



**Birmingham  
Airport**

Proud of every journey

# Climate Change Adaptation Progress Report

2021

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# 1. Introduction

## 1.1 Purpose and scope

In 2011 Birmingham Airport Ltd (BAL) produced its first Climate Change Adaptation Report. This report was completed under direction from the Department for Environment, Food and Rural Affairs (Defra) under the Adaptation Reporting Power as a regulatory requirement of the Climate Change Act 2008. The 2011 report identified the risks posed to Birmingham Airport from a changing climate in order to assist the business with preparing for climate change and contributed to the Government's first round of national adaptation reporting (ARP1). We have subsequently produced a 2016 Climate Change Adaptation Progress Report which formed part of a five-year cycle and the second round of national adaptation reporting (ARP2).

This 2021 report is the third update and outlines the progress made in adapting to the predicted effects of current and future climate change on our organisation since our previous 2016 Climate Change Adaptation Progress Report. It also reviews our Climate

Change Risk Register and will form part of the third round of national adaptation reporting (ARP3).

We have assessed our climate change adaptation risks against information from the latest UK Climate Projections available (UKCP18), produced by the Met Office Hadley Centre.

In addition to our work on climate change adaptation, we are also engaged in climate change mitigation with a commitment to become a net zero carbon airport by 2033, prioritising zero carbon airport operations and minimising carbon offsets. Whilst this progress report focuses exclusively on climate change adaptation, information regarding our climate change mitigation activities can be found within our [Sustainability Strategy](#). We are also developing a Net Zero Carbon Strategy in support of our Net Zero commitment; this will be published in early 2022.

## 2. Progress in adapting to climate change

### 2.1 Overview

We recognise that the UK's climate is changing and that recent decades have been warmer, wetter and hotter compared to the 20<sup>th</sup> century, with the MET Office's recent State of the UK Climate Report showing that 2020 was the third warmest, fifth wettest and eighth sunniest year on record for the UK.

The concept of climate change is embedded within all areas of the business and our 2016 climate change adaptation progress report identified a number of actions required in order to prepare the business for the likely

impacts of climate change. We have made significant progress against these actions and this is detailed at section 2.3.

During this round of reporting, we have reviewed and updated our climate change risk register. As part of this review, a number of climate change risk workshops have been held to engage both internal and external stakeholders. Our climate change risk register has been updated to reflect the progress that has been made against previous actions, and the input of changes in technology and development.

### 2.2 Reviewing our assessment of climate change risk

During 2021 we have reviewed our climate change risk register with all applicable stakeholders. This included representatives from a range of internal company departments, in addition to members of the Airport Consultative Committee (ACC). The ACC, representing the interests of local authorities, resident groups, industry bodies and Airport users, plays a vital role as a communication channel between the Airport and its many stakeholders. In total four workshops were held to review the risks identified in the previous round of reporting (2016) and to identify any new climate change risks.

We have re-evaluated the identified climate change risks against information from the latest UK Climate Projections (UKCP18), produced by the Met Office Hadley Centre.

There are various different emissions scenarios that can be used when generating data;

- Representative Concentration Pathway (RCP) 2.6 (low emissions scenario)
- RCP 4.5 and RCP 6.0 (medium emissions scenario)
- RCP 8.5 (high emissions scenario)
- SRES A1B (medium emissions scenario used in previous climate predictions - CP09)

In 2011 and 2016 the Airport Company chose two of the key timelines to discuss: 2020 and 2050. Within this current round of reporting climate change issues, three timelines have been considered within our climate change risk register: 2025, 2050 and 2080.

UKCP18 climate variables for the West Midlands region are summarised in Tables 1, 2 and 3 below.

| Climate Variable          | 2050s<br>RCP2.6 | 2050s<br>RCP6.0 | 2080s<br>RCP2.6 | 2080s<br>RCP6.0 |
|---------------------------|-----------------|-----------------|-----------------|-----------------|
| Mean Annual Temperature   | +1.2°C          | +1.2°C          | +1.3°C          | +2.4°C          |
| Mean Winter Temperature   | +1.1°C          | +1.1°C          | +1.2°C          | +2.0°C          |
| Mean Summer Temperature   | +1.7°C          | +1.5°C          | +1.9°C          | +3.2°C          |
| Mean Summer Precipitation | -15%            | -15%            | -19%            | -26%            |
| Mean Winter Precipitation | +6%             | +5%             | +9%             | +14%            |

Table 1. UKCP18 Climate Projections for temperature and rainfall for the West Midlands region, for low (RCP2.6) and medium (RCP6.0) emission scenarios. These figures are relative to a 1981-2000 baseline.

| Climate Variable  | Baseline<br>(1981-<br>2000) | Time Period |        |        |
|---|-----------------------------|-------------|--------|--------|
|   |                             | 2025's      | 2050's | 2080's |
| Temperature: number of frost days (days with a temperature equal or lower than 0°C) | 36                          | 22          | 17     | 9      |
| Temperature: number of hot days (days with a maximum temperature higher than 25°C)  | 20                          | 32          | 52     | 70     |
| Precipitation: number of dry spells (10 days+ with no precipitation)                | 9                           | 9           | 9      | 11     |
| Precipitation: winter mean (mm/day)   | 1.75mm                      | 1.8mm       | 2.0mm  | 2.09mm |

Table 2. UKCP18 Climate Projections for temperature (frost and hot days) and rainfall (dry spells and winter daily rainfall) for the West Midlands region, for medium (RCP6.0) emission scenario relative to a 1981-2000 baseline.

| Climate Variable | Long-term climate projection to 2080  |
|------------------|---|
| Storms           | An increase in frequency and severity   |
| Wind-speed       | A general calming of surface wind speeds (<10%) is projected for all seasons.   |
| Fog              | Spring: >35% decrease in fog events<br>Summer: >65% decrease in fog events<br>Autumn: 10 - 30% decrease in fog events<br>Winter: 20% increase in fog events |
| Lightning        | Winter: Similar<br>Spring: increase to 6-10 days from 4-5 days<br>Summer: increase to 8-13 days from 8-9 days<br>Autumn: increase to 5-9 days from 2-3 days |
| Snow             | Days of snowfall:<br>Autumn/spring: 80% less<br>Winter: 70% less<br>Heavy snow events:<br>Spring: 80% reduction<br>Winter: 60% reduction                    |

Table 3. High level overview of other climate parameters considered and their long-term climate projections out to 2080.

Our risk assessment process considers impact and likelihood on a scale of 1 to 5. The impact and likelihood scores are multiplied to calculate the risk score, with the maximum risk rating for any risk being 25. The risk matrix used is shown in Table 3 below. This method aligns with other airports through the Airport Operators Association, providing input on a sectoral climate change risk register template which has been developed in conjunction with Defra. This template is being used across reporting airports in order to increase the consistency of reporting and allows identified climate risks to be assessed and quantified in the same way across the

sector. Our 2021 climate change risk register can be found in Appendix A.

Actions arising from identified climate risks have been assigned to one of three categories:

1. **Watching brief;** to be maintained in the short-term using the latest climate projections.
2. **Investigate;** risk to be investigated in order to be fully understood before determining if action is needed.
3. **Action;** identified as needed in order to adapt to a climate change risk.

| Climate Change Risk Matrix |   |  |   |  |   |   |
|----------------------------|---|--|---|--|---|---|
|                            |   | Likelihood   |   |  |   |   |
|                            |   | <b>Improbable (1)</b><br>Event may occur in exceptional circumstances. Should virtually never occur. | <b>Unlikely (2)</b><br>Remote. Event could occur at some time. Possible but not likely. | <b>Less than likely (3)</b><br>Occasional. Event should occur at some time. Possible to occur. | <b>More than likely (4)</b><br>Event will probably occur in most circumstances. Likely to happen. Can be anticipated. | <b>Highly probable (5)</b><br>Frequent. Event is expected to occur in most circumstances. Almost certain. |
| Impact                     | <b>Minimal (1)</b><br>Noticeable event but manageable or absorbed through normal activity.  | 1  | 2   | 3  | 4   | 5   |
|                            | <b>Minor (2)</b><br>An event which can be managed via existing processes. Minor adverse consequences.   | 2  | 4   | 6  | 8   | 10  |
|                            | <b>Moderate (3)</b><br>A significant event which requires prompt action to prevent escalation. Can usually be managed under normal circumstances              | 3  | 6   | 9  | 12  | 15  |
|                            | <b>Major (4)</b><br>A large event that requires a high-level of engagement, special arrangements and effective management. Crisis Management Teams activated. | 4  | 8   | 12   | 16  | 20  |
|                            | <b>Catastrophic (5)</b><br>A critical event with extremely devastating consequences. Potential or actual disaster for the business. Loss of Life.             | 5  | 10  | 15   | 20  | 25  |

Table 4. Climate change risk matrix.

## 2.3 Progress against previously identified actions

The progress made against actions identified as part of our first round of climate change adaptation reporting (2011) is detailed below. All actions remained open at our 2016 review. Due to the long-term nature of the timeframes considered in our climate change risk assessment, specific completion dates have not been set.

Since reporting started in 2011, Birmingham Airport has taken a number of actions as a result of adaptation to climate change issues.

### **Number:** CCAA01

**Action:** Work with the Carbon Trust on the development of on-site Renewable Energy Biomass Combined Heat & Power (CHP) and/or Photovoltaic Solar Farm or a shared renewable energy generation facility will result in increased security of supply and a reduction of CO<sub>2</sub> emissions.

**Progress:** The security of electricity supply from the grid could be adversely impacted by future predicted extreme weather events caused by climate change. Increased summer temperatures will increase energy requirements for cooling across the UK and an increase in lightning strikes could cause a reduction in grid reliability. Since this action was identified in 2011, progress has been made with the investment and installation of 212 rooftop solar panels on the roof of our terminal building. Investigations into further renewables will form part of our Net Zero Roadmap which is currently in development. This investigation is detailed as a new action as part of our 2021 climate change risk register review, CCAA09: to reduce reliance on grid and increase security of electricity supply through on-site renewable electricity generation (Solar PV).

**Current Status:** Action closed.

### **Number:** CCAA02

**Investigate:** Work with De Montfort University to investigate how the existing Airport building stock can be made more resilient in terms of heating and cooling capacity and ensure compliance with the Energy Performance of Buildings Directive, with Energy Performance Certificates obtained for all buildings, these provide detailed energy efficiency improvement actions.

**Progress:** Current airport infrastructure capability is managed through the asset management programme. We recognise that climate change presents a high risk to the resilience of our Heating, Ventilation and Cooling (HVAC) System and that this has been incorporated into two new adaptation actions as part of our 2021 climate change risk register review. CCAA07: to carry out an enhanced review of heavily glazed building areas temperature control requirements e.g. ATC tower/ terminal buildings and CCAA08: to carry out a full review of HVAC system and building performance standards. The Airport remains compliant with the Energy Performance of Buildings (England and Wales) Regulations 2012, obtaining and displaying Energy Performance Certificates (EPC's) as required.

**Current Status:** Action closed.



**Number:** CCAA03

**Action:** Incorporate an analysis of climate change resilience into all capital investment appraisals for future infrastructure and building developments.

**Progress:** All infrastructure projects that require a capital investment appraisal are required to be evaluated to ensure sustainability criteria are met. This action will remain open for continual review of sustainability criteria within the capital expenditure process.

**Current Status:** Action open.

**Number:** CCAA04

**Action:** Carry out a Flood Risk Assessment (FRA) as part of the planning application for the runway extension.

**Progress:** The Airport Company carried out a Flood Risk Assessment (FRA) as part of the planning application process for the runway extension. This was in accordance with Planning Policy Statement 25: Development and Flood Risk (PPS25). The modelling considered the flood risk of the Low Brook in relation to the proposed runway extension works (these works were carried out in 2012). The FRA showed that the engineering and drainage works to be carried out as part of the runway extension works, including the realignment of the A45 and the diversion of upstream watercourses, reduce the potential flood levels upstream of the Airport to a 1 in 100-year event.

**Current Status:** Action closed.

**Number:** CCAA05

**Investigate:** Undertake a study to assess flood risk from the Hatchford Brook at the northern end of the airfield, in order to determine if any mitigation works are required.

**Progress:** The North Airfield Drainage system was installed in 2013 and has alleviated some of the flood risk from Hatchford Brook. This has increased the storage potential during heavy rainfall events and allows discharge to either foul sewer or to Hatchford Brook. Flood prevention measures were also put in place at one of the critical airport substations due to flooding issues in 2016 within the Hatchford Brook area. Further works have been deemed necessary at Hatchford Brook inflow with this work detailed as a new action as part of our 2021 climate change risk register review (CCAA11) to: carry out de-silting and bank stabilisation works at the Hatchford Brook inflow to increase channel capacity.

**Current Status:** Investigation closed.

**Number:** CCAA06

**Investigate:** Consider the need for equipment and/or data that will provide improved real time information on wind, wind shear and monitoring for storms.

**Progress:** Increased wind gusts and potential changes in direction are expected as a result of climate change, but details are uncertain. Extreme weather events are continually monitored on the airfield. Details are still uncertain on future predicted extreme weather events as a result of climate change. The airport has responded adequately to extreme events that have occurred and is capable of accepting aircraft diversions due to weather events at other airports.

**Current Status:** Investigation open.

Eight new actions have been identified and these are detailed within our 2021 climate change risk register at Appendix A.

### 3. Interdependencies

Birmingham Airport does not operate in isolation and works in partnership with a variety of internal and external stakeholders on a collaborative approach to climate change adaptation.

Our previous two rounds of reporting identified and considered a number of key interdependencies as outlined below.

| Key Stakeholders  |   |  |   |  |
|---|---|--|---|--|
| Industry  | Airport Community   | Local Community  | Business Community  | Government Regulators  |
| <ul style="list-style-type: none"> <li>• Sustainable Aviation</li> <li>• Airlines</li> <li>• NATS</li> <li>• Airport Operators Association</li> </ul> | <ul style="list-style-type: none"> <li>• Employees</li> <li>• Tenants</li> <li>• Concessions</li> </ul> | <ul style="list-style-type: none"> <li>• Residents Parish/Town Councils</li> </ul> | <ul style="list-style-type: none"> <li>• Small Businesses</li> <li>• Landowners</li> <li>• Regional Business Community</li> <li>• Chambers of Commerce</li> </ul> | <ul style="list-style-type: none"> <li>• Local Authorities</li> <li>• Department for Transport</li> <li>• Department for Environment, Food and Rural Affairs</li> <li>• Department for Business, Energy &amp; Industrial Strategy</li> <li>• Civil Aviation Authority</li> </ul> |

#### Surface Access

Birmingham Airport relies on other modes of transport for surface access, to allow passengers and staff to access the Airport. Stakeholders involved include Highways England, Network Rail, Solihull Metropolitan Borough Council, Birmingham City Council, Warwickshire County Council, Train Operating Companies and Bus and Coach operators. These functions are important to the success of Birmingham Airport’s Surface Access Strategy.

#### Communications

Both land and wireless communication feature heavily in Birmingham Airport’s interdependencies, particularly in the operational field of Air Traffic Control. At Birmingham Airport, Air Traffic Control sits as an internal function, giving greater control over the asset.

#### Energy Suppliers

Birmingham Airport is currently dependent on an energy supply from external energy suppliers, as are other businesses which operate at the Airport, including partner airlines and concessions.

Action CCAA09 aims to reduce reliance on the grid and increase security of energy supply through on-site renewable electricity generation in the form of Solar PV. Details of this will form part of our Net Zero roadmap which is currently in development.

#### Airport Operators Association

Birmingham Airport is also a member of the Airport Operators Association, allowing us to collaborate with other UK airports on climate change adaptation.

## **Sustainable Aviation**

At an industry level we work extensively with Sustainable Aviation, a collaboration of UK airlines, airports, air navigation service providers and major aerospace manufacturers which sets a long-term strategy for collective action to tackle the challenge of ensuring a cleaner, quieter, smarter future for our industry.

Other interdependencies identified in this round of reporting include: Airlines, Handling Agents, aircraft fuel providers, other airports, local planning authorities and West Midlands Fire Service. All interdependencies have been considered as part of the climate change risk register at Appendix A and we continue to monitor these and engage wherever necessary.

## 4. Monitoring and review

The concept of climate change and the need to adapt to a changing climate is integrated throughout the business, with our overarching aim being to ensure that the Airport remains resilient to a changing climate and is in a position to benefit from any potential opportunities. This is outlined within our Sustainability Strategy which is publicly available via our website.

We are committed to ensuring the airport is prepared to adapt to a changing climate and this message is communicated to all employees, partners and contractors through our [Sustainability Statement of Intent](#), which represents the views of our Board and is available to the public via our website.

Risks, opportunities and actions identified as part of our Climate Change Risk Register (Appendix A) contribute to the Airport Company's corporate risk register and are documented, reviewed and progressed through our Environmental Management System to ensure continuity. The actions will be reviewed annually through the Airports Environmental Management Review Group to ensure they are still relevant to the business and that progress is continuing. All risks/opportunities identified within the Climate Change Risk Register have been assigned a risk owner, with progress monitored through BAL's internal governance structure.

Climate change adaptation is embedded into key organisational processes, including our asset management register, procurement, development and operational processes which include Airport Instructions and Local Operating Procedures. Further work is underway to incorporate climate change adaptation into our Sustainable Building Design and Construction Standards which are currently in development. This will ensure responsible design in any construction and/or renovation projects at Birmingham Airport.

The climate change risk register will be reviewed whenever any significant changes are identified to areas that are potentially high risk to the business or to infrastructure at the airport. Progress against the actions identified will be regularly reviewed and we will undertake a full review of our climate change risk register in five years.

### Case Study: ATC Tower Design

The design of the 33m high Air Traffic Control Tower, which opened in 2013, considered future climate predictions. As a result, the tower has many features to mitigate against future climate change, including a heating and cooling system designed to cope with more extreme hot and cold weather conditions, external shutters to limit solar gain, internal blinds to allow for optimum temperature control and stabilising technology to limit movement during stormy weather.



## Case Study: Flood & Pollution Control System Upgrades



We operate a dedicated Flood & Pollution Control System across the site which is made up of four Total Organic Carbon (TOC) monitors and 10 polluted water holding tanks.

In 2019 we replaced all the TOC monitors in the system at a cost of over £60,000. The system is designed to prevent surface water contaminated with substances such as de-icing fluid from entering on-site watercourses. In the winter of 2019/20 over 150,000 litres of de-icer was used on aircraft and on the airfield, so the system has a very important role to play.

Flooding remains a prominent risk on site and monitoring of watercourse levels is undertaken continually. We have committed to a new action (CCAA10) to assess drainage system capacity, maintenance and upgrade requirements, to determine if there are any further flood prevention measures that are necessary to protect key infrastructure and assets.

# Appendix A - Climate change risk register

| Risk Identification |                              |  |  |   | Business Context                |   |  |                            | Risk Scoring      |                |                  |                     |                |                  |                     |                |                  | Control & Action  |   |
|---------------------|------------------------------|--|--|---|---------------------------------|---|--|----------------------------|-------------------|----------------|------------------|---------------------|----------------|------------------|---------------------|----------------|------------------|---|---|
| Risk No             | Climate Variable             | Risk/ Opportunity (including indirect and interdependency risks/opportunities)   | Decision threshold, process or trigger point for action on the risk  | Potential Consequences (Functions, Services, Assets affected)   | Interdependencies               | Location/ Business Area                                       | Risk Owner                                 | Previously Identified Risk | Risk Score (2025) |                |                  | Risk Score (2050's) |                |                  | Risk Score (2080's) |                |                  | Existing Controls   | Further Actions (if required)   |
|                     |                              |  |  |   |                                 |   |  |                            | Impact (I)        | Likelihood (L) | Risk Score (IxL) | Impact (I)          | Likelihood (L) | Risk Score (IxL) | Impact (I)          | Likelihood (L) | Risk Score (IxL) |   |   |
| CCR01               | Increased Summer Temperature | Thermal expansion of building infrastructure, such as concrete and steel, reducing longevity.  | No specific decision threshold   | Operational disruption<br>Airport closures<br>Financial cost to repair/ replace affected infrastructure   | No interdependencies identified | All buildings   | Development Asset Owners                   | Yes                        | 3                 | 2              | 6                | 3                   | 2              | 6                | 3                   | 3              | 9                | Maintenance programme<br>Conformance with building regulations<br>Consideration of climate change for all future builds as part of design works   | Watching Brief  |
| CCR02               | Increased Summer Temperature | Airfield surface and sub-surface structural damage to runway and aprons caused by temperatures exceeding design standards i.e. melting, cracking.  | UK tarmac standards (roads, aprons) begin to lose integrity once temperatures in the shade exceed 32°C. Tarmac itself is black, absorbs heat and can hit 80°C at such temperatures. Runway surfaces design standards withstand far higher temperatures to be able to cope with aircraft braking. | Operational disruption<br>Airport closures<br>Financial costs to repair damage<br>Reputational damage<br>Consequential damage                                 | No interdependencies identified | Airfield  | Head of Airfield Operations                | Yes                        | 3                 | 2              | 6                | 3                   | 3              | 9                | 3                   | 3              | 9                | Runway, taxiway and apron maintenance programme<br>Visual inspections   | Watching Brief  |
| CCR03               | Increased Summer Temperature | Landside surface and sub-surface structural damage to bituminous surfaces, such as car parks, landside roads caused by extreme heat.   | UK tarmac standards (roads, aprons) begin to lose integrity once temperatures in the shade exceed 32°C. Tarmac itself is black, absorbs heat and can hit 80°C at such temperatures.  | Operational disruption<br>Financial costs to repair damage<br>Reputational damage   | No interdependencies identified | Landside - all bituminous surfaces (car parks, on-site roads) | Head of Commercial (car parks) Development | Yes                        | 2                 | 2              | 4                | 2                   | 3              | 6                | 2                   | 3              | 6                | Maintenance programme   | Watching Brief  |
| CCR04               | Increased Summer Temperature | Increased accumulation of rubber on runway   | Requirement to maintain appropriate friction requirements in line with runway friction assessments   | Operational disruption due to runway closure<br>Runway excursion<br>Health & Safety incident  | No interdependencies identified | Airfield  | Head of Airfield Operations                | Yes                        | 2                 | 2              | 4                | 2                   | 2              | 4                | 2                   | 3              | 6                | Runway inspection regime including runway frictions assessment<br>Rubber removal contractor retained and works carried out to schedule  | Watching Brief  |
| CCR05               | Increased Summer Temperature | Decrease in passenger comfort within airport buildings caused by inadequate cooling systems and inability of air handling units (AHU's) to 'dump' hot air from internal to external due to high external temperature | 28°C - 30°C  | Decline in revenue and passenger numbers<br>Negative impact on passenger wellbeing<br>Reputational damage<br>Increase in Health & Safety incidents/ accidents | No interdependencies identified | All buildings   | Head of Engineering Services               | No                         | 2                 | 4              | 8                | 2                   | 4              | 8                | 3                   | 5              | 15               | Building Management System to manage hot days<br>Existing heating, ventilation and air conditioning system efficiency in newer buildings e.g. ATC tower<br>Maintenance regime of chilling infrastructure<br>Conformance to BREEAM standards | <b>Investigate CCAA07</b> - Carry out an enhanced review of heavily glazed building areas temperature control requirements e.g. terminal buildings<br><br><b>Investigate CCAA08</b> - Carry out a full review of HVAC system and building performance standards |

|       |   |   |                                   |   |                                 |  |                              |     |   |   |    |   |   |    |   |   |    |   |   |
|-------|---|---|-----------------------------------|---|---------------------------------|--|------------------------------|-----|---|---|----|---|---|----|---|---|----|---|---|
| CCR06 | Increased Summer Temperature  | Decrease in staff/contractor comfort within airport buildings caused by inadequate cooling systems and inability of air handling units (AHU's) to 'dump' hot air from internal to external due to high external temperature     | 28°C - 30oC                       | Increased staff absence<br>Negative impact on staff wellbeing<br>Reputational damage<br>Increase in Health & Safety incidents/accidents                 | No interdependencies identified | All buildings                                | Head of Engineering Services | No  | 3 | 4 | 12 | 3 | 4 | 12 | 3 | 5 | 15 | Building Management System to manage hot days<br>Existing heating, ventilation and air conditioning system efficiency in newer buildings e.g. ATC tower<br>Maintenance regime of chilling infrastructure<br>Conformance to BREEAM standards | <b>Investigate CCAA07</b> - Carry out an enhanced review of heavily glazed building areas temperature control requirements e.g. terminal buildings<br><br><b>Investigate CCAA08</b> - Carry out a full review of HVAC system and building performance standards |
| CCR07 | Increased Summer Temperature  | More residents' windows open, particularly at night, leading to greater disturbance from aircraft operations  | No specific decision threshold    | Requirement for additional noise mitigation<br>Operational restrictions imposed<br>Reputational damage  | No interdependencies identified | Airport noise footprint                      | Head of Sustainability       | Yes | 2 | 2 | 4  | 2 | 2 | 4  | 2 | 2 | 4  | Noise Action Plan<br>Sound Insulation Scheme<br>Noise Complaints Procedures<br>Introduction of newer quieter aircraft   | <b>Watching Brief</b>   |
| CCR08 | Increased Summer Temperature  | Flashpoint of aviation fuel exceeded on hot days causing a potential fire hazard.   | Aviation fuel flash point is 38°C | Financial costs for damage caused<br>Operational disruption<br>Health & Safety Incident   | Aircraft fuel providers         | Airfield                                     | Head of Airfield Operations  | Yes | 4 | 2 | 8  | 4 | 2 | 8  | 4 | 3 | 12 | Spillage reporting and clean up procedures.<br>Refuelling procedures  | <b>Investigate CCAA09</b> - Look at future aircraft types and their refuelling requirements   |
| CCR09 | Increased Summer Temperature  | Increase in local air quality pollutants such as ozone  | No specific decision threshold    | Environmental damage due to increase in pollutants<br>Restrictions on future planning and development activity  | No interdependencies identified | Local air quality                            | Head of Sustainability       | Yes | 1 | 3 | 3  | 2 | 3 | 6  | 3 | 3 | 9  | Air quality monitoring for a range of pollutants in place   | <b>Watching Brief</b>   |
| CCR10 | Increased Summer Temperature  | Reduced lift for departing aircraft due to 'thin air' and reduced engine efficiency in very hot weather   | No specific decision threshold    | Requirement for additional noise mitigation<br>Operational restrictions imposed   | No interdependencies identified | Airport noise footprint                      | Head of Sustainability       | Yes | 3 | 1 | 3  | 3 | 2 | 6  | 3 | 2 | 6  | Potential to change load factors<br>Existing noise footprint monitoring and mitigation  | <b>Watching Brief</b>   |
| CCR11 | Increased Summer Temperature  | Increased expansion and contraction of pipework damaging pipes  | No specific decision threshold    | Injury and damage to assets<br>Financial cost of maintenance and repair   | No interdependencies identified | All buildings                                | Head of Engineering Services | No  | 3 | 2 | 6  | 3 | 3 | 9  | 3 | 3 | 9  | Maintenance and replacement regime  | <b>Watching Brief</b>   |
| CCR12 | Increased Summer Temperature  | Reduced cabin comfort on-board aircraft during turnaround   | No specific decision threshold    | Reputational damage<br>Passenger distress   | Airlines                        | Aircraft                                     | Head of Customer Experience  | Yes | 3 | 2 | 6  | 3 | 3 | 9  | 3 | 3 | 9  | Air conditioning on board aircraft during turnaround  | <b>Watching Brief</b>   |
| CCR13 | Increased Summer Temperature<br>Increased Intense Periods of Rainfall | Hardening of natural surfaces with reduced natural drainage function resulting in increased run-off and risk of flooding  | No specific decision threshold    | Operational disruption due to excess surface water  | No interdependencies identified | Airfield - stands, taxiways & access roads)  | Head of Airfield Operations  | No  | 3 | 2 | 6  | 3 | 3 | 9  | 3 | 3 | 9  | Grounds Maintenance ensure ground inspections take place  | <b>Watching Brief</b>   |
| CCR14 | Increased Summer Temperature<br>Increased Intense Periods of Rainfall | Increased ground movement, leading to:<br>- instability of surrounding objects/buildings/ structures<br>- damage to underground infrastructure (drainage and utility pipes, cables and chambers)<br>- changes to tree stability | No specific decision threshold    | Operational disruption<br>Airport closure<br>Financial costs to repair damage/replace affected asset<br>Health & Safety incident<br>Reputational damage | No interdependencies identified | All buildings and underground infrastructure | Asset Owners                 | Yes | 3 | 2 | 6  | 3 | 2 | 6  | 3 | 2 | 6  | Monitoring and maintenance programme<br>Completion of Civil Aviation Authority 'CAP 232' annual airside survey  | <b>Watching Brief</b>   |



|       |   |  |                                |   |                                 |   |  |     |   |   |   |   |   |   |   |   |    |   |  |
|-------|---|--|--------------------------------|---|---------------------------------|---|--|-----|---|---|---|---|---|---|---|---|----|---|--|
| CCR15 | Increased Summer Temperature<br>Lightning                                     | Increased fire risk due to hotter dryer summers and increased incidence of lightning in summer. Grass/vegetation fires could cause poor visibility due to smoke, with possible fire damage to outlying structures. Risk of fires off site impacting aircraft operations to/from the airport. Risk of fire resulting from use of bird scaring flares. | No specific decision threshold | Financial costs for damage caused<br>Operational disruption<br>Health & Safety Incident       | West Midlands Fire Service      | Sitewide + off site within smoke range/ at destinations | Head of Health, Safety & Fire<br>Head of Fire & Emergency Planning | Yes | 4 | 1 | 4 | 4 | 2 | 8 | 4 | 2 | 8  | On-site Fire & Rescue Department<br>Procedures for use of flares  | Watching Brief   |
| CCR16 | Increased Summer Temperature  | Effect of air temperature on the (increased) speed of aircraft landing   | No specific decision threshold | Harder, faster landing affecting the structural integrity of the runway                       | Airlines                        | Airfield  | Head of Air Navigation Services<br>Head of Airfield Operations     | No  | 3 | 2 | 6 | 3 | 2 | 6 | 3 | 2 | 6  | Runway, taxiway and apron maintenance programme<br>Visual inspections<br>Regular engagement with airlines through flight safety committee<br>Review of landing procedures   | Watching Brief   |
| CCR17 | Increased/Decreased Summer/Winter Temperature                                 | Increased energy demand for cooling, ventilation and heating - increased reliance on energy suppliers being able to supply this demand   | No specific decision threshold | Power outages - critical equipment failure<br>Operational disruption<br>Airport closures      | Energy supplier                 | All buildings   | Head of Sustainability   | Yes | 3 | 2 | 6 | 3 | 3 | 9 | 3 | 4 | 12 | On-site diesel generators for back-up power for business critical operations  | Action<br>CCAA09 - Reduce reliance on grid and increase security of energy supply through on-site renewable energy generation electricity generation (Solar PV) - this will form part of the Net Zero roadmap (currently in development) |
| CCR18 | Increased/Decreased Summer/Winter Temperature<br>Increased/Decreased Rainfall | Increased risk to the health and wellbeing of outside workers due to a failure to exercise appropriate duty of care for outside workers caused by changes in climate, including hotter working conditions, wetter working conditions, colder working conditions  | No specific decision threshold | Health & Safety Incident<br>Reputational Damage   | No interdependencies identified | Outside workers   | Head of Health, Safety & Fire                                      | Yes | 3 | 2 | 6 | 3 | 3 | 9 | 3 | 3 | 9  | Occupational Health department on site<br>Health & Safety Department on site<br>Individual departmental risk assessments and wellbeing currently include provision for hot weather working  | Watching Brief   |
| CCR19 | Increased/Decreased Summer/Winter Temperature<br>Increased/Decreased Rainfall | Increase in disease vectors at the airport resulting from changes to their distribution, leading to tropical and other diseases  | No specific decision threshold | Increased staff absence<br>Operational disruption   | No interdependencies identified | Sitewide  | Head of Health, Safety & Fire                                      | Yes | 2 | 2 | 4 | 2 | 2 | 4 | 2 | 2 | 4  | Occupational Health Department on site<br>Regular liaison with port health<br>Health & Safety Department on site  | Watching Brief   |
| CCR20 | Increased/Decreased Summer/Winter Temperature<br>Increased/Decreased Rainfall | Changes to airfield habitats and bird populations impacting wildlife control and increasing risk of bird strike  | No specific decision threshold | Additional management of wildlife required<br>Health & Safety incident<br>Reputational damage | No interdependencies identified | Airfield  | Head of Airfield Operations  | Yes | 3 | 2 | 6 | 3 | 2 | 6 | 3 | 2 | 6  | Airfield wildlife management in place<br>Habitat management regime in line with the Civil Aviation Authority 'CAP 772' requirements   | Watching Brief   |
| CCR21 | Increased Rainfall  | Release of contaminated surface water to brooks as a result of polluted water holding tanks exceeding capacity   | No specific decision threshold | Regulatory notification/ fines<br>Reputational damage<br>Restriction of future development    | No interdependencies identified | Airfield brooks (Hatchford, Westley & Low brooks)       | Head of Engineering Services                                       | Yes | 3 | 3 | 9 | 3 | 3 | 9 | 3 | 3 | 9  | Surface water drainage system feeding into 10 polluted water holding tanks - control mechanisms if holding tanks reach full capacity<br>EA permits in place to manage polluted water, allowing discharge to brook in event of full capacity<br>Monitoring of overflow to brook days | Investigate<br>CCAA10 - Carry out an assessment of drainage system capacity, maintenance and upgrade requirements.   |



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| CCR22 | Increased Rainfall      | Inadequate site drainage system capacity leading to stand/ taxiway/ access road/ general site flooding   | Flooding of stand/ taxiway/ access road of airfield  | Operational disruption due to excess surface water<br>Airport closures<br>Financial cost to repair/ replace affected infrastructure   | No interdependencies identified | Airfield - stands, taxiways & access roads)       | Head of Engineering Services                                    | Yes | 3 | 2 | 6 | 3 | 2 | 6 | 3 | 3 | 9 | Drainage maintenance regime<br>Monitoring of brook levels<br>Flood & pollution control system in place.  | <b>Investigate CCAA10</b> - Carry out an assessment of drainage system capacity, maintenance and upgrade requirements.        |
| CCR23 | Increased Rainfall      | Overflow of brooks (and culverts) leading to stand/ taxiway/ access road/ general site flooding  | Flooding of stand/ taxiway/ access road of airfield  | Operational disruption due to excess surface water<br>Airport closures  | No interdependencies identified | Airfield - stands, taxiways & access roads)       | Head of Engineering Services                                    | Yes | 3 | 2 | 6 | 3 | 2 | 6 | 3 | 3 | 9 | Brook maintenance regime<br>Monitoring of brook levels<br>Flood & pollution control system in place.   | <b>Action CCAA11</b> - Carry out de-silting and bank stabilisation works at on-site brooks to increase channel capacity.      |
| CCR24 | Increased Rainfall      | Intense rainfall and standing water affecting the accuracy of ILS readings   | No specific decision threshold   | Operational disruption due to excess surface water<br>Airport closures  | No interdependencies identified | Airfield - stands, taxiways & access roads)       | Head of Engineering Services<br>Head of Air Navigation Services | No  | 4 | 1 | 4 | 4 | 1 | 4 | 4 | 2 | 8 | Improved drainage at ILS   | <b>Watching Brief</b>   |
| CCR25 | Increased Rainfall      | Torrential rain creates hazardous conditions for vehicles and aircraft i.e. airside and landside road vehicles, and taxiing and landing aircraft, due to:<br>-reduced visibility<br>-icy or wet conditions | No specific decision threshold   | Financial costs to repair/replace equipment<br>Operational disruption<br>Reduced aircraft movements<br>Aircraft/ vehicle collision<br>Health & Safety incident<br>Costs to meet additional de-icing volume requirements | No interdependencies identified | Sitewide  | Head of Airfield Operations                                     | Yes | 3 | 1 | 3 | 3 | 2 | 6 | 3 | 3 | 9 | Winter operations plan and activities<br>Airfield safety plan and activities   | <b>Watching Brief</b>   |
| CCR26 | Increased Rainfall      | Rain ingress in roof of certain airport buildings increasing the occurrence of false fire alarm activation   | No specific decision threshold   | Increase in frequency of false fire alarm activation  | No interdependencies identified | All buildings                                     | Head of Health, Safety & Fire                                   | No  | 2 | 3 | 6 | 2 | 3 | 6 | 2 | 3 | 6 | Fault reporting system   | <b>Investigate CCAA12</b> - Carry out building fabric survey to determine areas where more immediate roofing work is required |
| CCR27 | Increased Rainfall      | Flood damage to aircraft navigation systems/buildings and instrument landing system (ILS), leading to equipment shut down due to water exposure and/or unavailability of critical navigational aid systems | No specific decision threshold   | Financial costs to repair/replace equipment<br>Operational disruption<br>Reduced aircraft movements   | No interdependencies identified | Aircraft Navigation Systems/ILS                   | Head of Air Navigation Services                                 | Yes | 4 | 1 | 4 | 4 | 2 | 8 | 4 | 2 | 8 | Regular equipment monitoring of known wet and boggy areas<br>Daily checks<br>Maintenance regime<br>Equipment installed on higher ground to mitigate against water damage | <b>Watching Brief</b>   |
| CCR28 | Reduced Summer Rainfall | Pollution of local watercourses due to debris accumulated in pipework during longer dry spells then being washed out   | No specific decision threshold   | Regulatory notification/ fines<br>Reputational damage   | No interdependencies identified | Airfield brooks (Hatchford, Westley & Low brooks) | Head of Engineering Services                                    | Yes | 3 | 2 | 6 | 3 | 2 | 6 | 3 | 2 | 6 | Water quality monitoring and review programme<br>Maintenance of key parts of the flood & pollution control system equipment  | <b>Watching Brief</b>   |
| CCR29 | Reduced Summer Rainfall | Dry areas of soil being picked up in high winds/storms and becoming foreign object debris (FOD)  | No specific decision threshold   | Operational disruption  | No interdependencies identified | Airfield  | Head of Airfield Operations                                     | No  | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 4 | Existing FOD arrangements  | <b>Watching Brief</b>   |
| CCR30 | Fog                     | Seasonal changes to fog related disruption (increase in winter months, decrease for remainder of year).  | Low Visibility Procedures take effect when the Instrument Runway Visual Range (IRVR) is less than 600m and/or the cloud ceiling is 200ft or less | Operational disruption caused by runway closure and low ground visibility. Reduced aircraft movements<br>Reputational damage  | No interdependencies identified | Airfield  | Head of Airfield Operations                                     | Yes | 3 | 1 | 3 | 3 | 2 | 6 | 3 | 2 | 6 | Low visibility operating and notification procedures in place  | <b>Watching Brief</b>   |

|       |                     |  |                                |  |   |   |                                 |     |   |   |    |   |   |   |   |   |    |  |   |
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| CCR31 | Lightning           | Increase in lightning events leading to:<br>-refuelling suspension<br>-changes to flight routing<br>-asset damage due to strike/fire, including essential ATC and IT equipment<br>-decrease in ground handling agent's operational performance | No specific decision threshold | Operational disruption caused by decrease in aircraft movements<br>Increased insurance claims<br>Reputational damage<br>H&S incident                 | Aircraft fuel providers   | All aircraft on airfield/ in airspace controlled by BAL ATC | Head of Air Navigation Services | Yes | 4 | 2 | 8  | 4 | 2 | 8 | 4 | 2 | 8  | All commercial aircraft are tested for resilience to lightning strike as part of their certification. Aircraft can withstand lightning strike in the air but during take-off and landing instrument loss would be critical<br>Diversion procedures<br>Lightning protection system<br>Back-up generators for power loss to critical equipment | <b>Investigate</b><br>CCAA13 - Review and assess adequacy of lightning protection system airport wide   |
| CCR32 | Snow and Ice Events | Snow events leading to schedule disruption, staff & PAX difficulties getting to/from the airport site  | No specific decision threshold | Operational disruption caused by runway closure<br>Reduced aircraft movements<br>Reputational damage   | Surface Access: ground transport connections for PAX and staff travelling to/from site in snow conditions<br>Handling agents<br>Third parties | Airfield  | Head of Airfield Operations     | Yes | 4 | 3 | 12 | 4 | 2 | 8 | 4 | 1 | 4  | Winter operations plan and activities<br>Airfield safety plan and activities   | <b>Watching Brief</b>   |
| CCR33 | Snow and Ice Events | Increase in aircraft de-icing needed   | No specific decision threshold | Operational disruption<br>Increased risk of pollution incident   | Handling agents carrying out de-icing<br>De-icer supply chain   | Airfield  | Head of Airfield Operations     | Yes | 2 | 3 | 6  | 2 | 2 | 4 | 2 | 1 | 2  | Winter operations plan and activities<br>Flood & pollution control system processes  | <b>Watching Brief</b>   |
| CCR34 | Storms              | Rain, wind, snow affecting passengers during walk between carpark and terminal   | No specific decision threshold | Reduced passenger experience   | No interdependencies identified   | Car park to terminal  | Head of Planning and Transport  | No  | 2 | 2 | 4  | 3 | 3 | 9 | 3 | 3 | 9  | Covered walkway/ buses from car parks<br>People mover from train station   | <b>Watching Brief</b>   |
| CCR35 | Storms              | Increased occurrence of 'force majeure' enabling contractors to cease work without contractual penalty   | No specific decision threshold | Financial risk and delay in project completion   | No interdependencies identified   | Sitewide  | Procurement                     | No  | 2 | 2 | 4  | 3 | 2 | 6 | 3 | 2 | 6  | Current procurement processes  | <b>Watching Brief</b>   |
| CCR36 | Storms              | Increased risk of schedule interruption from stormy conditions, including increased risk of foreign object debris (FOD) creation and cross-winds   | No specific decision threshold | Reduced aircraft movements; operational disruption   | Other airports - diverts  | All aircraft on airfield/ in airspace controlled by BAL ATC | Head of Air Navigation Services | Yes | 3 | 3 | 9  | 3 | 3 | 9 | 3 | 4 | 12 | High wind procedures and cross wind procedures enacted at defined criteria (dependant on aircraft type)  | <b>Investigate</b><br>CCAA06 - consider the need for equipment and/or data that will provide improved real time information on wind, wind shear and monitoring for storms.<br><br><b>Investigate</b><br>CCAA14 - Review FOD procedure during storms |
| CCR37 | Storms              | Increased building induced turbulence in high winds, exacerbated through emerging ICAO policy to reduce restrictions on development adjacent to runways.   | No specific decision threshold | Operational disruption   | Local Planning Authorities  | Airfield  | Head of Airfield Operations     | No  | 2 | 2 | 4  | 2 | 2 | 4 | 2 | 3 | 6  | Assessed as part of any new building development   | <b>Watching Brief</b>   |
| CCR38 | Wind                | Increased longevity of wing tip vortex effect due to general becalming of surface wind speeds. Wing tip vortex is particularly problematic for small aircraft taking off/ arriving in quick succession after large aircraft.                   | No specific decision threshold | Damage to residential structure; H&S incident; financial cost to repair structures<br>Reduced runway capacity, reduction in load for larger aircraft | No interdependencies identified   | Controlled airspace<br>Vortex protection scheme boundary    | Head of Sustainability          | Yes | 1 | 2 | 2  | 2 | 2 | 4 | 3 | 2 | 6  | Vortex protection scheme<br>ATC procedures for vortex spacing (as per regulations)   | <b>Watching Brief</b>   |