

DEFRA ARP4

Climate Adaptation Risk Assessment

Introduction

Newcastle International Airport (“the Airport”) is situated just under 10 km North West of Newcastle Upon Tyne city centre and is north east England’s busiest airport. The Airport site covers 491.2 hectares, and its immediate surroundings consist of farmland and villages.

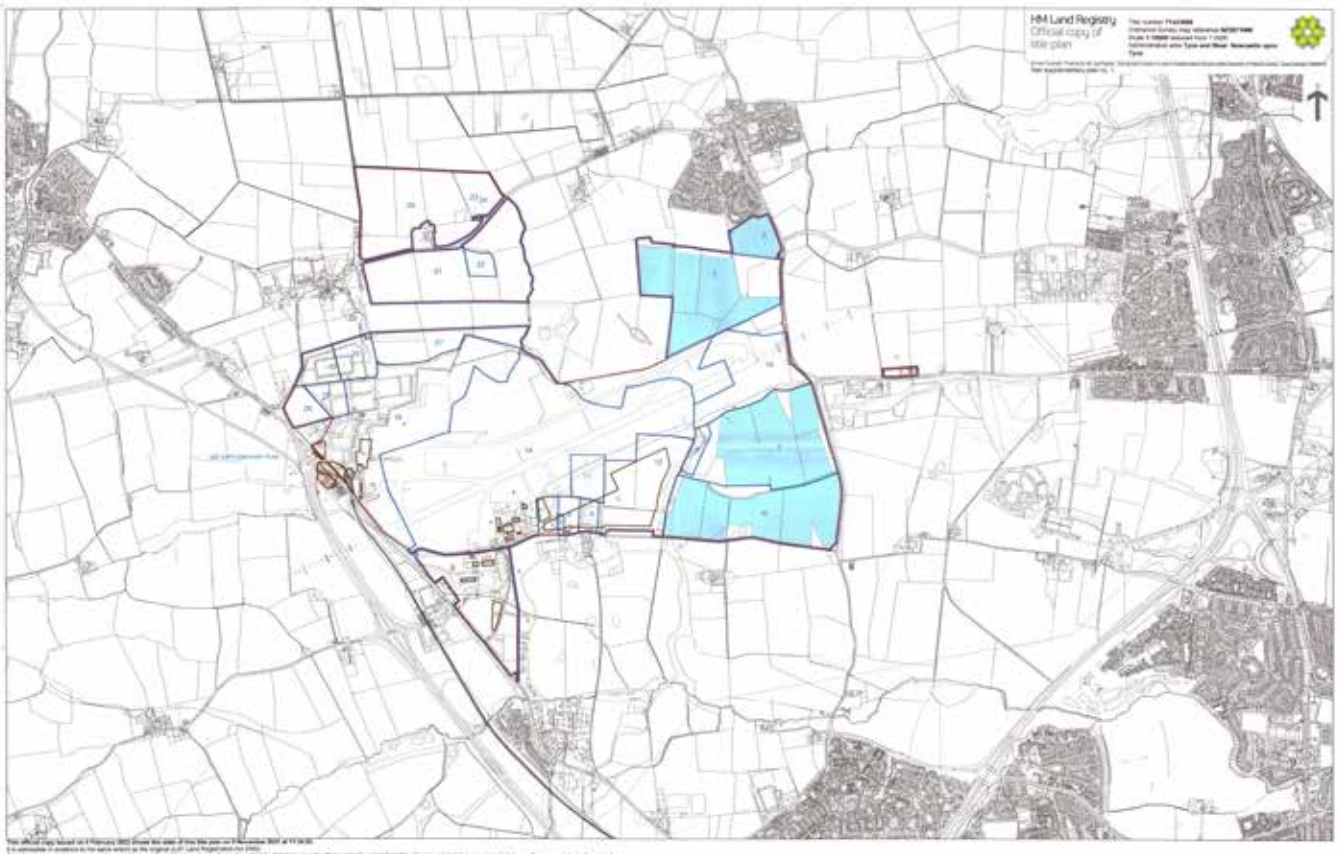


Figure 1: Newcastle International Airport site with a red and blue line border.

The Airport is run as a Public Private Partnership between the seven North East local authorities and InfraBridge, a global infrastructure investor, who have a 51% and 49% shareholding, respectively, of the company.

The seven local authorities, owning 51% of the company, are:

- Durham County Council
- Gateshead Council
- Newcastle City Council
- North Tyneside Council
- Northumberland County Council
- South Tyneside Council
- Sunderland City Council

The core catchment area of the Airport is North East England. Given the rurality of large parts of Northern England, the distance to other airports and the surface access transport links that are readily available, the Airport's wider catchment area spans to the Scottish Borders, Cumbria and Yorkshire.

The Airport is on track for reaching 5.2 million passengers in 2024. It employs over 600 people and supports over 13,000 jobs in the region through business partners.

Airport Operations

Newcastle International Airport site and services:

- One main terminal
- Two private jet facilities
- One runway
- Air Traffic Services tower
- Fire station and training ground
- Fuel farm
- Seven customer car parks
- Freight Village
- Educational facilities
- Motor Transport garage facility
- External businesses
- Two lagoons
- Solar farm
- Woodland and hedgerows

The above sites and services are included in this risk assessment.

Sustainability and Net Zero

The Airport is conscious of its responsibility to tackle the climate crisis. As part of this commitment, the Airport fulfils its duties and obligations by adopting plans such as Corporate Social Responsibility (CSR) Strategy, Noise Action Plan and Net Zero 2035 Carbon Plan, all of which are available for public review.

The Airport embeds climate action within the organisation through its CSR Strategy. There is a conscious effort to reduce the overall per passenger environmental impact of operations

and strive to deliver continuous improvement. The CSR Strategy contains the Airport's Environmental Policy, which sets objectives for environmental sustainability.

The Airport's Environmental Policy encompasses:

- Noise
- Water and Air Quality
- Delivering our Net Zero Carbon 2035 Plan
- Waste
- Biodiversity
- Sustainable travel and promotion of public transport
- Business partner, staff and supply chain engagement
- Compliance with legislation

Climate change action is governed by members of senior management.

Governance of climate action at Newcastle International Airport:

- Chief Executive Officer
- Chief Sustainability and Communications Officer
- Chief Financial Officer
- Chief Operating Officer
- Director of Operations

The Airport also has a dedicated Sustainability and Communications team to drive climate action.

Adapting to a Changing Climate

The Airport acknowledges that it must prevent but also prepare, simultaneously, for the implications of climate change on our environmental, social, economic and political landscape.

We want to ensure that the Airport provides a resilient service for passengers and sustainable employment for the region. We want to ensure our passengers and staff have a safe and comfortable experience at our airport in a changing climate. Additionally, we must not pollute the surrounding environment due to changing climatic variables putting pressure on our services.

We are proactive in reviewing and incorporating the publicly available adaptation guidance from DEFRA and the Met Office. In this ARP4 risk assessment, we are building upon previous risk assessments at the Airport, for example high level risk assessments, which have laid the foundations to ensure that operations will continue, as much as possible, in challenging climatic conditions.

UKCP18 Climate Scenarios

UKCP18, developed by the Met Office, are climate modelling projections which are recommended as a starting point for climate risk assessments. Climate projections enable planning for adaptation for the future. UKCP18 provides the Met Office understanding on how the climate system may evolve in the future.

UKCP18 modelling allows us to predict what climate variables will be of concern to the Airport in the mid-century (2050). We have chosen mid-century in our scenario as this is the time option available which is closest to our airport net zero by 2035 target, meaning we can carry out action plans on both at the same time and allow them to complement each other, where possible.

We have chosen the Representative Concentration Pathway (RCP) of 8.5, which gives the worst-case scenario of high global emissions continuing to grow unmitigated, and a change in temperature of 4.3°C by 2081-2100. RCP 8.5 is chosen because the Intergovernmental Panel on Climate Change (IPCC) reports in its AR6 Synthesis Report, 2023, that national emissions reduction plans are unlikely to limit warming to below 2°C in the 21st Century, and that nations are not currently implementing the transitions which will cause necessary emissions reductions¹.

UKCP18 probabilistic projections were used to assess risk from precipitation and temperature in a 25 km grid cell around the Airport (412500.00, 562500.00). UKCP18 regional projections were used to assess risk against wind in North East England.

Chosen climate variables and time periods:

- Precipitation Rate, Summer
- Precipitation Rate, Autumn
- Precipitation Rate, Winter
- Precipitation Rate, Spring
- Mean Temperature, Summer
- Mean Temperature, Winter
- Average Eastward Wind, Annual
- Average Northward Wind, Annual

Chosen climate scenarios:

- Present day climate variables with existing risk control measures
- Mid-century (medium-term) to 2050 with RCP 8.5 (change in temperature of 4.3°C by 2081-2100) with existing risk control measures and actions to improve risk control.

The 95th percentile is used in each probabilistic UKCP18 output for the chosen climate variables and time periods. This gives the worst-case scenario to assess risk against, which complements our choice of RCP 8.5 as the worst-case emissions scenario.

Precipitation Rate

Outputs from UKCP18 modelling, figures 2 to 5, show average precipitation rate decreasing by ~15% in the summer months from 2024 to 2050. These months show the largest decrease in precipitation rate, compared to spring and autumn, which both show a ~5% decrease. Precipitation rate in winter is predicted to increase by ~5%.

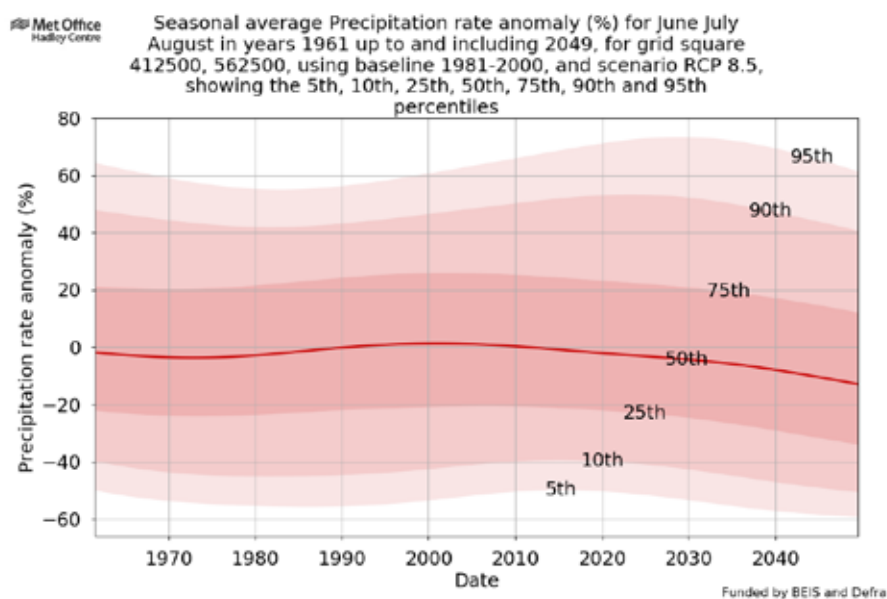


Figure 2: Precipitation Rate, Summer, RCP 8.5 to 2050

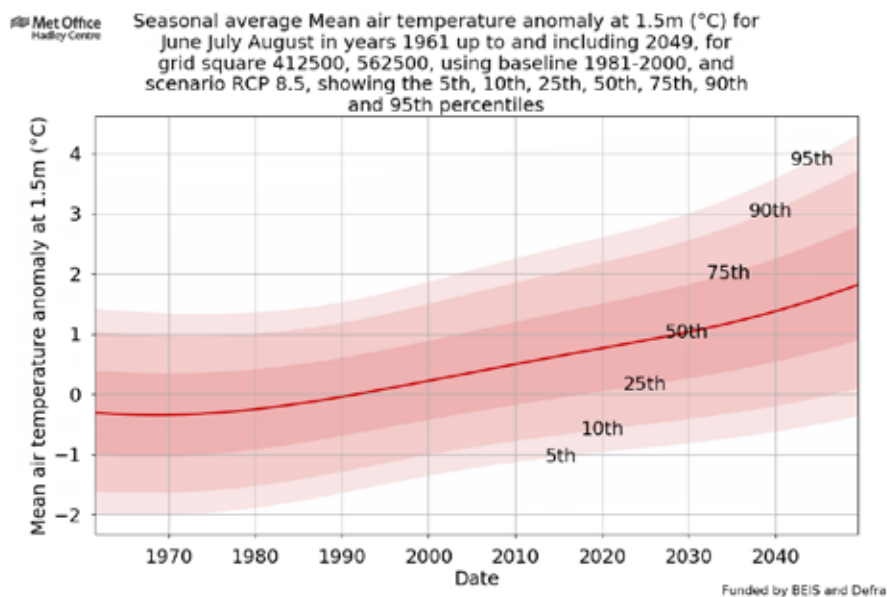


Figure 3: Precipitation Rate, Autumn, RCP 8.5 to 2050

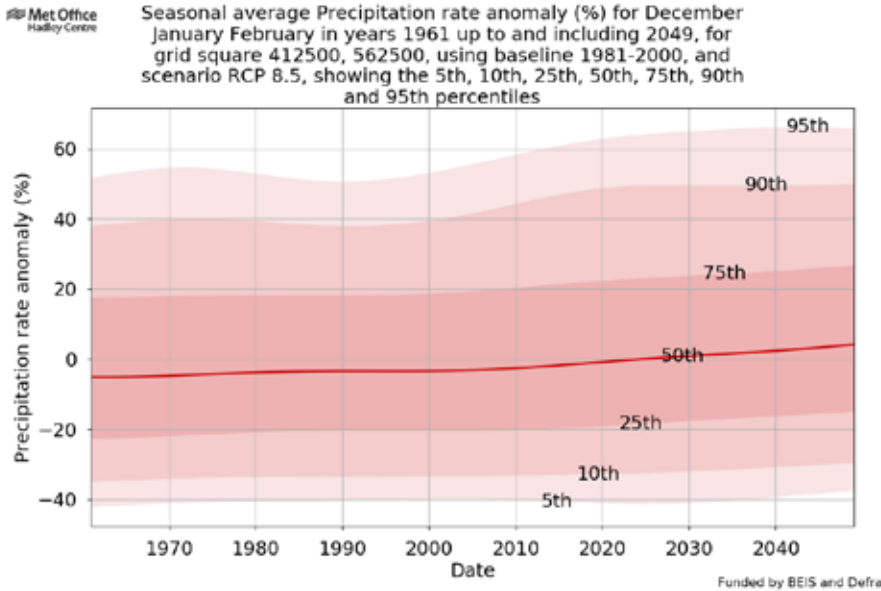


Figure 4: Precipitation Rate, Winter, RCP 8.5 to 2050

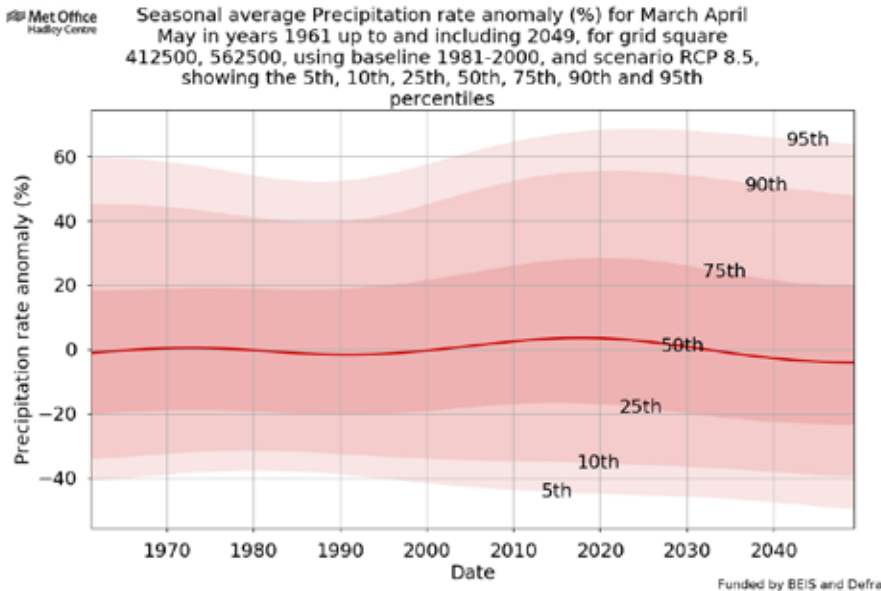


Figure 5: Precipitation Rate, Spring, RCP 8.5 to 2050

Mean Temperature

Temperature is predicted to increase from 2024 to 2050 in the summer and winter months, visible in figures 6 and 7. The largest increase is in the summer months, with a predicted increase of $\sim 2^{\circ}\text{C}$.

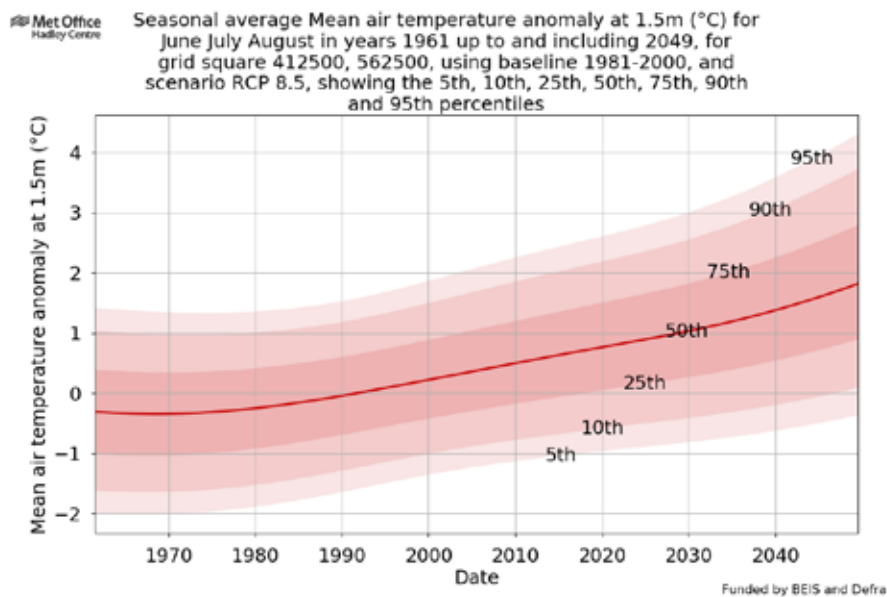


Figure 6: Mean Temperature, Summer, RCP 8.5 to 2050

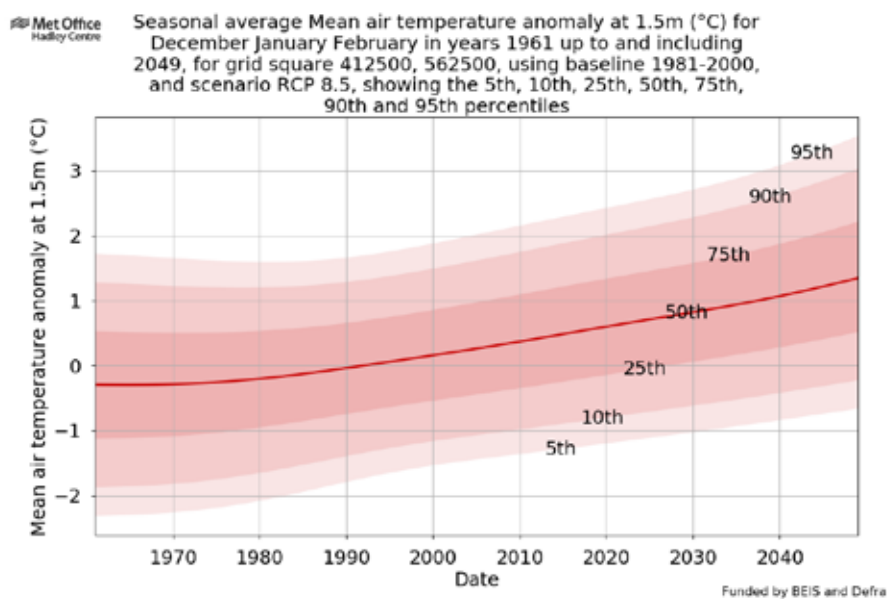


Figure 7: Mean Temperature, Winter, RCP 8.5 to 2050

Annual Average Wind

Northward and eastward wind speed is not predicted to increase in our chosen climate scenario up to 2050.

Assessing and Prioritising Risk

Following the use of climate projections, the Airport utilised the climate risks published in CCRA3 (the UK government's third Climate Change Risk Assessment) to identify and then tailor climate risks which are bespoke to its site and situation.

Consultation between departments took place to develop the risk assessment, including risk scoring. Risks were scored using the ARP4 measurement of risk. See Annexe B for the risk scoring matrix.

The airport has included interdependencies within the risk assessment where failure of an organisation's services would put our services at most risk.

Interdependency risks have been prioritised for:

- Northumbrian Water Limited
- Northern Powergrid
- Nexus Metro

The risk register, which has been created for ARP4, is in Annexe A. The risk register includes current and future risk assessment and interdependencies. It also includes current control measures and adaptation action.

References

¹ IPCC, 2023: Sections. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115, doi: 10.59327/IPCC/AR6-9789291691647

Annexe A

Risk Code	Climate Variable	Climate Variable Projection (UKCP18 RCP 8.5 2024 to 2050)	Risk	Risk Description & Effect	Location	Control Measures	Action for Adaptation	Likelihood	Impact	ARP 4 Risk Score	M1 Risk identified in CCRA3? (Y/N)
NCR1	Precipitation	<p>Precipitation rate decrease for summer, spring and autumn.</p> <p>Precipitation rate increase for winter.</p>	Risks to Metro network from flooding.	<p>Employees and passengers unable to reach the airport using the Metro. Passengers miss flights and employees are late to work shifts, causing pressure on or closure of airport services.</p> <p>The Metro system runs over multiple flood zones along the Tyne River and its tributaries, seen using the Flood Map for Planning service from the UK Government.</p>	Tyne and Wear Metro (Nexus)	Nexus communications would be distributed via established NIAL communication methods to employees, business partners and passengers.	<p>Sustainability and Communications employees will continue a strong working relationship with Nexus.</p> <p>Multiple travel options will continue to be communicated to employees and passengers including bus and car.</p>	Likely	Minor	8	Y
NCR2	Temperature	Temperature increase in the summer and winter months.	Risks to Metro network from high temperatures.	Employees and passengers unable to reach the airport using the Metro due to train track buckling. Passengers miss flights and employees are late to work shifts, causing pressure on or closure of airport services.	Tyne and Wear Metro (Nexus)	Nexus communications would be distributed via established NIAL communication methods to employees, business partners and passengers.	<p>Sustainability and Communications employees will continue a strong working relationship with Nexus.</p> <p>Multiple travel options will continue to be communicated, as they are currently through the website, for example, to employees and passengers including bus and car.</p>	Likely	Minor	8	Y

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NCR3	Precipitation	Precipitation rate decrease for summer, spring and autumn. Precipitation rate increase for winter.	Risks to pollution prevention from precipitation.	North, south or both lagoons overtop. Surface water pollution incident, negative publicity about the airport and potential legal action against the business.	North East England	Investment in 2024 has improved the airport's physical pollution prevention system and established procedures have been reviewed and are followed diligently.	Investment into pollution prevention is and will continue to be a key topic of discussion between multiple departments at the airport.	Possible	Minor	6	N
NCR4	All/Any	N/A	Risks to energy supply from cascading failures.	Grid electricity supply fails due to cascading failures affecting Northern Powergrid. Cascading failures can include lightening strike or flooding damaging energy system hardware, or temperature affecting the health and safety of employees or their productivity.	Airport site	Generator backup is available.	In line with the Airport's Net Zero strategy, the airport is scoping up additional renewable energy technologies and forms of energy storage e.g. constructing additional phases of our solar farm.	Unlikely	Moderate	6	Y
NCR5	Temperature Precipitation	Temperature increase in the summer and winter months. Precipitation rate decrease for summer, spring and autumn. Precipitation rate increase for winter.	Risks for forestry and hedgerow productivity with increased summer temperatures and decreased summer rainfall.	Airport-owned forests and hedgerows decrease in productivity, leading to reduced biodiversity and carbon sequestration for offsetting purposes.	Airport site	Any areas of damaged vegetation are replanted in accordance with the Airport's grant funding agreement. Additionally, planting was and is only carried out in areas approved by the Environment Agency for resilience and longevity.	Replanting will take place when vegetation is damaged. The airport will continue to work with the Environment Agency on all planting projects.	Possible	Moderate	6	Y

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NCR6	Precipitation	Precipitation rate decrease for summer, spring and autumn. Precipitation rate increase for winter.	Risks to passenger surface access via car and bus from flooding.	<p>Employees and passengers unable to reach the airport using car or bus from some areas. Passengers miss flights and employees are late to work shifts, causing pressure on or closure of airport services. The majority of the airport's employees and passengers reach the airport via car.</p> <p>The airport's main catchment area is the North East of England, which has multiple areas at risk of flooding, mainly along rivers.</p> <p>Increased precipitation is predicted until 2050, when it then plateaus, using our chosen climate scenario.</p>	North East England	'Weather events & natural hazards' high level risk assessment control measures are followed.	Weather events & natural hazards high level risk assessment is reviewed annually, and the annual review will now include climate risk assessment.	Possible	Moderate	6	Y
NCR7	Temperature	Temperature increase in the summer and winter months.	Risks to business from reduced employee productivity due to higher temperatures in working environments.	Employee productivity reduces leading to pressure on airport services and reduced customer service.	Airport site	<p>Temperature is controlled by the Building Management System and in other, manual, methods and procedures are followed during high temperatures to ensure comfort in buildings.</p> <p>Procedures exist for health and safety when working outdoors.</p>	<p>Airport is to consider the addition of solar film to terminal windows as a passive cooling technique.</p> <p>Review working procedures related to high temperature outdoors. Most of these procedures will be held with business partners.</p>	Possible	Minor	6	Y

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Risk Code	Climate Variable	Climate Variable Projection (UKCP18 RCP 8.5 2024 to 2050)	Risk	Risk Description & Effect	Location	Control Measures	Action for Adaptation	Likelihood	Impact	ARP 4 Risk Score	M1 Risk identified in CCRA3? (Y/N)
NCR8	All/Any	N/A	Risks to water supply from cascading failures.	<p>Water supply fails due to cascading failures affecting Northumbrian Water Limited. No supply of clean, tap water for staff and passengers for drinking, washing hands or washing dishes in food and beverage outlets. No supply of water for toilets or fire fighting sprinklers.</p> <p>Cascading failures can include flooding or subsidence damaging the water treatment system, or temperature affecting the health and safety of employees or their productivity.</p>	Airport site	<p>Emergency communications procedure will be followed.</p> <p>'Loss of utilities' high level risk assessment control measures will be followed.</p>	Airport will continue a close working relationship with Northumbrian Water.	Highly Unlikely	Catastrophic	5	Y
NCR9	Precipitation	<p>Precipitation rate decrease for summer, spring and autumn.</p> <p>Precipitation rate increase for winter.</p>	Risks to buildings and stores from flooding.	Buildings and stores (e.g. the airport's fuel farm) are flooded, leading to inability to deliver airport services.	Airport site	'Weather events & natural hazards' high level risk assessment control measures are followed.	Weather events & natural hazards high level risk assessment is reviewed annually, and the annual review will now include climate risk assessment.	Highly Unlikely	Major	4	Y

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NCR10	Precipitation	Precipitation rate decrease for summer, spring and autumn. Precipitation rate increase for winter.	Risks to airport roads from flooding.	Airport roads airside, and airport roads landside, are flooded, leading to inability to deliver airport services.	Airport site	'Weather events & natural hazards' high level risk assessment control measures are followed.	Weather events & natural hazards high level risk assessment is reviewed annually, and the annual review will now include climate risk assessment.	Highly Unlikely	Major	4	Y
NCR11	Precipitation	Precipitation rate decrease for summer, spring and autumn. Precipitation rate increase for winter.	Risks to runway and taxiways from flooding.	Runway and taxiways and flooded, leading to aircraft unable to take off and land.	Runway	'Weather events & natural hazards' high level risk assessment control measures are followed.	Weather events & natural hazards high level risk assessment is reviewed annually, and the annual review will now include climate risk assessment.	Highly Unlikely	Major	4	Y
NCR12	Temperature	Temperature increase in the summer and winter months.	Risks to employee and passenger health and wellbeing from high temperatures.	Employees and passengers experience discomfort within buildings. Employees at risk of heatstroke when working outdoors.	Airport site	Temperature is controlled by the Building Management System and in other, manual, methods and procedures are followed during high temperatures to ensure comfort in buildings. Procedures exist for health and safety when working outdoors.	Airport is to consider the addition of solar film to terminal windows as a passive cooling technique. Study and review working procedures related to high temperature outdoors. Most of these procedures will be held with business partners.	Highly Unlikely	Minor	4	Y

Annexe B

Impact

Rating	Definition
Catastrophic	It would result in catastrophic events resulting in failure to deliver the organisations functions
Major	It would result in significant disruption to the organisation's functional delivery, resulting in the need to conduct re-planning and re-estimating. In the extreme, it may result in failure of the project
Moderate	It would result in delays or additional work that would exceed existing contingencies, resulting in exceeded time scales, additional resource and/or additional budget requirements
Minor	It would result in delays or additional work that could be contained with existing contingencies
Minimal	It would result in negligible delays or disruption

Likelihood

Rating	Definition
Almost certain	The risk in the process of materialising and may already be under active management as an event
Likely	Past events have not been fully resolved, effective mitigations not yet identified, control weakness are known and are being managed.
Possible	Past events satisfactorily resolved, mitigations are in place or are on track to be in place, control improvements are under active management
Unlikely	Events are rare, required mitigations in place, controls are effective
Highly unlikely	No known event or if known extremely rare, extreme industry-wide scenarios

Annexe B

		Impact				
Risk To be Derived for each Climate Scenario		Minimal	Minor	Moderate	Major	Catastrophic
Likelihood	Almost certain	5 / Moderate	10 / Major	15 / Major	20 / Severe	25 / Severe
	Likely	4 / Moderate	8 / Moderate	12 / Major	16 / Major	20 / Severe
	Possible	3 / Minor	6 / Moderate	9 / Moderate	12 / Major	15 / Major
	Unlikely	2 / Minor	4 / Moderate	6 / Moderate	8 / Moderate	10 / Major
	Highly unlikely	1 / Minor	2 / Minor	3 / Minor	4 / Moderate	5 / Moderate