ENVIRONMENTAL STATEMENT – VOLUME 1 – CHAPTER 14 CLIMATE CHANGE RESILIENCE

Drax Bioenergy with Carbon Capture and Storage

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations, 2009 – Regulation 5(2)(a)

Document Reference Number: 6.1.14

Applicant: Drax Power Limited

PINS Reference: EN010120

REVISION: 01

DATE: May 2022

DOCUMENT OWNER: WSP UK Limited

AUTHOR: A. Curry

APPROVER: S. Hands

PUBLIC

TABLE OF CONTENTS

PLATES

TABLES

14. CLIMATE CHANGE RESILIENCE

14.1. INTRODUCTION

14.1.1. This chapter reports the outcome of the assessment of likely significant environmental effects in relation to the vulnerability of the Proposed Scheme to climate change hazards. It also outlines potential adaptation measures (for consideration in the planning and design, to be adopted) that will make the Proposed Scheme more resilient to climate change.

14.1.2. Impacts during the operational phase of the Proposed Scheme are assessed. The potential effects of climate change during the construction phase were scoped out of the assessment at the scoping stage. It is considered that the potential effects of decommissioning of the Proposed Scheme would be similar to, and no worse than, the construction phase, and would be controlled via measures in a decommissioning environmental management plan (DEMP). Decommissioning has therefore not been considered in this chapter.

14.1.3. A full description of the Proposed Scheme is described in **Chapter 2 (Site and Project Description)** of this ES (document reference: 6.1.2).

14.1.4. This chapter (and its associated appendices (**Volume 3**)) is intended to be read as part of the wider ES.

14.1.5. This chapter:

- **a.** Summarises the legislative and policy framework;
- **b.** Describes consultation undertaken to date;
- **c.** Describes the assessment methodology;
- **d.** Identifies the potential impacts to the Proposed Scheme as a result of climate change hazards;
- **e.** Details the design, mitigation and enhancement measures that have been identified;
- **f.** Reports the assessment of the significant effects that climate change hazards may have on the Proposed Scheme; and
- **g.** Details the monitoring that should be carried out for the Proposed Scheme.

14.1.6. The Proposed Scheme has the potential to be affected by climate change through the following climate variables:

- **a.** Precipitation;
- **b.** Temperature;
- **c.** Wind;
- **d.** Humidity; and
- **e.** Sea level rise.

OPTIONALITY

14.1.7. For the purposes of this assessment the options, as described in **Chapter 2 (Site and Project Description)**, **para 2.3.4** do not affect the assessment.

14.2. LEGISLATIVE AND POLICY FRAMEWORK

LEGISLATIVE FRAMEWORK

14.2.1. The applicable legislative framework is summarised as follows.

International

United Nations Framework Convention on Climate Change; and UK Climate Change Act 2008 (2050 Target Amendment) Order 2019

14.2.2. The UK is a member of the United Nations Framework Convention on Climate Change (UNFCCC) which drives international action on climate change. The UK has pledged to reduce emissions under the 'Paris Agreement' in 2015, as part of a joint pledge by members of the EU. This provides an overarching commitment by the UK.

14.2.3. The Climate Change Act 2008 established a legal requirement for 80% reduction in the GHG emissions of the UK economy by 2050 in comparison to the 1990 baseline. In June 2019, the government laid the draft Climate Change Act 2008 (2050 Target Amendment) Order 2019 to introduce a net zero target - for at least 100% reduction of GHG emissions (compared to 1990 levels) in the UK by 2050.

14.2.4. The Act also created the Committee on Climate Change, with a responsibility for:

- **a.** Advising and scrutinising the UK Government's associated climate change adaptation programmes; and
- **b.** Producing a national adaptation plan for the UK Government to implement that highlights the priority climate risks for the UK and should be considered in the design of new, and operation of existing, infrastructure and services.

14.2.5. Bioenergy with Carbon Capture and Storage (BECCS) is a negative emissions technology that allows the removal of CO_2 from the atmosphere. The Proposed Scheme is designed to capture approximately 95% of the carbon dioxide from up to two biomass generating units.

Directive 2014/52/EU of the European Parliament and of the Council of the European Union

14.2.6. The requirement to consider a project's impact on, and vulnerability to, climate change results from the 2014 amendment to the EIA Directive (2014/52) (Directive 2014/52/EU of the European Parliament and of the Council 16 April 2014 amending Directive 2011/92/EU on the assessment of the effect of certain public and private projects on the environment, 2014). The Directive has been fully transposed into UK law in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 and came into force in the UK on the 16 May 2017. The Directive requires: "*A description of the likely significant effects of the project on climate (for*

example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change."

POLICY FRAMEWORK

14.2.7. The applicable policy framework is summarised as follows:

National

Overarching National Policy Statement for Energy (EN-1) (2011) (Department of Energy and Climate Change , 2011)

14.2.8. The National Policy Statement for Energy (EN-1) (2011) outlines the planning policy for the energy sector. In particular, it discusses:

a. The transition to a low carbon economy, and the energy sector's role in achieving that end;

b. The challenge of meeting energy security and carbon reduction objectives (set out in the Climate Change Act (2008), and Energy Act (2013));

c. The aim of reducing demand through energy efficiency; and

d. The role of smart technologies to balance supply and demand and therefore result in carbon savings.

14.2.9. Part 2 of EN-1 covers the Government's energy and climate change strategy, including policies for mitigating climate change. Part 4 of EN-1 sets out how the effects of climate change should be taken into account when planning the location, design, build, operation and where appropriate, decommissioning of new energy infrastructure. EN-1 states that the latest UK Climate Projections should be used and that the proposed design should be adapted to a range of climate scenarios, although where energy infrastructure has a safety critical element, a high emissions scenario should be applied to those elements.

14.2.10. The Government is currently updating the Energy NPSs with the draft Outline National Policy Statement for Energy (EN1) published in September 2021 (Department for Business, Energy & Industrial Strategy, 2021).

Draft Overarching National Policy Statement for Energy (EN1) (Department for Business, Energy & Industrial Strategy, 2021)

14.2.11. The Applicant is aware that the Government is currently updating the Energy NPSs and it is anticipated that these will be published in 2022. Accordingly, the updated versions of the NPSs have been considered as part of the EIA. The Draft EN1 has been updated to reflect the amendment to the Climate Change Act and the ratification of the Paris Agreement.

14.2.12. Section 4.9 of the draft policy sets out how applicants and the Secretary of State should take the effects of climate change into account when developing and consenting infrastructure. The policy states under paragraph 4.9.2 "*Climate change is likely to mean that the UK will experience hotter, drier summers and warmer, wetter winters. There is a likelihood of increased flooding, drought, heatwaves, and intense*

rainfall events, as well as rising sea levels and coastal change. Adaptation is therefore necessary to deal with the potential impacts of these changes that are already happening. Renewable and low carbon development is an adaptive measure to address climate change".

14.2.13. Section 4.9.7 of the draft policy also states that "*The Secretary of State should be satisfied that applicants for new energy infrastructure have taken into account the potential impacts of climate change using the latest UK Climate Projections and associated research and expert guidance (such as the EA's Climate Change Allowances for Flood Risk Assessments) available at the time the ES was prepared to ensure they have identified appropriate mitigation or adaptation measures".*

14.2.14. Section 4.9.10 of the draft policy also states *"Where energy infrastructure has safety critical elements (for example parts of new gas-fired power stations or some electricity sub-stations), the applicant should apply the high emissions scenario to those elements".*

National Planning Policy Framework (Ministry of Housing, Communities & Local Government, 2021)

14.2.15. The National Planning Policy Framework (NPPF) explains that achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supporting ways (so that opportunities can be taken to secure net gains across each of the different objectives). One of the three objectives is an environmental objective (with the other two being economic and social), which includes the objective of "*mitigating and adapting to climate change, including moving to a low carbon economy*" (paragraph 8).

14.2.16. Section 14 of the NPPF provides national planning policy in respect of the need to meet the challenge of climate change, flooding and coastal change. Paragraph 152 of the NPPF provides that:

"*The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. 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".*

14.2.17. Paragraphs 153 – 158 provide policies in relation to the need to plan for climate change. Paragraph 154 provides that "*New development should be planned for in ways that:*

a. *Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be mitigated through suitable adaptation measures, including through the planning of green infrastructure; and*

b. *can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.*

14.2.18. Paragraph 158 provides that *"When determining planning applications for renewable and low carbon development, local planning authorities should:*

a. *Not require applicants to demonstrate the overall need for renewable or low carbon energy…; and b) approve the application if its impacts are (or can be made) acceptable".*

14.2.19. Whilst Paragraph 5 of the NPPF confirms the framework does not contain specific policies for Nationally Significant Infrastructure Projects, it is identified that the policies contained in the NPPF may be considered by the Secretary of State as other matters that are important and relevant. Accordingly, the Secretary of State may determine that the policies of the NPPF in relation to climate change, in addition to those contained in local planning policy, discussed below, are relevant to their determination of the DCO Application for the Proposed Development.

UK Climate Change Risk Assessment 2022 (HM Government, 2022)

14.2.20. As required by the Climate Change Act 2008, the UK government has undertaken the third five-year assessment of the risks of climate change on the UK. The Technical Report for the third Climate Change Risk Assessment (CCRA3) identifies sixty-one climate risks cutting across multiple sectors. Chapter 4: Infrastructure, of the technical report (Jaroszweski, 2021), explains the UK-wide future risk of a reduction of energy generation due to a lack of water supplies but increased requirements will have an effect on the use of BECCS.

14.2.21. Paragraph 4.10.1.2.1 provides that "the future vulnerability of energy generation due to reduced water availability caused by both drought and restrictions due to water temperature increases is dependent on how the UK's energy supply changes… .In addition to the requirements for water in thermal generation, electrolysis, carbon capture and storage (including with hydrogen generation) and biofuel production all require water, with the potential to increase the UK's energy systems' vulnerability to reduced water availability."

Local

North Yorkshire County Council (NYCC) Plan 2021 - 2025 (North Yorkshire County Council, n.d.)

14.2.22. The NYCC Plan outlines how North Yorkshire aims to improve economic resilience by enhancing the local environment, which will improve biodiversity and reduce the impact of climate change, particularly in relation to severe flood events. North Yorkshire has a key role in promoting environmentally sustainable development as they tackle their aspirations of being carbon neutral and climate resilient by 2030.

Selby District Core Strategy Local Plan (Selby District Council, 2013)

14.2.23. The purpose of the Core Strategy is to provide a spatial strategy for future development within Selby District over at least the next 15 years. The Council wishes to ensure that future development is sustainable and ensures that the potential impacts of climate change are managed in line with the Government's overarching aims. One of Selby's priority aims relating to climate change are:

> "*To ensure that new development is sustainable and that it contributes to mitigating and adapting to the future impacts of climate change*".
>
> Policy SP15 Sustainable Development and Climate Change – 'Design and Layout of Development', states that "*in order to ensure development contributes toward reducing carbon emissions and are resilient to the effects of climate change, schemes should where necessary or appropriate:*
>
> > *C) Incorporate water-efficient design and sustainable drainage systems which promote groundwater recharge;*
> >
> > *D) Protect, enhance and create habitats to both improve biodiversity resilience to climate change and utilise biodiversity to contribute to climate change mitigation and adaptation".*

14.2.24. An assessment of the relevant policies is detailed further in the **Planning Statement** (document reference 5.2).

14.3. CONSULTATION

14.3.1. The Applicant undertook formal Section 42 and Section 47 consultation on 1 November 2021 which included the publication of the Preliminary Environmental Information Report (PEIR) (WSP, 2021). No concerns were raised with regards to climate adaptation.

14.3.2. A **Scoping Opinion (Appendix 1.2)** (document reference 6.3.1.2) was received by the Applicant from the Planning Inspectorate (PINS) on behalf of the Secretary of State (SoS) on 26 February 2021, including formal responses from Statutory Consultees. The responses from PINS in relation to Climate Change Resilience and how these requirements are addressed by the Applicant are set out in **Appendix 4.2 (Scoping Opinion Responses) (**document reference 6.3.4.2).

14.4. SCOPE OF THE ASSESSMENT

14.4.1. The scope of this assessment has been established through a scoping process. Further information can be found in Chapter 4 (EIA Methodology) (document reference 6.1.4).

14.4.2. This section provides an update to the scope of the assessment and reiterates the evidence base for scoping out elements through the iterative assessment process.

ELEMENTS SCOPED OUT OF THE ASSESSMENT

14.4.3. The elements shown in **Table 14.1** are not considered to be significantly impacted as a result of potential climate change hazards (based on current guidance and professional judgement as set out in **Section 14.5 Assessment Methodology**) and have therefore not been considered within this assessment.

Table 14.1 - Elements Scoped Out of the Assessment

Element scoped out	Justification
Construction phase and decommissioning	The construction phase and decommissioning of the Proposed Scheme are to be scoped out as they have been determined as having low vulnerability due to the short construction timescale (six years). Measures would be integrated into the CEMP to ensure the Site would be prepared and responsive to extreme weather events. While there are two indicative construction options (**Table 2.1 and 2.2** in **Chapter 2 (Site and Project Description)**), there are only four months between the two options and therefore no difference in climatic conditions would be observed, therefore there is no need to consider the construction options separately. The potential effects from snow and ice during the construction phase would be mitigated by; ~ Planning the timing and seasonality of the construction phase and decommissioning activities (especially those that may be temperature dependent (e.g., concrete laying)) where risk of snowfall / ice is reduced; ~ Monitoring weather forecasts for any cold spells; ~ Ensuring any liquids (if relevant) are stored in a manner where they cannot freeze; and ~ Having measures in place to ensure construction equipment is de-iced for safe use. Decommissioning is anticipated to last no longer than the construction phase. It is considered that the potential effects of decommissioning of the Proposed Scheme would be similar to, and no worse than, those of the construction phase.

Elements Scoped into the Assessment

Operational Phase

14.4.4. The following elements are considered to have the potential to give rise to likely significant effects during the operational phase of the Proposed Scheme and have therefore been considered within this assessment:

a. Precipitation;
b. Temperature;
c. Wind;
d. Humidity; and
e. Sea level rise.

14.5. ASSESSMENT METHODOLOGY

ASSESSMENT OF SIGNIFICANCE

14.5.1. The significance of effects, in accordance with the Design Manual for Road and Bridges (DMRB) LA 114 Climate, paragraphs 3.36 to 3.42 (Highways England, 2021), has been determined by considering the consequence and the likelihood of potential impacts associated with changes in climate variables on the Proposed Scheme. Likelihood and consequence have been qualitatively assessed using the descriptions in **Table 14.2** and **Table 14.3** which are informed by Tables 3.39a and 3.39b respectively DMRB LA 114 and developed using professional judgement, and are informed by the existing and future baseline. The likelihood definitions depend on the lifetime of the Proposed Scheme's components (as highlighted in **Table 14.3**) and therefore will vary. Table **14.2** describes the frequency of occurrence for the structural elements of the Proposed Scheme (25 years).

14.5.2. The assessment of likelihood and consequence (and therefore significance) takes into account primary mitigation and is set out in **Appendix 14.1 (Primary Mitigation and Preliminary Assessment of Likely Significant effects)** – (document reference 6.3.14.1).

Table 14.2 - Likelihood Categories

Measure of likelihood	Description
Very high	The event occurs multiple times during the lifetime of the project e.g., approximately annually.
High	The event occurs several times during the lifetime of the project e.g., approximately once every 5 years.
Medium	The event occurs limited times during the lifetime of the project e.g., approximately once every 10 years.
Low	The event occurs during the lifetime of the project e.g., once in 15 years.
Very low	The event can occur once during the lifetime of the project.

Table 14.3 - Measure of Consequence

Measure of Consequence	Description
Very large adverse	Permanent damage. Disruption lasting more than ten days. Early renewal of facility / infrastructure >90%. Severe health effects and / or fatalities. Repairs cost 50% of facility reconstruction cost.
Large adverse	Extensive facility / infrastructure damage. Disruption lasting more than three but less than ten days. Early renewal of 50-90% of infrastructure Severe health effects and / or fatalities. Significant effect on the environment, requiring remediation. Repairs cost 50% of facility reconstruction cost.
Moderate adverse	Limited facility / infrastructure damage with damage recoverable by maintenance or minor repair. Disruption lasting more than one but less than three days. Adverse effects on health and / or the environment. Repairs cost 25% of facility reconstruction cost.
Minor adverse	Localised facility / infrastructure disruption. No permanent damage, minor restoration work required: Facility closure lasting less than one day. Slight adverse health or environmental effects. Repairs cost 2% of facility reconstruction cost.
Negligible	No facility / infrastructure damage, minimal adverse effects on health, safety and the environment. Facility doesn't shut down. No financial loss.

Evaluation of Significance

14.5.3. The likelihood and consequence have been combined to determine the significance of effects on the affected receptors, as set out below in **Table 14.4** which is based on DMRB LA 114 (Table 3.41).

Table 14.4 - Significance Rating Matrix

Measure of consequence of hazard occurring	Measure of likelihood				
	Very Low	**Low**	**Medium**	**High**	**Very High**
Very Large	Not Significant	Significant	Significant	Significant	Significant
Large	Not Significant	Not Significant	Significant	Significant	Significant
Moderate	Not Significant	Not Significant	Significant	Significant	Significant
Minor	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Negligible	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

METHOD OF BASELINE DATA COLLECTION

Desk Study

14.5.4. The focus of the climate change resilience assessment is the impact of climate change on the Proposed Scheme (rather than the impact of the Proposed Scheme on the environment). All baseline data collection has been completed through desk study using published data and guidance as outlined in this section.

Site Visit and Surveys

14.5.5. No sites visits or surveys have been undertaken to complete the climate change resilience assessment.

Guidance and Data used as Baseline Sources

14.5.6. The following guidance documents and data sources have been used to inform the climate change resilience assessment and in the preparation of this chapter:

- **a.** Met Office Regional Climate Profile for North East England (Met Office, 2016) (existing baseline);
- **b.** UK Climate Projections (Met Office, 2019) (future baseline);
- **c.** IEMA Environmental Impact Assessment guide to Climate Change Resilience and Adaptation (IEMA [online], 2020);
- **d.** Design Manual for Roads and Bridges (DMRB) LA 114 Climate (Highways England, 2021);

e. National Policy Statement for National Networks (Department for Transport, 2014);

f. Independent Assessment of UK Climate Risk – Energy Briefing, (Climate Change Committee [online], 2021);

g. The climate of the United Kingdom and recent trends (Jenkins, Perry, & and Prior, 2008);

h. State of the UK Climate 2020 (Kendon, 2021);

i. River Ouse, York rises to worst levels since 2015 floods (York Press [online], 2020); and

j. Humber 2100+ (Environment Agency, 2019).

Assessment Assumptions and Limitations

14.5.7. The following assumptions and limitations apply to this chapter:

Assumptions

a. There are inherent uncertainties associated with climate projections and they are not predictions of the future. It is possible that future climate will differ from the future baseline climate against which the resilience of the Proposed Scheme has been assessed, depending on global emissions over the next century. A 'high' emissions scenario (RCP 8.5) using the 2050s time slice (2040 – 2059) has been used to develop the baseline against which resilience has been assessed. This is consistent with the precautionary principle (i.e., 'worst case' scenario);

b. As described in **Chapter 2** (**Site and Project Description**), the Applicant has full planning permission for the demolition of the redundant Flue Gas Desulphurisation (FGD) Plant and associated restoration works at Drax Power Station (2020/0994/FULM). The decommissioning and demolition works of Absorber Units 4, 5 and 6 are scheduled to take place prior to the start of the construction phase of the Proposed Scheme, which has therefore been considered as part of the baseline of the assessment, whilst the demolition of Absorber Units 1, 2 and 3 are assumed to take place following the completion of the Proposed Scheme. The demolition of Units 1, 2 and 3 are assessed in **Chapter 18** (**Cumulative Effects**) (document reference 6.1.18); and

c. Detailed construction information is not yet available for the Proposed Scheme and this assessment therefore draws on the professional experience of the assessor of other similar projects.

Limitations

a. The UK Climate Projections 2018 (UKCP18) have been used to infer future changes in a range of climate variables that may affect the resilience of the Proposed Scheme to climate change. At the time of writing, these represent the most up-to-date representation of future climate in the UK. However, the UKCP18 data currently available does not provide data for snow and ice or wind, as such these variables are assessed in a qualitative manner.

b. Any further research, analysis or decision-making should take into account the caveats, limitations and uncertainties associated with climate projections. Climate projections are based on the latest science and climate modelling, however there are limitations to modelling climate change such as projections being dependent on future greenhouse gas assumptions. Projections provide a range of plausible outcomes but cannot cover all potential future climate outcomes. These are addressed in Met Office (UKCP18 Guidance: Caveats and Limitations, n.d.).

c. The assessment of likelihood of these climate drivers occurring is based on selected observational data, the results of climate model ensembles and a selected range of existing climate change research and literature available at the time of the assessment, therefore information which has been made available after the time at which the report was produced has not been included.

14.6. STUDY AREA

14.6.1. The focus of the climate change resilience assessment is the impact of climate change on the Proposed Scheme (rather than the impact of the Proposed Scheme on the environment). The study area for the assessment is the Proposed Scheme's Order Limits and the Off-Site Habitat Provision Area.

14.7. BASELINE CONDITIONS

14.7.1. The Institute of Environmental Management and Assessment (IEMA) (IEMA [online], 2020) identifies the need for the baseline to consider:

a. The current climate baseline (defined by historic climate conditions) to provide an indication of past vulnerability; and

b. The future climate baseline (short term extremes and long-term variation) to assess a project's vulnerability to climate change.

EXISTING BASELINE

14.7.2. The Proposed Scheme is located in the Met Office (Met Office, 2016) climate profile of North East England, which is characterised as having a climate influenced by the high altitude of the Pennines to the west and the North Sea to the east. This creates an environment that is frequently cool, dull and wet but also experiencing a 'rain shadow' as the Pennines shelter the region from the prevailing westerly winds.

14.7.3. The closest weather station to the Proposed Scheme is Church Fenton (approximately 20 km north-west from the Proposed Scheme) and has therefore been used as representative of the local climate of the Proposed Scheme.

Precipitation

14.7.4. The North East of England region is drier than the UK average, averaging 80 mm of rainfall per month compared to 96 mm nationally. The Proposed Scheme (data from Church Fenton weather station) has experienced even less rainfall, averaging 50 mm per month (Met Office, 2010).

Extreme Precipitation

14.7.5. Whilst the region is drier than the UK average, it does experience extreme rainfall events (Jenkins, Perry, & and Prior, 2008). In July 2019, many counties in central and northern England received more than one and a half times the month's typical rainfall for July. Some noteworthy extreme rainfall, drought and storm events include:

a. Heavy rainfall July 2019: thunderstorms from an area of low pressure caused flooding across parts of northern England. Intense downpours caused flash-flooding, with 40 to 60 mm recorded in one hour across parts of North Yorkshire and around 60 to 80 mm or more falling in two hours (Met Office, 2019); and

b. February 2020 was the UK's wettest February and fourth wettest calendar month on record in a series from 1862 (Kendon, 2021).

Snow and Ice

14.7.6. Snowfall is closely linked with temperature, with falls rarely occurring if the temperature is higher than 4°C. For snow to lie for any length of time, the temperature must normally be lower than this. Over most of the North East of England region, snowfall is normally confined to the months from November to April, but upland areas such as the Pennines may have brief falls in October and May. Snow rarely lies outside the period from December to March. The region has experienced snow events in:

a. February to March 2018: the most significant spell of snow and low temperatures for the UK overall since December 2010 (Met Office , 2020);

b. December 2009: January 2010: the UK experienced a spell of very low temperatures and significant snowfalls which affected almost the whole country (Met Office , 2020); and

c. December 2010: two spells of snowfall lasting around a month (Met Office , 2020).

Temperature

14.7.7. The North East of England region is cooler than the UK average with an annual temperature averaging 8°C, compared to 9°C for the UK. However, the local climate of the Proposed Scheme has recorded warmer temperatures compared to the UK and the region, averaging an annual temperature of 9.7°C (Met Office, 2010).

Extreme Temperature

14.7.8. The region experiences extreme temperatures. Some noteworthy extreme temperature events include:

a. July 2019: the UK experienced a short but exceptional heatwave in late July with temperatures of 30°C recorded through much of northern England, and up to 33°C at Church Fenton weather station (Met Office, 2019); and

b. Summer 2018: warm, dry, sunny weather with the UK under the influence of high pressure, particularly during June and July. This was the UK's warmest summer

since 2006, the driest since 2003 and the sunniest since 1995. Temperatures exceeded 25°C over much of Northern England and exceeding heatwave thresholds for this region (Met Office, 2020).

Relative Humidity

14.7.9. Relative Humidity is the most common measure of humidity for which it measures how close the air is to being saturated. The average humidity for the region is recorded as averaging approximately 76-78% in the summer and 84-86% in the winter (Met Office, 2019).

Wind and Storms

14.7.10. Wind speed in the North East England region is heavily influenced by the terrain and is associated with the passage of depressions close to or across the UK and is sensitive to altitude and local topographic effects. The period November to March has the highest mean speeds and the peak gusts follow a similar pattern.

14.7.11. Thunderstorms are most likely to occur from May to September, reaching their peak in July and August, with the North East of England experiencing approximately five to eight days of thunder per year. Thunderstorms during the summer are associated with heavy rainfall events.

14.7.12. A day of gale is defined as a day on which the wind speed attains a mean value of 34 knots or more over any period of ten minutes. Notable gales affecting the region include:

a. Storms Dudley, Eunice and Franklin, February 2022, affected the UK within the space of a week. This is the first time three named storms have occurred in a week since storm naming was introduced in 2015 / 2016. Two rare red warnings were issued for storm Eunice, the most severe and damaging storm to affect England and Wales since February 2014. Winds gusted at over 70Kt (81mph) in exposed coastal locations. Storm Dudley resulted in loss of power for thousands of homes across parts of Cumbria, Yorkshire and Lancashire, and rail lines heading north to Glasgow and Edinburgh were disrupted. The strong winds from Franklin hampered clean-up operations following Eunice. In Yorkshire, the River Wharfe flooded the railway lines at Rotherham Central station, disrupting transport; and (Met Office, 2022).

b. The UK experienced a turbulent week of weather from 10 to 16 March 2019 as a succession of Atlantic low-pressure systems brought strong winds and heavy rain, driven by a powerful jet stream. This spell included Storm Gareth on 12 to 13 March, the seventh named storm of the 2018-2019 winter (Met Office, 2020).

Sea Level

14.7.13. The Proposed Scheme is located within 2 km of the River Ouse which flows into the Humber Estuary. The River Ouse frequently floods, with York experiencing flooding in February 2020, rising to its worst levels since bad flooding in 2015 (York Press [online], 2020). The Humber is situated on low-lying land and as the Estuary is tidal,

the impact of storm surges and exceptional high tides can lead to flooding well away from the coast, as additional water is pushed into the Estuary (Environment Agency, 2019).

14.7.14. The northern and southern part of the Existing Drax Power Station, Carr Lane, Redhouse Lane and the area of the existing jetty are located in the high risk Flood Zone 3 and benefit from the existing flood defences on the River Ouse. Flood Zone 3 is described as land assessed as having a 1-in-100 or greater annual probability of flooding from rivers or a 1-in-200 or greater annual probability of flooding from the sea in any year. The risk of flooding in this area is dominated by the River Ouse which is tidally influenced at this location, with minor fluvial contributions.

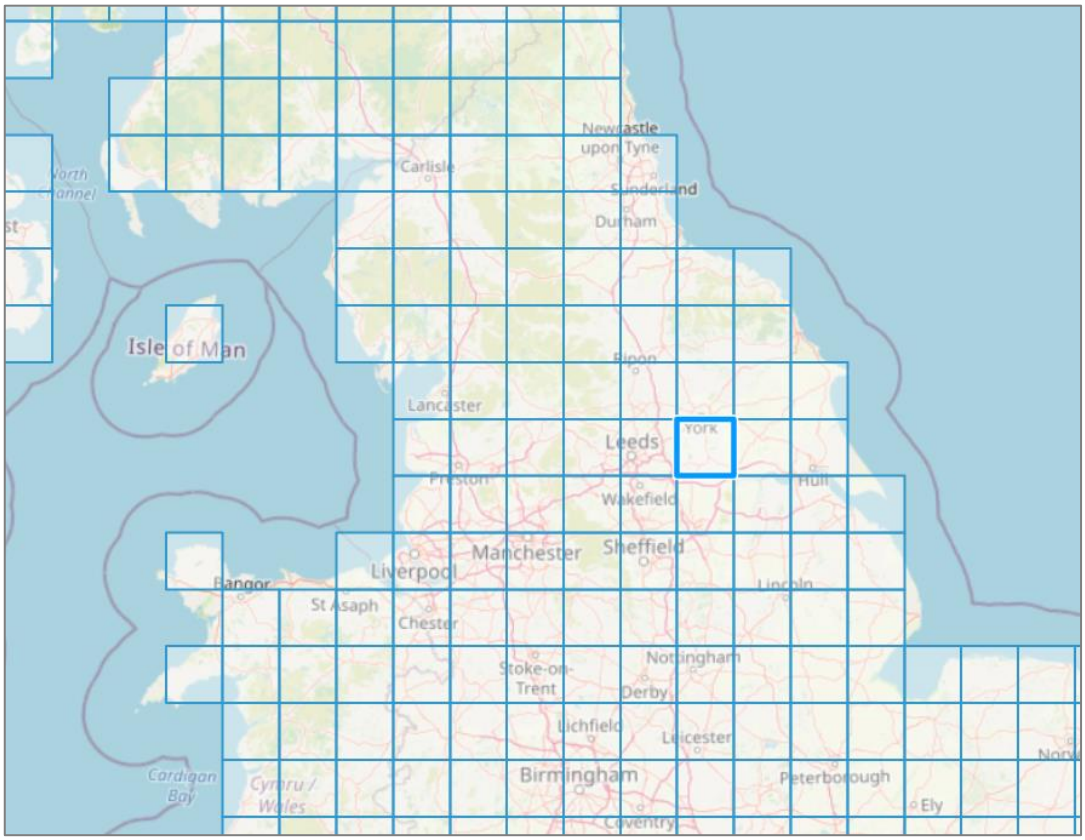
FUTURE BASELINE

14.7.1. The UK Climate Projections 2018 (UKCP18) (Met Office, 2019) are the most up-to-date projections of climate change for the UK, providing projections until the end of the twenty-first century, and have therefore been used to inform this assessment. UKCP18 includes probabilistic projections for a range of climate variables under multiple emissions scenarios, termed as representative concentration pathways (RCP), precautionary approach scenario RCP 8.5 (equivalent to a high emissions scenario as required by the Draft EN1 NPS) has been used in this assessment.

14.7.2. To identify the anticipated climate conditions over the life of the Proposed Scheme's (design life of 25 years) the future baseline is presented for the 2020s (2010-2039) and the 2050s (2040-2069) using the reference period of 1981-2010. These results are presented for the 50th percentile. Probabilistic projections, such as those provided by UKCP18, give a range of possible climate change outcomes and their relative likelihoods, which typically give climate information that is considered the unlikely, likely or very likely (i.e., ranging across 10th to 90th percentiles) outcomes. IEMA therefore recommends the use of the 50th percentile of the RCP 8.5 climate scenario. This is the 'central estimate' across the models and is considered the level for which as much evidence points to a lower outcome as a higher one. It is therefore taken as the median value of predicted change.

14.7.3. **Plate 14.1** shows the 25 km grid square chosen as representative of the Proposed Scheme location.

Plate 14.1 - 25 km Grid Square used for Probabilistic Projections



Precipitation

14.7.4. Climate change is projected to lead to wetter winters and drier summers although natural variation, including extreme events such as storms and heatwaves, will continue to punctuate these trends. The projected changes to average summer and winter rainfall for the 2020s and 2050s are summarised in **Table 14.5** for the location of the Proposed Scheme demonstrated by **Plate 14.1**.

Table 14.5 - Projected Change in Mean Summer and Winter Precipitation (%) for the 2020s and 2050s, RCP8.5

Season	Time slice, precipitation change (%)	
	2020s	**2050s**
Summer	-4.1%	-17.6%
Winter	+3.1%	+7.9%

14.7.5. The central estimate (50th percentile) projects, for all time slices, summer rainfall will decrease by 17.6% by the 2050s but that winter precipitation is projected to increase

by up to 7.9% for the 2050s. These changes relate directly to the Proposed Scheme located in the 25 km grid square (**Plate 14.1**).

Extreme Precipitation

14.7.6. **Table 14.6** shows that the summer months will experience a decrease in intense rainfall whilst the winter months will face an increase in extreme weather. The 90th percentile has been used as a proxy for these rainfall events, this shows the upper limit of change.

Table 14.6 - Projected change in mean extreme Summer and Winter Precipitation (%) for the 2020s and 2050s, RCP8.5

Season	Time slice, precipitation change (%)	
	2020s	2050s
Summer	+9.6%	+4%
Winter	12%	20.3%

Temperature

14.7.7. In general, UKCP18 predicts that there would be hotter summers and warmer winters. **Table 14.7** summarises the UKCP18 projections for changes in mean temperature for the 25 km grid square where the Proposed Scheme is located in the 2020s and 2050s under RCP 8.5.

Table 14.7 - Projected Change in Mean Summer and Winter Temperature (^{0}C) for the 2020s and 2050s RCP8.5

Season	Time slice, temperature change (^{0}C)	
	2020s	2050s
Summer	+0.9^{0}C	+2.2^{0}C
Winter	+0.7^{0}C	+1.6^{0}C

Extreme Temperature

14.7.8. **Table 14.8** summarises the UKCP18 projections for changes in maximum and minimum temperature for summers and winters. The values below represent mean maximum and minimum temperature changes; individual days may therefore exceed these values.

Table 14.8 - Projected Change in Maximum and Minimum Mean Summer and Winter Temperatures (°C) for the 2020s and 2050s under RCP8.5 for the Proposed Scheme Area

Season	Time slice, temperature change (^{0}C)			
	2020s		2050s	
	Max	Min	Max	Min
Summer	1.0	0.8	2.4	2.1
Winter	0.7	0.6	1.6	1.6

Humidity

14.7.9. Projections for humidity anticipate an increase in summer and winter humidity up to 11.2% by 2050. Summer (11.2%) is projected to see a slightly greater increase in humidity compared to winter (10.8%).

Wind

14.7.10. There is large uncertainty in modelling wind over the UK as wind speed is variable with altitude and topography, therefore wind for the region of the Proposed Scheme has not been included. UKCP18, however, depicts a wide spread of future changes in mean surface wind speed (Brown, Boorman, McDonald, & and Murphy, 2012). It is therefore difficult to represent regional wind extremes and gusts within regional climate models (Bengtsson, Hodges, & Roeckner, 2006).

14.7.11. A storm is defined by the Met Office as a wind event measuring 10 or higher on the Beaufort scale (equivalent to a wind speed of 24.5 ms-1 or 55 mph) (Met Office , 2020).

14.7.12. Studies (Slingo, et al., 2014) (Bengtsson, Hodges, & Roeckner, 2006) relating to future projections of storms suggest that climate-driven storm changes are less dis tinct in the Northern than Southern Hemisphere. However, such is the wide range of inter-model variation, robust projections of changes in storm track are not yet possible and there is low confidence in the direction of future changes in the frequency, duration or intensity of storms affecting the UK.

14.7.13. With this in mind, it is not possible to predict the future baseline for wind in the Proposed Scheme and the assessment has broadly included the consideration of the effects of storms on the Proposed Scheme.

Sea Level

14.7.14. Projections for sea level rise have been ascertained using UKCP18 marine projections for the 'closest location' (some 50 km to the east) to the Proposed Scheme area (**Plate 14.2**) as presented in **Table 14.9**. By 2050, the area (**Plate 14.2**) could experience sea level rise in the region of 32 cm, posing flood risk to the

Proposed Scheme which is upstream on the tidal Humber and River Ouse (tidal as far as Naburn, which is approximately 25 km north of Drax).

Plate 14.2 - Grid Square used for Marine Projections

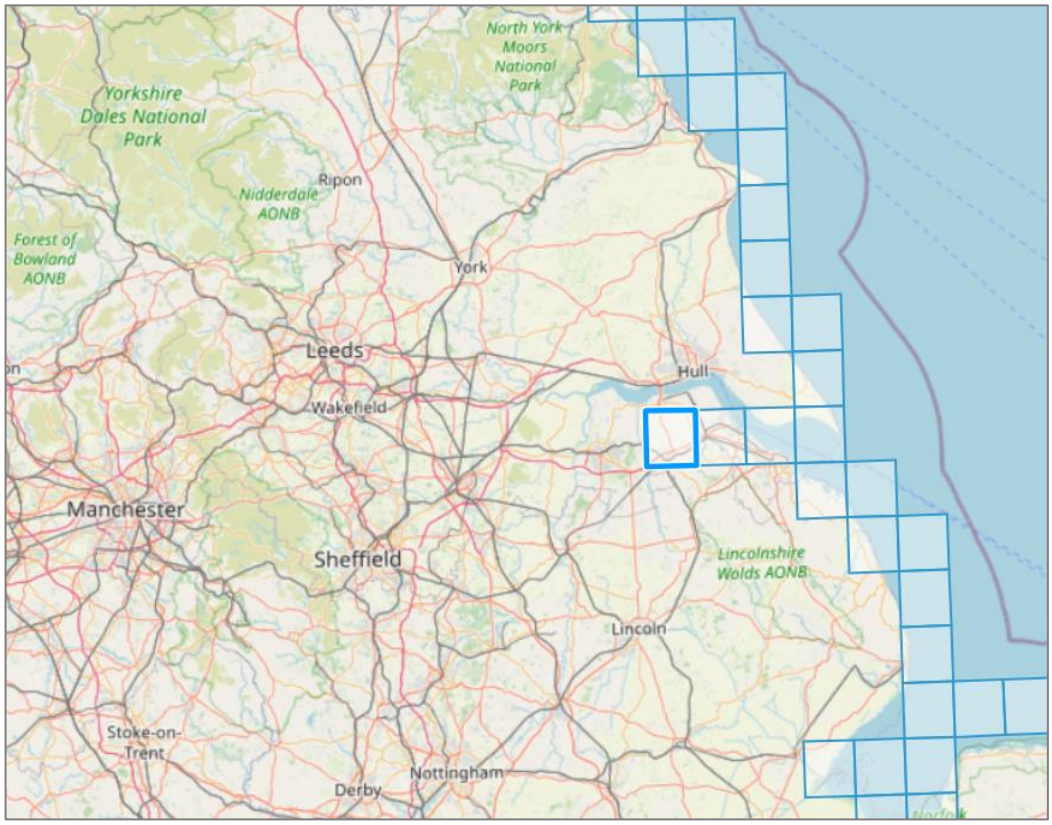


Table 14.9 - Projected Change in Sea Level Rise (mm) for the 2020s, 2050s and 2080s RCP8.5

	Time slice	
	2020s	**2050s**
Sea level increase (m)	+0.12 m	+0.32 m

14.8. SENSITIVE RECEPTORS

14.8.1. The following sensitive receptors have been identified for the Proposed Scheme:

- **a.** Carbon Capture Plants (this includes the additional infrastructure associated with the Carbon Capture Plants);
- **b.** Existing Infrastructure;
- **c.** Ancillary works (including pavement maintenance, site lighting infrastructure, emergency lighting, security infrastructure e.g. lighting and cameras, fencing); and
- **d.** Habitat Provision Area and Off-Site Habitat Provision Area.

14.8.2. All key sensitive receptor locations are shown on **Figure 2.1 (Environmental Constraints)** (document reference 6.2.2.1).

14.9. PRELIMINARY ASSESSMENT OF LIKELY IMPACTS AND EFFECTS

14.9.1. This section details the preliminary assessment of significant effects during the operational phase taking account of primary mitigation, as described in Chapter 2 (Site and Project Description) but in the absence of secondary mitigation. Secondary mitigation for the Proposed Scheme is described in Section 14.10 below.

Operational Phase

14.9.2. The assessment breaks the Proposed Scheme down into five separate components: Carbon Capture Plants (up to two), existing infrastructure, ancillary works and the Habitat Provision Area and Off-Site Habitat Provision Area (refer to **Chapter 2 (Site and Project Description)** for further details).

Climate Change Variables

14.9.3. How these components may be affected by climate change variables is described in **Table 14.10**.

Table 14.10 - Climate Change Variables that have the Potential to have an Impact upon the Operational Phase

Proposed Scheme Component	Climate Variable	
Installation of new Carbon Capture Plants	Precipitation	Changes in annual average
		Extreme precipitation events
	Temperature	Extreme temperature events
	Wind	Gales and extreme wind events
	Humidity	Humidity
	Sea level rise	Sea level rise
Existing infrastructure	Precipitation	Changes in annual average
		Extreme precipitation events
	Temperature	Extreme temperature events
	Wind	Gales and extreme wind events
		Storms (hail, lightning)
	Sea level rise	Sea level rise
Ancillary works	Precipitation	Extreme precipitation events
	Temperature	Extreme temperature events

Proposed Scheme Component	Climate Variable	
	Wind	Gales and extreme wind events
	Humidity	Humidity
	Sea level rise	Seal level rise
Habitat Provision Area and Off-Site Habitat Provision Area	Precipitation	Extreme precipitation events
	Temperature	Extreme temperature events

Potential Impacts

14.9.4. The potential impacts during the operational phase of the Proposed Scheme as a result of climate hazards identified in **Table 14.10** above are outlined in **Table 14.11**.

Table 14.11 - Potential Impacts to the Operational Phase as a result of Climate Change

Climate Hazard	Associated Hazard	Receptor(s) Affected	Potential Impact
Precipitation	Changes in annual average precipitation Extreme precipitation events	Carbon Capture Plants Existing infrastructure Ancillary works Habitat Provision Area and Off-Site Habitat Provision Area	Flooding of the Carbon Capture Plants and supporting infrastructure Damage to structures from increased run-off Existing drainage infrastructure overwhelmed leading to surface water flooding Longer growing season, more vigorous vegetation growth within the Proposed Scheme in spring and autumn without a vegetation management plan. Windborne dust and debris clogging drainage channels and requiring clearing Changes to ground conditions from flooding or drought causing subsidence and changes in soil moisture. Flooding of the Habitat Provision Area and southern part of the Off-Site Habitat Provision Area
Temperature	Extreme temperature events	Carbon Capture Plants Existing infrastructure Ancillary works Habitat Provision Area and Off-Site Habitat Provision Area	Overheating of equipment Deterioration of material structure and fabric Risk of fire Expansion of building joints compromising structural integrity Faster rate of deterioration of materials from an increase in UV radiation (e.g., brittleness, fading) Increase in thermal expansion of structural joints compromising structural integrity Failure of water-cooling systems Greater demand for cooling Deformation and melting of paved surfaces Deterioration of material structure and fabric Shrinking and cracking of soils Failure of security infrastructure and lighting due to overheating Increased dieback of vegetation / planting within the Habitat Provision Area and Off-Site Habitat Provision Area
Wind	Gales and extreme wind events	Carbon Capture Plants	Wind driven rain infiltration into surfaces and materials compromising the outer shell of the building

Climate Hazard	Associated Hazard	Receptor(s) Affected	Potential Impact
	Storms (hail, lightning)	Existing infrastructure Ancillary works	Damage / deterioration to cladding and coating Lightning strikes leading to power outages onsite and causing fires Increased wind loading on stacks compromising the structural integrity Power loss
Humidity	Humidity	Carbon Capture Plants Ancillary works	Increase in condensation, mould growth, mildew staining and decay of metal surfaces Poor performance of insulation
Sea level rise	Sea level rise	Carbon Capture Plants Existing infrastructure Ancillary works	Flooding of the Carbon Capture Plants and supporting infrastructure Drainage infrastructure capacity and performance of conveyance is compromised Increase in deterioration of material structure and fabric Power outages

Preliminary Assessment of Significance

14.9.5. This section details the preliminary assessment of significant effects taking account of primary and tertiary mitigation as described in **Chapter 2 (Site and Project Description)**, but in the absence of secondary mitigation. These mitigation measures have been detailed in **Table 1.1** of **Appendix 14.1**. Secondary mitigation for the Proposed Scheme is described in **Section 13.10** below.

14.9.6. Where the preliminary assessment of likely significant effects has identified that receptors would experience no change, negligible or minor effects (i.e. not significant) as a result of the Proposed Scheme these are contained in **Table 2.1** of **Appendix 14.1**.

14.9.7. The preliminary assessment of likely significant effects has identified the following potentially significant effects:

a. The flooding of the Carbon Capture Plants and supporting infrastructure which may cause temporary or permanent damage, cause access issues to the facility and disrupt the operation of the Carbon Capture Plants if they cannot continue to operate safely;

b. The faster rate of deterioration of materials from increase in UV radiation e.g. brittleness, fading and the deterioration of material structure and fabric on both the Carbon Capture Plants and existing structures. This may comprise the structural integrity and affect the frequency and cost of maintenance and repairs to the structures; and

c. Increased wind loading on the Main Stack may compromise the structural integrity and affect the safe operating of the Main Stack and / or disrupt the operation of the Main Stack if repairs are required.

14.10. DESIGN, MITIGATION AND ENHANCEMENT MEASURES

14.10.1. This Section sets out the design, mitigation and enhancement measures which are likely to be required to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment.

DESIGN

14.10.2. The design of the Proposed Scheme has taken into account climate change resilience within design measures and in accordance with relevant standards. The committed design measures embedded within the Proposed Scheme design, 'primary mitigation', in relation to climate change resilience are detailed in **Table 1.1 of Appendix 14.1**. The preliminary assessment of likely significant effects in **Table 2.1 of Appendix 14.1** is based on the design including the primary mitigation.

MITIGATION

14.10.3. A **Register of Environmental Actions and Commitments (REAC)** has been produced for the Proposed Scheme (document reference 6.5). The REAC sets out

how the actions and commitments set out within it (and described in this section) are secured.

14.10.4. The following mitigation would need to be implemented during detailed design stage to reduce the effects described in **paragraph 14.9.7**.

Sea Level Rise

14.10.5. Mitigation required to reduce the potential effects for flooding from sea level rise of the Carbon Capture Plants and supporting infrastructure is:

a. Creation of additional floodplain capacity (a minimum floodplain area of 1,889m^2 will be created) through the lowering of ground outside the floodplain on land controlled by the Applicant; and

b. Raising sensitive equipment above the design flood level plus freeboard.

Extreme temperatures

14.10.6. The following mitigation would be implemented to reduce the potential effects for extreme temperature events:

a. The design shall be in accordance with the UK Building Regulations and BE EN codes. Where no BS EN code exists the Eurocodes and ISO standards will be adopted;

b. The Applicant has requested the FEED contractor to consider using heat resistant materials when it comes to replacement / refurbishment of pavements in the future; and

c. Proactive maintenance to address any defects to be carried out on the Proposed Scheme assets.

Wind

14.10.7. To reduce the potential effects of wind loading on the Main Stack:

a. The structures shall be designed in accordance with UK Building Regulations and BS EN design codes. For structural system design purposes, wind loads will be considered according to the provisions of BS EN 1991-1-4 + NA with the following parameters for the Site:

i. vb,0 = 22.7 m / s (fundamental basic wind velocity);

ii. Calt = 1.01 (altitude factor);

iii. Cseason <= 1.0 (seasonal factor);

iv. Cdir <= 1.0 (directional factor); and

v. Terrain category: “country terrain”.

14.10.8. These account for increases in wind event frequencies and magnitudes due to climate change via the various nationally defined parameters.

14.10.9. Although the Applicant has specified the codes which were current at the time of writing the design parameters for the Proposed Scheme, these may need to be

realigned to any changes to UK Regulations and BSI updates to codes during subsequent design phases.

14.10.10. Only existing structures which are altered / re-purposed as part of the Proposed Scheme would be subject to reappraisal to modern wind codes which have allowances for the effects of climate change. Any required strengthening to meet the design life (25 years) for the Proposed Scheme would be carried out as required.

Opportunities for Environmental Enhancement

14.10.11. No enhancement measures associated with climate change resilience have been identified.

14.11. ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

OPERATIONAL PHASE

14.11.1. This section details the assessment of significant effects as presented in **Table 14.12** taking account of the secondary mitigation detailed in **Section 14.10** above.

14.11.2. For the flooding of the Carbon Capture Plants and supporting infrastructure the likelihood would be Low and the consequence **minor adverse**. The effect would therefore be **not significant**.

14.11.3. For the deterioration of materials and material structure for both the Carbon Capture Plants and Existing structures the likelihood would be Medium and the consequence **minor adverse**. The effect would therefore be **not significant**.

14.11.4. In relation to wind loading on the Main Stack the likelihood would be Medium and the consequence would be **minor adverse**. The effect would therefore be **not significant**.

14.12. CUMULATIVE EFFECTS

14.12.1. The climate change resilience assessment looks at potential impacts of changes in climate on the Proposed Scheme, rather than impacts of the Proposed Scheme on the environment. A detailed assessment of intra-project combined effects and inter-project cumulative effects for the Proposed Scheme has been carried out and is presented in **Chapter 18 (Cumulative Effects)** (document reference 6.1.18) of this ES. Individual topics have carried out and reported on in-combination assessments which considers the extent to which Climate Change may alter the effects that have been identified during the EIA. Refer to individual topic **Chapters 5-17** of this ES.

14.13. MONITORING

14.13.1. Resilience to climate hazards would be considered periodically through maintenance regimes and inspections of all built infrastructure, including as noted in the primary mitigation measures set out in **Appendix 14.1**. This should be captured in the Environmental Management System (EMS).

14.13.2. The design team will be responsible for ensuring the additional mitigation is built into the detailed design components, having particular regard for the design standards referenced in the climate assessment mitigation. The commitment of this shall be captured within the **REAC** (document reference 6.5) and monitored by the Design Manager at each design iteration, to ensure the design standards are adhered to during construction.

14.13.3. Monitoring of the climate risks and impacts will ensure that the Proposed Scheme can continue to be resilient to climate change, this will be managed and monitored through the existing EMS. Over the lifespan of the operational phase, operational maintenance / improvements should be implemented to address climate vulnerability as required.

Table 14.12 - Summary of Residual Climate Change Resilience Effects

Receptor	Potential Effects	Additional Mitigation	Residual Effects
Carbon Capture Plants	Flooding of the Carbon Capture Plants and supporting infrastructure	Creating additional floodplain capacity (a minimum floodplain area of 1,889m^2 will be created) through the lowering of ground outside the floodplain on land controlled by the Applicant Raising sensitive equipment above the design flood level plus freeboard.	**Minor Adverse (not significant) P / D / LT**
Carbon Capture Plants	Faster rate of deterioration of materials from increase in UV radiation e.g., brittleness, fading	The design will be in accordance with the UK Building Regulations and BE EN codes. Where no BS EN code exists the Eurocodes and ISO standards will be adopted. Proactive maintenance to address any defects to be carried out on the Proposed Scheme assets.	**Minor Adverse (not significant) P / D / LT**
Carbon Capture Plants	Deterioration of material structure and fabric	The design will be in accordance with the UK Building Regulations and BE EN codes. Where no BS EN code exists the Eurocodes and ISO standards will be adopted. Proactive maintenance to address any defects to be carried out on the Proposed Scheme assets.	**Minor Adverse (not significant) P / D / LT**
Existing structures	Increased wind loading on Main Stack compromising the structural integrity	The structures would be designed in accordance with UK Building Regulations and BS EN design codes. For structural system design purposes, wind loads will be considered according to the provisions of BS EN 1991-1-4 + NA with the following parameters for the Site: vb,0 = 22.7 m / s (fundamental basic wind velocity); Calt = 1.01 (altitude factor); Cseason <= 1.0 (seasonal factor); Cdir <= 1.0 (directional factor); and Terrain category: “country terrain”.	**Minor Adverse (not significant)** **P / D / LT**
Existing structures	Faster rate of deterioration of materials from increase in UV radiation e.g., brittleness, fading	The design will be in accordance with the UK Building Regulations and BE EN codes. Where no BS EN code exists the Eurocodes and ISO standards will be adopted. Proactive maintenance to address any defects to be carried out on the Proposed Scheme assets.	**Minor Adverse (not significant) P / D / LT**
Existing structures	Deterioration of material structure and fabric	The design will be in accordance with the UK Building Regulations and BE EN codes. Where no BS EN code exists the Eurocodes and ISO standards will be adopted. Proactive maintenance to address any defects to be carried out on the Proposed Scheme assets.	**Minor Adverse (not significant) P / D / LT**

Key to table:

P / T = Permanent or Temporary, D / I = Direct or Indirect, ST / MT / LT = Short Term, Medium Term or Long Term, N / A = Not Applicable

REFERENCES

Bengtsson, L., Hodges, K., & Roeckner, a. E. (2006). Storm tracks and climate change. *Journal of Climate*, 3518-3543.

Brown, S., Boorman, P., McDonald, R., & and Murphy, J. (2012). Interpretation for use of surface wind speed projections from the 11-member Met Office Regional Climate Model ensemble. Post-launch technical documentation for UKCP09. *Met Office*.

Climate Change Committee [online]. (2021). Retrieved from Independent Assessment of UK Climate Risk.

Department for Business, Energy & Industrial Strategy. (2021). *Draft Overarching National Policy Statement for energy (EN-1) [online]*.

Department for Transport. (2014). *Department for Transport [online]*. Retrieved from National Policy Statement for National Networks.

Department of Energy and Climate Change . (2011). *Department of Energy and Climate Change [online]*. Retrieved from Overarching National Policy Statement for Energy (EN-1).

Environment Agency. (2019). *Environment Agency Humber 2100+*.

Highways England. (2021). Retrieved from Design Manual for Roads and Bridges (DMRB) Sustainability and Environment Appraisal, Climate LA 114, Version 0.0.1.

HM Government. (2022). Retrieved from UK Climate Change Risk Assessment: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1047003/climate-change-risk-assessment-2022.pdf

IEMA [online]. (2020). Retrieved from Environmental Impact Assessment guide to Climate Change Resilience and Adaptation.

Jaroszweski, D. W. (2021). Retrieved from Infrastructure. In: The Third UK Climate Change Risk Assessment Technical Report. [Betts, R.A., Haward, A.B., Pearson, K.V. (eds)] Prepared for the Climate Change Committee, London: file:///C:/Users/UKAXC085/Downloads/CCRA3-Chapter-4-FINAL.pdf

Jenkins, G., Perry, M., & and Prior, M. (2008). *The climate of the United Kingdom and recent trends.* Met Office Hadley Centre, Exeter, UK.

Kendon, M. M. (2021, July). *State of the UK Climate 2020*.

Met Office . (2020). *Met Office Beaufort wind force scale [online]*.

Met Office . (2020). *Met Office Snow and low temperatures February to March 2018 [online]*.

Met Office . (2020). *Met Office, Snow and low temperatures, December 2009 to January 2010 [online]*.

Met Office . (2020). *Met Office, Snow and low temperatures, December 2010 [online]*. Retrieved from Snow and low temperatures, December 2010.

Met Office. (2010). *Met Office UK climate averages [online]*.

Met Office. (2016). *Met Office North East England: climate [online]*.

Met Office. (2019). *Met Office Heavy Rainfall July 2019 [online]*.

Met Office. (2019). *Met Office Record breaking heat-wave July 2019 [online]*.

Met Office. (2019). *Met Office UK Climate Projections [online]*.

Met Office. (2020). *Met Office Stormy and very wet spell March 2019 [online]*.

Met Office. (2020). *Met Office, Summer 2018 [online]*.

Met Office. (2022). *Met Office, Storms Dudley, Eunice and Franklin, February 2022 [online]*.

Ministry of Housing, Communities & Local Government. (2021). Retrieved from National Planning Policy Framework.

North Yorkshire County Council. (n.d.). *North Yorkshire County Council [online]*. Retrieved from Local Plan - district and borough councils.

Selby District Council. (2013). *Selby District Council [online]*. Retrieved from Selby District Core Strategy Local Plan.

Slingo, J., Belcher, S., Scaife, A., McCarthy, M., Saulter, A., McBeath, K., . . . and Parry, S. (2014). *The recent storms and floods in the UK.* Met Office, Exeter, UK.

UKCP18 Guidance: Caveats and Limitations. (n.d.). *UKCP18 Guidance: Caveats and Limitations [online]*.

WSP. (2021). *Drax BECCS Preliminary Environmental Information Report.*

York Press [online]. (2020). Retrieved from River Ouse, York rises to worst levels since 2015 floods.