concerned with the assets of the proposed development and the broader consideration of existing interdependent infrastructure, a cumulative assessment is not required.

Table 19.8. ICCI Assessment likely impacts table

Receptors	Climate event	Impact (climate event and hazard occurring together)
Coastal Protection, Flood Defence & Drainage	Rising sea level	Increase in frequency and severity of flood events in the future. Low frequency return period flood events today expected to become regular events in the future as higher sea levels will increase annual probability of coastal flood events occurring.
Coastal Protection, Flood Defence & Drainage	Increase frequency in severe weather events (e.g. storms)	Increased risk of joint probability events (e.g. coincidence of high river flows, high sea levels and heavy rainfall events) in the future as sea levels rise and severe weather events become more frequent.
Coastal Protection, Flood Defence & Drainage	Storm surge risk	Potential for changes in the severity of future storm surges. However, the latest UKCP18 modelling suggests a relatively small contribution from storm surge changes and it is not yet known whether storm surges will become more severe, less severe or remain the same (Met Office, 2018a). However, combined with sea level rise, storm surges are expected to lead to an increase in frequency and magnitude of flooding. Low frequency return period flood events related to storm surge today are expected to become regular events in the future as higher sea levels will increase annual probability of events occurring.
Coastal Protection, Flood Defence & Drainage	Increased frequency of heavy precipitation events	Climate change can increase the intensity and frequency of precipitation. Warmer oceans increase the amount of water that evaporates into the air. When more moisture-laden air moves over land or converges into a storm system, it can produce more intense precipitation (Met Office, 2018a).

19.9 Mitigation measures

GHG Impact Assessment

19.9.1 Mitigation measures under consideration include the provision of shoreside electrical power to ships at berth, electric vehicle charging points, electric tugs for shunting, and electric reefer gantry chargers.

CCR Review and ICCI Assessment

19.9.2 Mitigation measures included to reduce the significance of climate change effects are summarised in Table 19.9.

Table 19.9. CCR Review and ICCI Assessment Mitigation Measures

Climate event	Mitigation Measures built into the Proposed Development
Rising sea-level	Coastal defences to be constructed considering projected sea-level rises in the future using the latest industry guidance for sea-level rise projections.
Increased frequency in severe weather events (e.g. storms)	Drainage Strategy to be prepared taking account of the flood risk assessment's findings to ensure that surcharged levels within collector, carrier and receiving systems are appropriately designed and mitigated. Drainage Strategy to also consider tide-lock scenarios at flapped outfalls.
Storm surge risk	Coastal defences to be constructed considering projected storm surge changes in the future using the latest industry guidance.
Increased frequency of heavy precipitation events	Drainage Strategy to be prepared considering the projected increase in peak rainfall intensity allowances using the latest industry guidance (note: allowances may be updated in 2021 based on recently published UKCP Local data).
Increasing average temperatures and increasing frequency of hot days and heatwaves	Prevention measures and health and safety plans to be developed to prevent worker exhaustion due to heat. Use of materials with superior properties which offer increased tolerance to high temperatures to be considered. Regular maintenance of assets to be undertaken to detect deterioration and damage. All new buildings and assets will either be designed for the climatic conditions projected for the end of their design life, using appropriate design guidance where available, or adaptive capacity will be built into the designs.
Increased drought risk	Consideration of drought risk contingency plans.

19.10 Limitations

GHG Impact Assessment

19.10.1 Due to the early concept design of the proposed development at this stage of writing the PEIR, no GHG emission calculations have yet been undertaken. A quantitative GHG impact will be calculated in the ES when more construction and operational data is available. Therefore, the GHG assessment was based upon qualitative statements in line with the GHG Protocol guidelines (WBCSD/ WRI, 2013).

CCR Review and ICCI Assessment

19.10.2 The CCR review and ICCI assessment were based upon UKCP18 projections over the construction and operational period of the proposed development. UKCP18 projections comprise a range of uncertainties and caveats, as detailed at Met Office (2018b).

19.10.3 Furthermore, the emissions scenario for the future climate is also uncertain since the world's emissions will determine this. Thus, a RCP8.5 high emissions scenario has been considered for this assessment to try and determine a business-as-usual scenario, which may not accurately represent the future climate.

19.11 Preliminary Conclusions on Residual Effects

GHG Impact Assessment

19.11.1 Emissions arising from the proposed development have not yet been quantified. However, the proposed development will likely increase GHG emissions in comparison to the existing baseline.

19.11.2 Following IEMA (2017) guidance, it is considered that all GHG emissions are classed as being capable of being significant on the basis that all emissions contribute to climate change (IEMA, 2017).

19.11.3 The assessment of GHG emissions in the ES will quantify the magnitude of the proposed development's emissions and put these into context against national and sectoral carbon budgets to assess their significance.

CCR Review

19.11.4 A summary of the impact pathways that have been assessed, the identified residual effects and the level of confidence is presented in Table 19.10.

19.11.5 The proposed development has followed the latest industry guidance on mitigation measures for sea-level rise, coastal flooding and drainage strategy as further detailed in the Coastal Protection, Food Defence and Drainage Chapter (Chapter 11).

19.11.6 The proposed development has considered the implementation of heat and drought mitigation measures through building design and operational methods.

19.11.7 A potentially major adverse effect for the proposed development was identified from climate hazard risks to operational plant equipment, assets, and infrastructure. Climate change is expected to increase the risk of the proposed development to climate hazards, with the greatest risk present during the operational lifecycle stage. However, as the confidence around the certainty of the climate hazard impact is low, and there is a low probability chance for a catastrophic climate scenario, the current mitigation measures may not be sufficient due to the lack of adaptive capacity design measures. Therefore, the residual effect on the proposed development remains the same with the proposed mitigation measures in place.

Table 19.10. CCR Review - summary of potential impact, mitigation measures and residual impacts

Receptor	Impact pathway	Effect Significance	Mitigation measure	Residual Effect	Confidence
Construction Phase					
The proposed development	Inaccessibility to site	Minor adverse	Drainage Strategy	Minor adverse	Low
	Health and safety risks	Minor adverse	Coastal defences	Minor adverse	Low
	Unsuitable site conditions	Minor adverse	Prevention measures and health plans to prevent worker heat exhaustion	Minor adverse	Low
	Damage to construction materials, plant equipment, assets, and infrastructure	Moderate adverse	Coastal defences and Drainage Strategy	Moderate adverse	Low
Operational Phase					
The proposed development	Inaccessibility to site	Minor adverse	Drainage Strategy	Minor adverse	Low
	Health and safety risks	Minor adverse	Coastal defences	Minor adverse	Low
	Unsuitable site conditions	Moderate adverse	Prevention measures and health plans to prevent worker heat exhaustion	Moderate adverse	Low
	Damage to operational plant equipment, assets, and infrastructure	Major adverse	Coastal defences and Drainage Strategy	Major adverse	Low
	Increased operational cooling requirements	Moderate adverse	New buildings and assets will either be designed for the climatic conditions projected for the end of their design life, using appropriate design guidance where available or adaptive capacity will be built into the designs	Moderate adverse	Low

ICCI Assessment

- 19.11.8 A summary of the impact pathways that have been assessed, the identified residual impacts and the level of confidence is presented in Table 19.11.
- 19.11.9 The proposed development has followed the latest industry guidance on mitigation measures for sea-level rise, coastal flooding and drainage strategy as further detailed in the Coastal Protection, Food Defence and Drainage chapter (Chapter 11).
- 19.11.10 Climate change is expected to increase the risk of the proposed development to climate hazards, with the greatest risk present during the operational life cycle stage.
- 19.11.11 As the confidence around the certainty of the climate hazards is low, the residual impact on the proposed development remains the same.

Table 19.11. ICCI Assessment - Summary of potential effects, mitigation measures and residual effects

Receptor	Impact pathway	Effect Significance	Mitigation measure	Residual Effect	Confidence
Construction Phase					
Coastal Protection, Flood Defence & Drainage	Rising sea level	Moderate adverse	Coastal defences	Moderate adverse	Low
	Increase frequency in severe weather events (e.g. storms)	Moderate adverse	Drainage Strategy	Moderate adverse	Low
	Storm surge risk	Moderate adverse	Coastal defences	Moderate adverse	Low
	Increased frequency of heavy precipitation events	Moderate adverse	Drainage Strategy	Moderate adverse	Low
Operational Phase					
Coastal Protection, Flood Defence & Drainage	Rising sea level	Major adverse	Coastal defences	Major adverse	Low
	Increase frequency in severe weather events (e.g. storms)	Major adverse	Drainage Strategy	Major adverse	Low
	Storm surge risk	Major adverse	Coastal defences	Major adverse	Low
	Increased frequency of heavy precipitation events	Major adverse	Drainage Strategy	Major adverse	Low

19.12 References

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19.13 Abbreviations/Acronyms

Acronym	Definition
ABP	Associated British Ports
BSI	British Standard Institute
CCR	Climate Change Resilience

DCO	Development Consent Order
EIA	Environmental Impact Assessment
ES	Environmental Statement
GHG	Greenhouse Gas
HGV	Heavy goods Vehicle
ICCI	In-combination Climate Change Impacts
ID	Identification
IEMA	Institute for Environmental Management and Assessment
IERRT	Immingham Eastern Ro-Ro Terminal
IPCC	Intergovernmental Panel on Climate Change
MHCLG	Ministry for Housing, Communities and Local Government
NPPF	National Planning Policy Framework
NPSfP	National Policy Statement for Ports
PAS	Publicly Available Specification
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
RCP	Representative Concentration Pathway
UKCP	UK Climate Change Projections
UNFCCC	United Nations Framework Convention on Climate Change
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

19.14 Glossary

Term	Definition
Climate hazard	A physical process or event (hydro-meteorological or oceanographic variables or phenomena) that can harm human health, livelihoods, or natural resources
Lifecycle GHG impact assessment	Lifecycle GHG impact assessment converts inventory data, construction data, and operational data from a life cycle assessment into a set of potential impacts
Climate resilience	The capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation

Contact Us

ABPmer

Quayside Suite,
Medina Chambers
Town Quay, Southampton
SO14 2AQ

T +44 (0) 23 8071 1840

F +44 (0) 23 8071 1841

E enquiries@abpmer.co.uk

www.abpmer.co.uk

