



# Gatwick Airport Northern Runway Project

Supporting Climate Change Technical Notes to Statements  
of Common Ground

**Book 10**

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# Appendix A – Climate Change Technical Note – Wildlife and Fog

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## 1 Climate Change Technical Note: Wildfire and Fog

### 1.1 Purpose of this Technical Note

- 1.1.1 The purpose of this technical note is to provide further details on wildfire and fog data and associated risk to the Project to support the Statements of Common Ground process.
- 1.1.2 As part of the Statements of Common Ground process, risks around wildfire and fog are currently 'under discussion' with Crawley Borough Council and West Sussex County Council and this note is provided in response to their comments.
- 1.1.3 Additional data is now available for wildfire that was not available at the time of submission of the DCO application. Given this, GAL have outlined below new proposed response strategies to effectively mitigate the risks associated with wildfires during the construction and operation periods for the Project.

## 2 GAL's Response

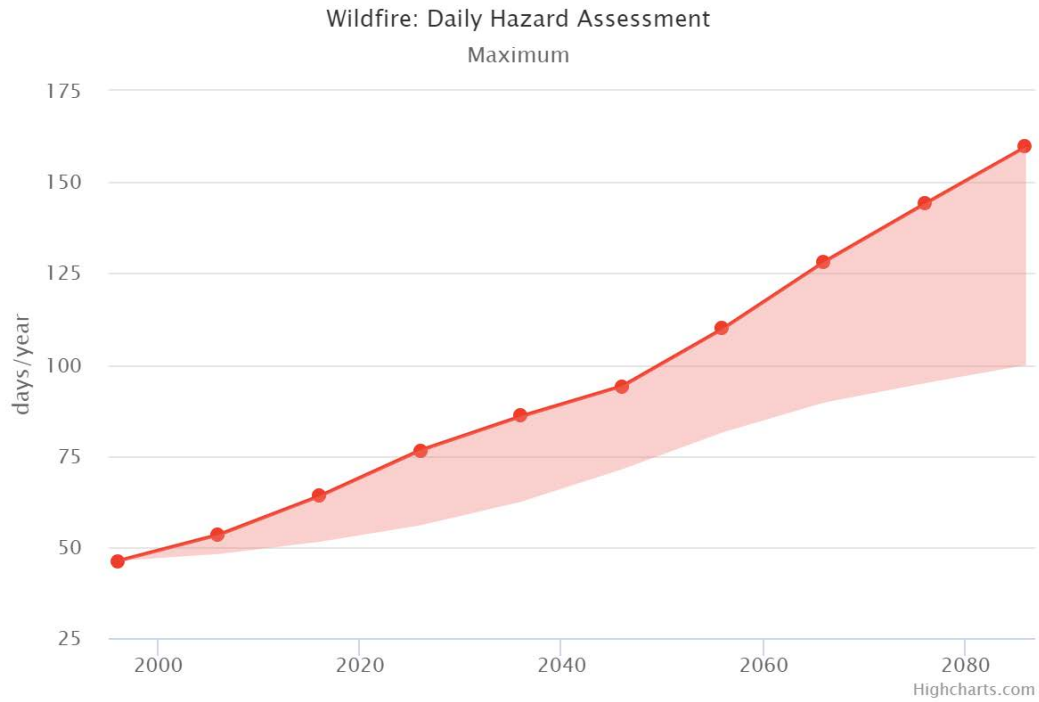
### 2.1 Wildfire risk under climate change

- 2.1.1 Post submission of the DCO application, GAL examined new wildfire indicators from the new UK Climate Risk Indicators (UK-CRI) data. After reviewing all three available indicators – the Met Office Fire Severity Index, Wildfire Daily Hazard Assessment, and Wildfire FFMC 99th percentile – it was determined that the Wildfire Daily Hazard Assessment and the Wildfire FFMC 99th percentile serves as the most suitable indicators, as they represent the average and most extreme worst-case scenario. The analysis included examining the data for the two grid squares encompassing Gatwick: 'BI-91' and 'BH-91'.

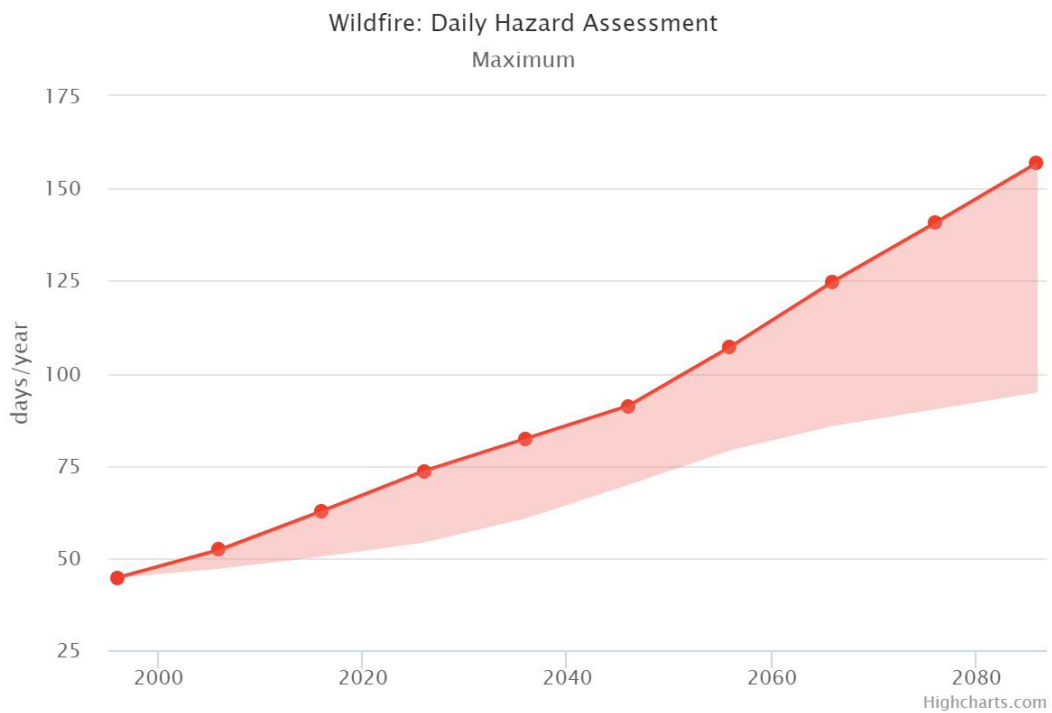
- Met Office Fire Severity Index – assessment of how severe a fire could become if one were to start, providing a trigger for fire prevention restrictions on access land. It is not an assessment of the risks of wildfires occurring.
- Wildfire Daily Hazard Assessment – This indicator provides a five-day summary for wildfire that could affect the UK, helping users assess the risk of wildfires occurring. This is the average case scenario.
- Wildfire FFMC 99th percentile – This is the value of the Fine Fuel Moisture Code (FFMC) indicator that is exceeded only 1% of the time in a given season and location and represents the availability of dry 'tinder' material

in and around the vegetation susceptible to ignition. This is the worst-case scenario.

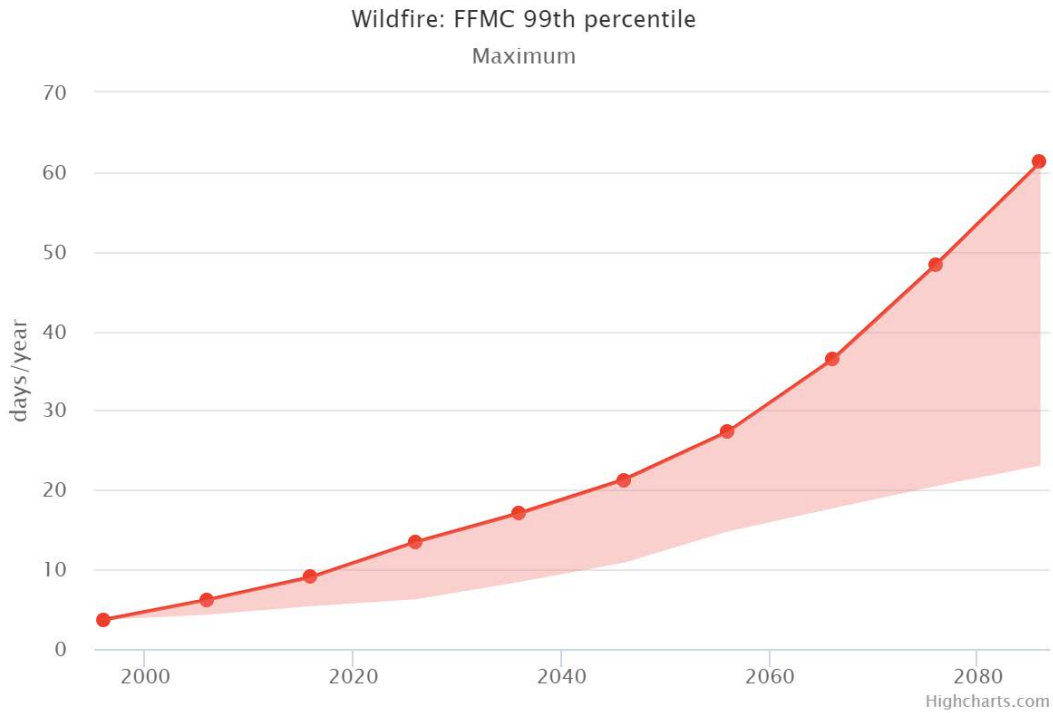
- 2.1.2 From the UK-CRI data, the wider range in the number of days per year of wildfire risk across different time periods reflects the increasing variability and severity of wildfire conditions over time. Analysis of the data indicates a consistent increasing trend across all time periods for both the Wildfire Daily Hazard Assessment and Wildfire FFMC 99th percentile.
- 2.1.3 For the Wildfire Daily Hazard Assessment (Figure 2.1.1 and 2.1.2), there is a gradual increase in the maximum number of days per year of wildfire risk from the baseline (1981-2010) (46.2 days/ year) to the projected future periods of the 2030s (2021-2049, covering construction) a range of 62.4 to 85.8 days/year and the 2050s (2051-2080, covering the operational period) at 89.5 to 128.1 days/year.
- 2.1.4 For the Wildfire FFMC 99th percentile (Figure 2.1.3 and 2.1.4), there is a gradual increase in the maximum number of days per year of wildfire risk from the baseline (1981-2010) (3.8 days/ year) to the future projected periods of the 2030s (2021-2049, for construction) a range of 8.3 to 17.2 days/year and the 2060s (2051-2080, for operation) at 8 to 36.7 days/year).
- 2.1.5 The different time periods account for construction and operational periods of the Project as well as the baseline comparison. The increasing pattern in wildfire risk is consistent for both grid squares 'BI-91' and 'BH-91' and underscores an escalation in wildfire hazard and vulnerability into the future. The data analysis and trends for wildfires may also indicate potential increase in low visibility patterns in the future.



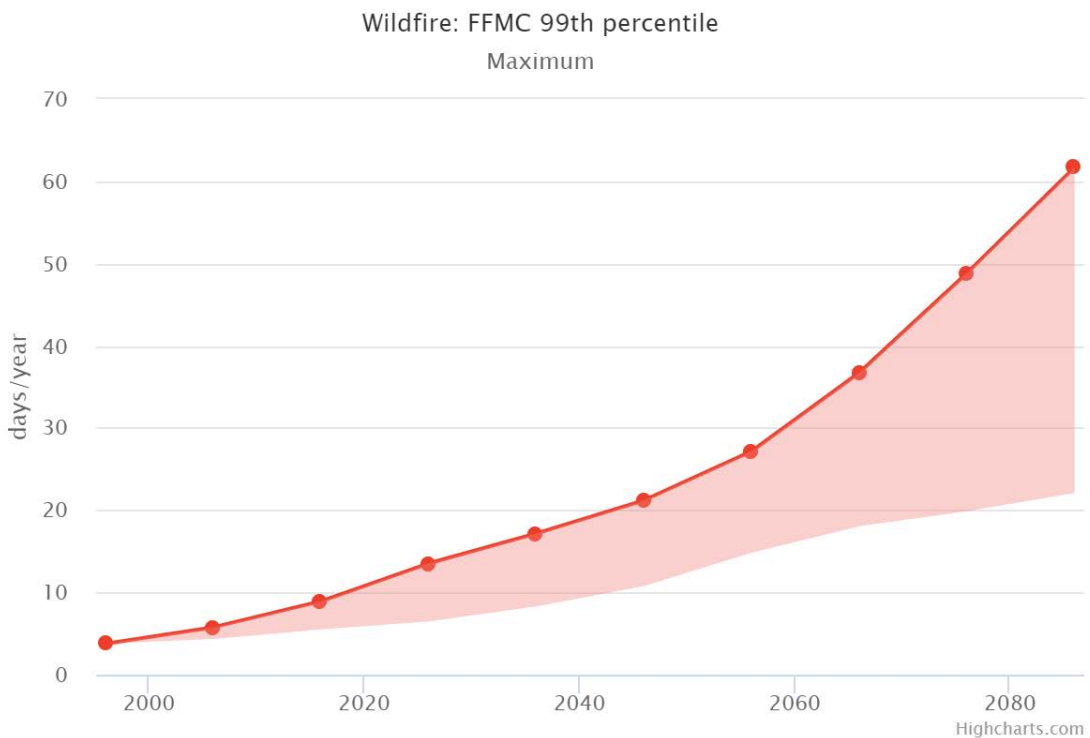
**Figure 2.1.1: Wildfire Daily Hazard Assessment (Gatwick Grid Square BI-91)**



**Figure 2.1.2: Wildfire Daily Hazard Assessment (Gatwick Grid Square BH-91)**



**Figure 2.1.3: Wildfire FFMC 99th percentile (Gatwick grid square BI-91)**



**Figure 2.1.4: Wildfire FFMC 99th percentile (Gatwick Grid Square BH-91)**

- 2.1.6 There is limited mention of wildfires and fogs in The State of the UK Climate Report (Met Office 2021). The report does discuss a heatwave event in the UK that had significant impacts on various sectors, including multiple fires that broke out during this period and that were declared major incidents.
- 2.1.7 UK and Global Fire Weather Programme has been set up the Met Office to investigate the causes and impacts of wildfires, in the UK and worldwide. It presently outlines that higher temperatures alone will not necessarily lead to more fires. While higher temperatures contribute to wildfire risk by drying out vegetation, the severity of fires depends on many various factors including fuel availability, weather conditions like high winds, and human or lightning ignition sources. It cites examples of extreme wildfires in different regions, underscoring the role of climate change in exacerbating these events. Additionally, it emphasises the need for urgent action to mitigate greenhouse gas emissions to curb the increasingly severe impacts of climate change on wildfire frequency and severity.
- 2.1.8 Met Office led research examines trends in UK wildfire occurrences. Historically, UK wildfires were most closely associated with spring. Research led by Met Office Scientist Matthew Perry (Perry et al., 2022), indicates a large projected increase in hazardous fire weather conditions in summer, with a possible extension of the wildfire season into late summer and early autumn. The paper's findings conclude that wildfire can be considered an 'emergent risk' for the UK, with adaptation actions being required to manage the future risk. Whilst the results do not take account of specific human and fuel factors, they do highlight a large increase in risk between 2 °C and 4 °C of global warming, highlights the importance of global efforts to keep warming below 2 °C.
- 2.1.9 England & Wales Fire Severity Index (FSI) is a Met Office bespoke service, designed to fulfil Natural England land access obligations under the Countryside and Rights of Way (CROW) Act 2000. Calculated using information such as wind speed, temperature, time of year and rainfall, the index provides an assessment of how severe a fire could become if one were to start. The FSI acts as a trigger for enforcing fire prevention restrictions on access land under the CROW Act 2000. These restrictions aim to minimize the risk of accidental fires on vulnerable access land by suspending open access rights when conditions become exceptional (FSI level 5).
- 2.1.10 Delivered through the Met Office Hazard Manager and Resilience Direct, the Natural Hazards Partnership's Daily Hazard Assessment provides an at-a-glance overview of potential natural hazards which could affect the UK. Covering a 5-day period, this assessment provides a summary which aims to improve the UK's



resilience and preparedness for multi-hazard events. The assessment comprises 21 natural hazards, including fires, all of which are assessed using the Hazard Matrix which contains links and further information on each of the highlighted hazards.

## 2.2 GAL's existing fire procedures

2.2.1 There is a suite of measures in place to manage fire procedures at Gatwick Airport including robust safety protocols for refuelling operations, such as utilising Jet A1 aviation fuel with properties resistant to increased ambient temperatures of a few degrees, implementing closed systems, earth bonding, ATEX rated equipment, dead man switches, and vehicle interlocks. Additionally, a risk assessment was carried out for aircraft fuelling for the Dangerous Substances and Explosive Atmospheres Regulation (DSEAR), and the results showed that the increase in ambient temperatures does not have an impact on this risk assessment. Furthermore, the airport has procedures to suspend refuelling in the event of nearby wildfires, ensuring the safety of aircraft and personnel. In the unlikely event of a wildfire that could have the potential to impact an aircraft fuelling; the fuelling would be suspended and if necessary be disconnected from the aircraft to allow the removal of both the refueller vehicle and the aircraft. However, concerns have been identified regarding the potential impact of significant wildfires on the emergency response capabilities of local fire services, prompting further consideration within the airport's emergency response plan.

## 2.3 Concerns regarding underestimation of risk for flashpoint of aviation fuel

2.3.1 There are concerns regarding underestimation of risk in risk ID #7 - Flashpoint of aviation fuel exceeded on hot days, leading to delays in refuelling procedures (from RBBC PADSS (54) Concerns regarding underestimation of risk. And: SCC PADSS (89) ES appendix 15.8.1 Climate Change Resilience Assessment [[APP-187](#)] - Concerns regarding underestimation of risk).

2.3.2 Example comment: Regarding Risk 7, there is a concern that the impacts could be more severe than just delays in fuelling i.e. reaching flashpoint of aviation fuel on extreme hot days could lead to combustion. Also given it has been suggested that there may be hydrogen usage for low emissions vehicles during construction and potentially hydrogen storage / fuelling capabilities during operation, the climate risk around this should be more thoroughly explored. The Applicant should review the articulation of risk, impact and risk rating and revise where appropriate. Further consideration should be given to climate risks associated with hydrogen storage and usage.

- 2.3.3 As part of the Statements of Common Grounds process, details of the risks around flashpoint of aviation fuel are currently agreed with Crawley Borough Council.
- 2.3.4 Response: This risk is aligned with the most recent ARP3 report for Gatwick Airport. The existing procedures that are in place at Gatwick to minimise the risk of fuel combustion during hot weather will also take place during future operation, with NRP. The airport will continue to work with the fuel system operator (GASHCo) on mitigation and will continue to adhere to the Airport Fire Service aspects embedded within Gatwick's Heat Plan, as set out in the Gatwick Airside Operations Adverse Weather Plan (GAL, 2021) as required by the UK Civil Aviation Authority (CAA) UK regulations (EU) 139/2014. The CAA is the UK's aviation regulator, and the regulations require Gatwick Airport to have an Adverse Weather Plan as a certified Aerodrome (UK CAA, 2024).
- 2.3.5 The current evolving landscape and R&D for hydrogen fuel for vehicles or planes is unclear. Hydrogen storage is not part of the Project so GAL is not required to assess it as part of the Project's construction or operation. This potential fuel change and any possible related climate risks or in-combination climate change impacts will be reviewed as needed/if the situation changes for both construction and operation of the Project.
- 2.4 Fog**
- 2.4.1 The matter of risks associated with fog not being adequately considered in the risk assessment was raised during the Relevant Repts and PADSS by the local planning authorities. As part of the Statements of Common Ground process, risks fog are currently 'under discussion' with Crawley Borough Council and West Sussex County Council and this note is provided in response to their comments.
- 2.4.2 Fog is challenging to forecast on a 5 day or rolling weather forecast, let alone modelling it using climate models and over a 20 or 30 year average to present climate projections (not weather).
- 2.4.3 Climate models cannot model future fog or fog days to achieve robust outputs. As the earlier (UKCP09) and current (UKCP18) model ensembles in the UK Climate Projections showed large variations in their outputs with significant uncertainties in the data, probabilistic climate projections were not included in the published suite of climate projections data by the UK Met Office.
- 2.4.4 Findings in the previous version of the UK Climate Projections 2009 (UKCP09) showed that the number of fog days across spring, summer and autumn seasons is projected to reduce, with a minimal increase in winter, by the 2080s for a

medium scenario. Uncertainty in the estimated changes given above is substantial (Met Office, 2010).

- 2.4.5 The qualitative assessment for the Project shows that fog is not expected to change in frequency or duration with climate change and may even decrease in most seasons, although there is a large amount of uncertainty. This high-level finding was omitted from the ES Chapter 15 Climate Change [APP-040] given the risk is likely to be the same as now, but this Technical Note clarifies the position through the supplementary CCR assessment in the next section and Table 3.1.1.

### 3 Supplementary Climate Change Resilience (CCR) Assessment for wildfire and fog

- 3.1.1 A Supplementary CCR assessment was undertaken for wildfire risk, and fog, and is presented in Table 2.4.1. The risk level is determined based on a combination of the likelihood and consequence of the climate change impact as set out in the risk matrix in Table 15.8.3 of ES Chapter 15: Climate Change [APP-040].
- 3.1.2 No high or very high risks (considered significant) for wildfire and fog during construction or operation for the Project were identified in the CCR assessment. Therefore, no further mitigation is required.

**Table 3.1.1: Supplementary Climate Change Resilience Assessment for wildfire and fog**

Risk ID	Construction / Operation Period	Climate Change Hazard	Trend or Likelihood of Climate Hazard occurring	Asset Type	Climate Change Impact	Existing or Embedded Mitigation Measure	Result of Mitigation Measure on Resilience	Assessment of Climate Change Impact		Risk Rating	Justification		Proposed Further Resilience Measure (only if Risk Rating = 'High' (4) or 'Very high' (5))	Reference Documenting Relevant Mitigation
								Likelihood	Consequence		For the Likelihood of the Hazard Impact	For the Consequence of the Hazard Impact		
25	Construction	Increased number of days per year of wildfire risk	Increasing trend Likely	Temporary buildings for construction workers and site offices.	Increased risk of wildfires in surrounding areas around temporary building accommodation for construction workers during construction of the Project, negative impacts of working conditions.	Regular fire risk assessments and implementation of fire safety measures such as clearance of vegetation around temporary structures, installation of fire extinguishing equipment, and evacuation protocols. Establishing firebreaks in surrounding areas.  Implement an early warning system for wildfire detection and evacuation procedures for construction workers, along with regular drills to ensure preparedness.	Resilience enhanced through existing plans.  Embedded mitigation measures are considered to be sufficient.	Unlikely	Major	Medium	The impact of the climate hazard is <b>unlikely</b> as although wildfire risks are expected to <b>increase</b> over the course of the construction period, the implementation of appropriate mitigation measures will either avoid or reduce this impact.	<b>Major</b> as could cause <b>delays &gt; 1 day</b> due to buildings becoming unusable and/or create <b>public disputes</b> with contractors using the buildings	No further resilience measures required.	GAL's existing procedures - Gatwick Emergency Plan  ES Appendix 5.3.2: Code of construction practice <a href="#">[REP1-021]</a>
26	Construction	Increased number of days per year of wildfire risk	Increasing trend Likely	Construction processes	Disruption or hinderance of construction processes	Implementation of robust project management strategies, contingency plans for weather-related disruptions, and alert system for wildfire risk	Resilience achieved through existing plans.  Embedded mitigation measures are	Unlikely	Major	Medium	The current assessment of the impact of the climate hazard is <b>unlikely</b> as although impacts are likely to occur several times during the	Potentially <b>Major</b> due to disruption and delays caused.	No further resilience measures required.	Gatwick Emergency Plan  ES Appendix 5.3.2: Code of construction practice <a href="#">[REP1-021]</a>

Risk ID	Construction / Operation Period	Climate Change Hazard	Trend or Likelihood of Climate Hazard occurring	Asset Type	Climate Change Impact	Existing or Embedded Mitigation Measure	Result of Mitigation Measure on Resilience	Assessment of Climate Change Impact		Risk Rating	Justification		Proposed Further Resilience Measure (only if Risk Rating = 'High' (4) or 'Very high' (5))	Reference Documenting Relevant Mitigation
								Likelihood	Consequence		For the Likelihood of the Hazard Impact	For the Consequence of the Hazard Impact		
							considered to be sufficient.				construction period, the implementation of appropriate mitigation measures will reduce this impact.			
27	Operation	Increasing number of days per year of wildfire risk	Increasing trend Likely	Surrounding land, nature	Increased risk of damage to surrounding land and nature and thus to infrastructure and property of the airport due to wildfires	Regular vegetation management around infrastructure to reduce fuel load and implementation of fire-resistant building materials.  Establishing firebreaks in surrounding areas.	Resilience achieved through existing plans.  Embedded mitigation measures are considered to be sufficient.	Unlikely	Major	Medium	The current assessment of the impact of the climate hazard is <b>unlikely</b> as although impacts are likely to occur several times during the operation period, the implementation of appropriate mitigation measures will either avoid or reduce this impact.	Potentially <b>Major</b> due to disruption and delays caused.	No further resilience measures required.	Gatwick Emergency Plan  Gatwick's Airside Operations Adverse Weather Plan (committed to under the UK CAA requirements)
28	Operation	Increasing number of days per year of wildfire risk	Increasing trend Likely	Airport Infrastructure	Possible damage to infrastructure and property during	Implement an early warning system for wildfire detection and evacuation procedures for airport staff workers, along with regular	Resilience achieved through existing plans.	Unlikely	Major	Medium	The current assessment of the impact of the climate hazard is <b>unlikely</b> as	Major as could cause delays > 1 day and extensive	No further resilience measures required.	GAL Emergency Response Plan

Risk ID	Construction / Operation Period	Climate Change Hazard	Trend or Likelihood of Climate Hazard occurring	Asset Type	Climate Change Impact	Existing or Embedded Mitigation Measure	Result of Mitigation Measure on Resilience	Assessment of Climate Change Impact		Risk Rating	Justification		Proposed Further Resilience Measure (only if Risk Rating = 'High' (4) or 'Very high' (5))	Reference Documenting Relevant Mitigation
								Likelihood	Consequence		For the Likelihood of the Hazard Impact	For the Consequence of the Hazard Impact		
					operation: inundation of airfield, airport building basements and sub-structures, utility, cables/tunnels	drills to ensure preparedness.  Continuation of and adherence to Gatwick's Airside Operations Adverse Weather Plan that contains mitigation measures to monitor wind, air quality, heat and various weather that may contribute to wildfire risk on airside and landside operations. This plan is in place as good practice.	Embedded mitigation measures are considered to be sufficient.				although impacts are likely to occur several times during the operation period, the implementation of appropriate mitigation measures will reduce this impact.	damage to infrastructure.		Gatwick's Airside Operations Adverse Weather Plan
29	Operation	Increased temperatures and increased probability of wildfire causing fire on or nearby aviation equipment	Increasing trend Likely	Aviation Equipment/ Operation	Increased risk of disruption to operations and possible damage to aviation equipment	Utilising Jet A1 aviation fuel with properties resistant to increased ambient temperatures of a few degrees, implementing closed systems, earth bonding, ATEX rated equipment, dead man switches, and vehicle interlocks.	Resilience achieved through existing plans.  Embedded mitigation measures are considered to be sufficient.	Unlikely	Moderate	Low	The current assessment of the impact of the climate hazard is <b>unlikely</b> as although impacts may occur during the operation period, the implementation of appropriate mitigation measures will reduce this impact.	Moderate as could cause delays of up to 2hrs on multiple days and > 2hrs on one single day	No further resilience measures required.	GAL Emergency Response Plan  Existing legislative regime

Risk ID	Construction / Operation Period	Climate Change Hazard	Trend or Likelihood of Climate Hazard occurring	Asset Type	Climate Change Impact	Existing or Embedded Mitigation Measure	Result of Mitigation Measure on Resilience	Assessment of Climate Change Impact		Risk Rating	Justification		Proposed Further Resilience Measure (only if Risk Rating = 'High' (4) or 'Very high' (5))	Reference Documenting Relevant Mitigation
								Likelihood	Consequence		For the Likelihood of the Hazard Impact	For the Consequence of the Hazard Impact		
30	Operation and Construction	Potential impacts of significant wildfires nearby on emergency response capabilities	Increasing trend Likely	Airport Infrastructure / Operation	Increased risk of disruption to emergency response services due to wildfires in surrounding areas	Collaboration with local fire services to develop and integrate wildfire response protocols into the construction site's emergency response plan.	Enhances resilience by ensuring preparedness and coordination for wildfire-related emergencies.	Likely	Major	Medium	The current assessment of the impact of the climate hazard is <b>likely</b> as although implementation of appropriate mitigation measures will reduce this impact, it is difficult to predict the capacity of local fire services.	Major as could cause delays, disruptions to operations or services, and damage to infrastructure.	No further resilience measures required.	GAL Adverse Weather Plan  Existing legislative regime
31	Operation and Construction	Changing risk of fog / fog days	No change expected, may improve (high uncertainty)	Airport Infrastructure / Operation	Resulting in low or reduced visibility causing delays	The low visibility plan as part of GAL's Adverse Weather Plan.	Resilience achieved through existing plans.	Likely	Moderate	Low	The current assessment of the impact of the climate hazard is <b>likely</b> as although implementation of appropriate mitigation measures will reduce this impact.	Moderate as could cause delays of up to 2hrs on multiple days and > 2hrs on one single day.	No further resilience measures required.	Gatwick's Airside Operations Adverse Weather Plan  Existing legislative regime

## 4 Summary

- 4.1.1 By analysing various indicators in the new wildfire data on the UK-Climate Risk Indicators (UK-CRI, 2024), focusing on Gatwick Airport's risk, this research has found that both the Wildfire Daily Hazard Assessment and the Wildfire FFMC 99th percentile are useful for understanding wildfire risks.
- 4.1.2 In analysing the wildfire data from different time periods, a consistent and stark increase in the maximum number of wildfire risk days per year is projected, especially by the 2060s (2051-2080). This increased risk of wildfires could affect the Project during both the construction and operational periods.
- 4.1.3 The CCR assessment did not identify any high or very high risks (considered significant) for wildfire during construction or operation. Therefore, no further mitigation is required. Moreover, the airport has robust safety measures in place for refuelling operations, including protocols for suspending fuelling during nearby wildfires.
- 4.1.4 Climate models cannot model future fog or fog days to achieve robust outputs. The qualitative assessment for Gatwick shows that fog is not expected to change in frequency or duration with climate change and may even decrease in most seasons, although there is a large amount of uncertainty.



## 5 References

Met Office (2010) UK Climate Projections 2009, Future changes in fog frequency: technical note. Penelope Boorman, Geoff Jenkins & James Murphy, Met Office Hadley Centre, Exeter. September 2010. Available but archived content online: [https://webarchive.nationalarchives.gov.uk/ukgwa/20181204111104mp\\_/http://ukclimateprojections-ukcp09.metoffice.gov.uk/media.jsp?mediaid=87948&filetype=pdf](https://webarchive.nationalarchives.gov.uk/ukgwa/20181204111104mp_/http://ukclimateprojections-ukcp09.metoffice.gov.uk/media.jsp?mediaid=87948&filetype=pdf) )

Met Office (2021) State of the UK Climate. Available online: <https://www.metoffice.gov.uk/research/climate/maps-and-data/about/state-of-climate> [last accessed January 2024]

Met Office (2024) Met Office's UK and Global Fire Weather Programme. Available online: <https://www.metoffice.gov.uk/research/climate/climate-impacts/uk-and-global-fire-weather> [last accessed January 2024]

Perry, M. C., Vanvyve, E., Betts, R. A., and Palin, E. J.(2022) Past and future trends in fire weather for the UK, Nat. Hazards Earth Syst. Sci., 22, 559–575,

[REDACTED]

UK Civil Aviation Authority (2024) Aerodromes. UK Regulation (EU) 139/2014. Available at: [REDACTED] [last accessed May 2024]

# Appendix B – Climate Change Technical Note – Climate Impacts Statements

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## 1 Climate Change Technical Note – Climate Impacts Statements

### 1.1 Purpose of this Document

1.1.1 The purpose of this document is to provide clarification on how climate impacts statements are used in the Climate Change Resilience (CCR) Assessment.

1.1.2 The issue around some of the climate impacts statements lacking consistency and detail has been raised by some of the local planning authorities during the Relevant Reps and PADSS. These include Crawley Borough Council (CBC), Horsham District Council (HDC), West Sussex County Council (WSCC), Mid Sussex District Council (MSDC), East Sussex County Council (ESCC), Reigate and Banstead Borough Council (RBBC) and Surrey County Council (SCC). As part of the Statements of Common Grounds process, the issue of the climate impacts statements lacking consistency and detail was under discussion but is now addressed for CBC and WSCC and closed out for the other councils. Even though this matter is addressed, it was acknowledged by these two councils that further detail and clarity around impact statements would be helpful.

## 2 GAL's Response

### 2.1 Climate Impacts Statements

2.1.1 The anticipated impacts of climate change are provided for all risks identified within the CCR Assessment [[APP-187](#)] and are included within the 'Climate Change Impact' column for the assessment and summarised in ES Chapter 15: Climate Change [[APP-040](#)].

2.1.2 In ES Chapter 15: Climate Change [[APP-040](#)], is included within Tables 15.8.5 and 15.8.6 within the 'Climate Change Impact' column and in ES Appendix 15.8.1: Climate Change Resilience Assessment [[APP-187](#)] within Table 2.1.1 in the 'Climate Change Impact' column.

2.1.3 The overall “end impact” is then categorised in terms of the consequences for the Project, in the “consequence rating” across multiple different consequence categories including disruption, public perception, financial consequences to owners GAL and operators, safety and damage e.g. *Moderate as impact could result in delays of >2 hours and damage to infrastructure requiring minor repair* (this is as per the methodology set out in Table 15.8.2: Criteria used to assess

consequence of a climate change impact, in Chapter 15 of the ES (Climate Change) [APP-040]), repeated below for ease (Table 2.1.1).

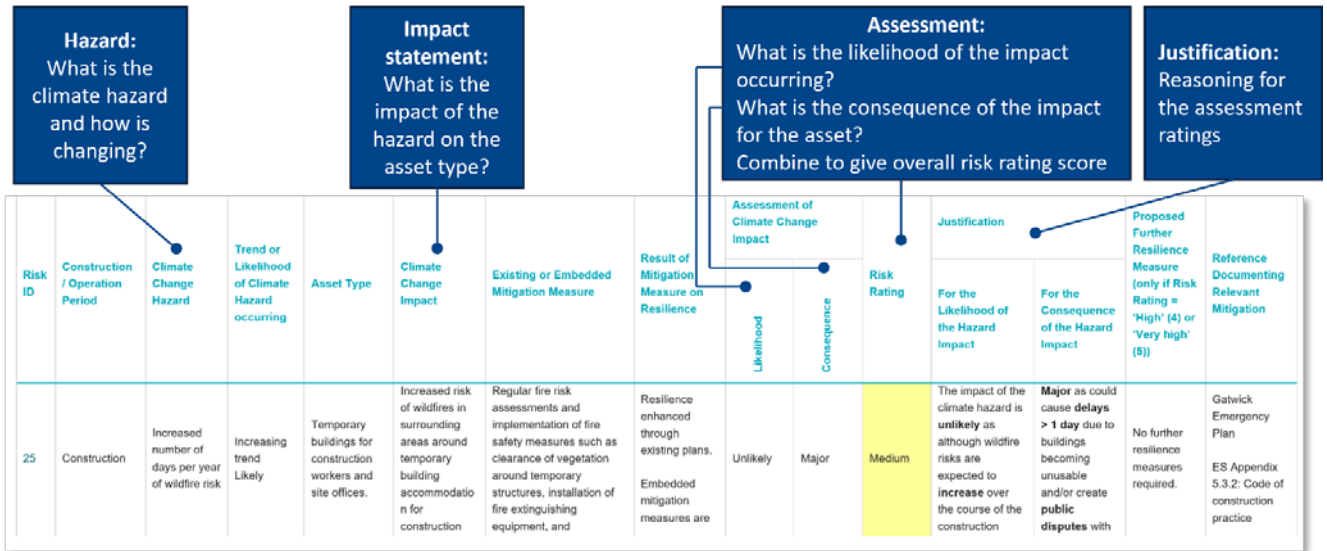
**Table 2.1.1: Criteria used to assess consequence of a climate change impact**

Consequence Rating	Disruption	Public perception	Financial consequences to owners GAL and operators	Safety	Damage
Minimal	Minor service disruption within a single day (<30 mins).	Short-term adverse local stakeholder reaction.	Negligible financial loss.	Minor harm or near miss – no adverse human health effects or complaints.	No damage to assets.
Minor	Minor service disruption for multiple days or delays up to two hours on a single day.	Adverse local media reports over sustained period; localised stakeholder concern.	Additional operational costs. Minor financial loss.	Lost time, injury or medical treatment, short-term impact on persons affected.	No permanent damage. Some restoration work required.
Moderate	Service delays of up to two hours for multiple days or major delays (>two hours) on a single day.	Significant local and/or regional reports including social media. National media interest creating public concern.	Moderate financial loss.	Long term injury or illness, prolonged hospitalisation or inability to work.	Widespread damage and loss of service. Damage recoverable by maintenance and minor repair. Partial loss of local infrastructure.

Consequence Rating	Disruption	Public perception	Financial consequences to owners GAL and operators	Safety	Damage
Major	Service closed for one day or major delays for multiple days.	Negative national reporting and public disputes with key stakeholders, utility companies or other governmental agencies such as the EA.	Major financial loss.	Single fatality/multiple long-term injuries – emergency response.	Extensive damage requiring extensive repair.
Catastrophic	Service closed for multiple days.	Extensive and prolonged negative reporting nationally and/or public disputes with key stakeholders.	Significantly high financial loss.	Multiple fatalities – emergency response.	Permanent damage and/or loss of service. Retreat and translocation of development

2.1.4 **The Risk ratings would not change following further disaggregation of more individual or more separated impacts** and therefore no material impact on the assessment will arise.

2.1.5 Further clarity on the full impact chain (Figure 2.4.1), used in the CCR assessment, using an example risk from the CCR assessment for construction is given in Figure 2.1.1 below.



Risk ID	Construction / Operation Period	Climate Change Hazard	Trend or Likelihood of Climate Hazard occurring	Asset Type	Climate Change Impact	Existing or Embedded Mitigation Measure	Result of Mitigation Measure on Resilience	Assessment of Climate Change Impact		Risk Rating	Justification		Proposed Further Resilience Measure (only if Risk Rating = 'High' (4) or 'Very high' (5))	Reference Documenting Relevant Mitigation
								Likelihood	Consequence		For the Likelihood of the Hazard Impact	For the Consequence of the Hazard Impact		
25	Construction	Increased number of days per year of wildfire risk	Increasing trend Likely	Temporary buildings for construction workers and site offices.	Increased risk of wildfires in surrounding areas around temporary building accommodation for construction	Regular fire risk assessments and implementation of fire safety measures such as clearance of vegetation around temporary structures, installation of fire extinguishing equipment, and	Resilience enhanced through existing plans.  Embedded mitigation measures are	Unlikely	Major	Medium	The impact of the climate hazard is unlikely as although wildfire risks are expected to increase over the course of the construction	Major as could cause delays > 1 day due to buildings becoming unusable and/or create public disputes with	No further resilience measures required.	Gatwick Emergency Plan  ES Appendix 5.3.2: Code of construction practice

**Figure 2.1.1: Clarification on impact statement and impact chain.**

### 3 Summary

- 3.1.1 The impacts of climate change are provided for all risks identified within the CCR Assessment [APP-040] and are included within Tables within the 'Climate Change Impact' column for the assessment and summary. The “end impact” is presented as an overall combined consequence rating along with its justification.
- 3.1.2 GAL has provided more clarification about climate impact statements in this Technical Note: Climate impacts statements to finalise the two Statements of Common Ground with Crawley Borough Council and West Sussex County Council on this matter within the climate change topic. This includes a diagram to show how the assessment breaks down the impact chain for each identified risk.

Appendix C – Climate Change Technical Note  
– Adverse Weather Plan Review



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# 1 Purpose and Introduction to the Climate Change Technical Note – Adverse Weather Plan Review

## 1.1 Purpose of this Document

1.1.1 Gatwick Airport is a certified Aerodrome. Under UK Civil Aviation Authority (CAA) regulations (EU) 139/2014, Gatwick Airport is required to have an Adverse Weather Plan (UK CAA, 2024). This is not part of the DCO application but is an existing operational legislative requirement that the Project will be subject to.

1.1.2 The purpose of this document is to provide a review of Gatwick's latest Airside Operations Adverse Weather Plan (AWP) for 2023-2024 (GAL, 2023) against the latest good practice guidance on AWP's and consideration of climate change. In addition, this note specifically reviews how and what AWP measures are considered during construction at GAL and how these measures could be enhanced and cover the full range of climate hazards and extreme events expected to increase in frequency, magnitude and duration under a changing climate.

## 1.2 Introduction

1.2.1 As the AWP is reviewed annually, it will be subject to a number of reviews before the NRP is operational.

1.2.2 GAL's commitment to continuing its Airside Operations AWP (GAL, 2021b) and enhance it as needed to consider a changing climate, following Eurocode good practice for both AWP's (EUROCONTROL, 2021a) and managing climate risks (EUROCONTROL, 2021b) for the purposes of the CCR assessment during the operational period was first stated in the ES Chapter 15 [APP-040], Table 15.3.1: Summary of Scoping Responses.

1.2.3 Moreover, the issue of the construction risks identified in Table 15.8.5 of the ES Chapter 15: Climate Change [APP-040] being considered limited and needing to be addressed in more detail was raised during the PADSS by the following local planning authorities: Crawley Borough Council (CBC), Reigate and Banstead Borough Council (RBBC), Surrey County Council (SCC) and West Sussex County Council (WSCC).

1.2.4 The Environmental Statement Appendix 5.3.2: Code of Construction Practice (CoCP) [REP1-021] sets out best practice construction methods including adverse weather measures in construction to ensure that there are plans in place (which include all airside operations areas) about how GAL can sustain stable

construction in the event of an adverse weather event including a processes and procedures for different extreme weather events during the construction period. However, the adverse weather events measures are not developed enough in the CoCP, and should, therefore, be further developed in the AWP.

- 1.2.5 Furthermore, the AWP only considers wind events during construction. It should be updated to consider other hazards too, such as flooding and heatwaves.

## 2 GAL’s response on the AWP review against good practice guidance

2.1.1 **Sub-Sections 2.2 to 2.5** below review GAL’s current AWP against the four EUROCONTROL good practice documents:

- Section 2.2 - Document 1. EUROCONTROL (2021a): Collaborative Best Practices for Handling of Adverse Weather at European Aerodromes.
- Section 2.3 - Document 2. EUROCONTROL (2021b): Climate change risks for European aviation.
- Section 2.4 - Document 3. ACI Europe and EUROCONTROL (2023a): Aviation Preparations for Summer Adverse Weather.
- Section 2.5 - Document 4. ACI, EUROCONTROL (2023b): Aviation Preparations for Winter 2023 Adverse Weather

2.2 **Document 1. EUROCONTROL (2021a): Collaborative Best Practices for Handling of Adverse Weather at European Aerodromes.**

2.2.1 This document was written by the SMART Wx Task Force with the aim to provide guidance for airports on how best to improve their operational response to adverse weather effects on aerodrome capacity. As this is the latest and only guidance on this topic, it was agreed with GAL that Gatwick’s AWP should be reviewed against it.

Recommendation from the report	Applicable to GAL’s AWP?
#1 meteorological (MET) forecasters’ team embedded in operations (OPS)	<p><b>Yes</b></p> <p>Section 2 of the AWP, Monitoring Weather Conditions and Weather Forecasting, states that the GAL Airfield Operations department receives weather warnings from the Met Office that cover (but are not limited to) the following weather</p>

Recommendation from the report	Applicable to GAL's AWP?
	<p>events:</p> <ul style="list-style-type: none"> <li>▪ Ash Cloud</li> <li>▪ Fog / Freezing Fog</li> <li>▪ Frost</li> <li>▪ Heat</li> <li>▪ Heavy Rainfall</li> <li>▪ Thunderstorm</li> <li>▪ Hail</li> <li>▪ Snow</li> <li>▪ Wind (Gale / Gusting)</li> <li>▪ Temperature Inversion</li> </ul>
<p>#2 Harmonised utilisation of risk thresholds for Weather (Wx) Aerodrome (AD) Air Traffic Flow and Capacity Management (ATFCM)</p>	<p><b>Yes</b></p> <p>The AWP has different state levels for all hazards covered in the plan (the Passenger Operations Plans states are covered in Section 16 of the AWP). For example, wind state 1 is when Met Office forecast high wind speeds &gt;20kt (knots) and/or gusts &gt;28kt in the next 48 hours, but not expected to impact airfield operations, and has its own set of actions and tasks. Wind state 2A is when Met Office forecast strong winds in the next 24 hours &gt;20kt with gusts &lt;28kt expected during this period with expected impact to airfield operations – and has its own actions and tasks etc.</p> <p>Each hazard has predefined states with specific actions and tasks.</p>
<p>#3 Attention to the forecast uncertainty. Risk Matrix</p>	<p><b>Yes</b></p> <p>The recommendation suggests that for each weather phenomenon (e.g. snowfall) three scenarios should be estimated. These are: best possible scenario, most probable and worst-case scenario.</p> <p>For GAL, the 2-5 day forecast provided by the Met office only covers a most probable scenario. GAL</p>

Recommendation from the report	Applicable to GAL's AWP?
	<p>has reviewed the option of having three different forecasts. However, it was deemed unsuitable both by the operational teams at GAL and by the Met Office.</p> <p>Relating to forecast uncertainty, commentary is provided by the Met office forecaster which can highlight uncertainties and the 'talk to a forecaster' service is available and used by the airport operations teams to gather more detail on forecasts and uncertainties.</p> <p>In terms of the risk matrix, the AWP has a flood risk matrix presented in Section 5: Flood Plan, which is an illustrative example of a matrix the EA would provide for flood events. Similar risk matrices may be provided for other weather events, usually in the form of a Met office colour warning.</p>
#4 Flow Management Position (FMP)'s Awareness of Airport Wx Risk and planned OPS response to Wx	<b>Not applicable</b> as FMP is a EUROCONTROL/NATS Swanwick role, not a local airport position.
#5: Convergence of FMPs to Airport operations/operators	<b>Not applicable</b> as FMP is a EUROCONTROL/NATS Swanwick role, not a local airport position.
#6: Proposed standard topics for the daily Airport collaborative conferences	<p><b>Yes</b></p> <p>Multiple daily meetings are held both internally and with the community to discuss daily operations. These include the latest weather forecasts and any associated risks.</p> <p>Please note these meetings are not mentioned in the AWP as it is part of BAU.</p>
#7: Monitor and do regular risks assessment starting at D-3 (3-days before)	<p><b>Yes</b></p> <p>The AWP mentions in Section 2 under the Met Office Website sub-section heading that the Met</p>

Recommendation from the report	Applicable to GAL's AWP?
	<p>Office Website is a good tool to adopt for a long-range weather forecast, as it can be utilised for 5-day, 15-day and 30-day forecasts. The AWP also mentioned in Section 2 under the 2-5 Day Forecast sub-heading that the Met Office will send via e-mail to GAL Airfield Operations a 2–5-day forecast.</p> <p>The recommendation suggests the risk of adverse weather that may affect the airport to be reported to the operational stakeholders at D-3 at the collaborative cell conferences. As mentioned above, multiple daily meetings are held both internally and with the community to discuss daily operations. These include the latest weather forecasts and any associated risks.</p>
<p>#8: D-1 selection of capacity reduction scenario from pre-agreed playbook</p>	<p><b>Yes</b></p> <p>Capacity reduction is situation dependant and coordinated through the airports incident and management process. With capacity availability and reduction requirements determined through inter-agency calls with ATC, airlines, ground handlers, airport operations. Pre-emptive capacity reductions will be sought for significant forecast weather events.</p> <p>The airport is starting consultation with the airlines this year on a capacity reduction plan, to ensure that the airport can equally and fairly reduce capacity during times of disruption (including, but not limited to, weather, infrastructure failures, resource limitations etc.)</p>
<p>#9: Now-casting and prompt change of scenario if needed, based on the</p>	<p><b>Yes</b></p>

Recommendation from the report	Applicable to GAL's AWP?
evolution of the Wx phenomenon	The additional forecasting tools available, including TAF, METAR, and Open runway, are covered in Section 2 of the AWP. These tools provide near real-time forecasts. If a change of weather state is needed based on live conditions, this will be activated as part of the plan.
#10: High level features of the Local Collaborative Cell	<b>Yes</b> GAL equivalent is the ADC call, or a Bronze incident command status.
#11: NM to analyse and potentially optimise AD Wx ATFCM measures applied due to convective Wx at destination airport affecting flights with EET>4 hours	<b>Not applicable</b> , as this is a EUROCONTROL process, not a local airport process.
# 12: Focus on delay-free execution of the First Rotation Hours	<b>Yes</b> This recommendation is not mentioned in the AWP. However, Gatwick's Stable Operations team confirmed that it is part of BAU operations.
#13: Centralised repository/web service for airport weather forecast with European coverage	<b>Not applicable</b> , as this is a EUROCONTROL process, not a local airport process.
#14: Extension of the current "Cross-border procedure to Aerodromes	<b>Not applicable</b> , as this is a EUROCONTROL process, not a local airport process.

## 2.3 Document 2. EUROCONTROL (2021b): Climate change risks for European aviation.

2.3.1 Research report carried out by Egis and the UK Met Office on behalf of EUROCONTROL published in September 2021. It sets out how the aviation industry faces increasing disruption on the ground and in the air from climate change and highlights the growing danger that climate change poses to all parts of the aviation sector. This study is relevant to Gatwick because it provides extensive quantitative data on storms, wind pattern changes, sea-level rise and temperature increases that can help Gatwick better understand how these will

impact aviation in the years ahead and update their climate change risk assessments and adaptation strategies in order to build in resilience to adapt and address future climate impacts.

- 2.3.2 The report assesses how existing weather trends have impacted aviation in recent years, factoring in climate change impacts that are emerging faster than expected. It forecasts growing disruption both on the ground and in the air: airports and their surrounding transport infrastructure face a rising risk of flash flooding and rising sea levels, while flight operations are set to be increasingly delayed by violent storms that will increase delays, raise fuel burn and lead to higher emissions.
- 2.3.3 The report analysed the impact of changes in storm patterns and intensity, sea level rise, changes in wind patterns and the impact of climate change on tourism demand.
- 2.3.4 The main findings of the report are presented below.
- 2.3.5 Extreme sudden rainfall and rising sea levels are assessed to pose a growing risk to Europe's airports. Two-thirds of coastal or low-lying airports are expected to be at increased risk of flooding in the event of a storm surge, with potentially large secondary impacts on regional economies, including the loss of ground transport links.
- 2.3.6 Major storms, which cost aviation an estimated €2.2 billion in 2019 in terms of enroute delays, are expected to increase in intensity. Bad weather forced airlines to fly 1 million km extra in 2019, burning 6,000+ tonnes of extra fuel and resulting in 19,000 tCO<sub>2</sub> extra GHG emissions. Extreme weather is predicted to drive these numbers up, with horizontal flight inefficiency on days when storms account for over 50% of air traffic flow management delays expected to worsen by 0.5% by 2050. That will add an additional 5,700 tCO<sub>2</sub> per year, increasing every 1,000 nautical mile flight by roughly 40 nautical miles on bad weather days, and further driving up the cost to airlines, passengers and their carbon footprint.
- 2.3.7 Future flight operations will also be modified by climate change, with jet streams reducing many transatlantic flight durations both eastbound and westbound. This will have positive effects on flight times, fuel burn and emissions, and could yield possible savings of 55,000 tonnes of aviation fuel per year by 2050, corresponding to roughly 175,000 tCO<sub>2</sub>. Route demand and traffic flows are also expected to shift as tourism adjusts to changing temperatures.
- 2.3.8 For GAL's AWP, the impact of each of the four weather trends is described below:



- Changes in storm patterns and intensity – No explicit mention of storm intensity in the AWP. Some storm patterns can be referred to implicitly from Cumulonimbus (CB) Activity states, which states lightning activity detected at different distances.
- Sea level rise – As Gatwick Airport is not near the coast, sea level rise is not considered an issue.
- Changes in wind patterns – AWP includes different wind states from wind speeds <15kt with <25kt gusts to gale force winds >34kt and or gusts >43kt.
- Tourism demand – This is not explicitly mentioned in the AWP.

## 2.4 Document 3. ACI Europe and EUROCONTROL (2023a): Aviation Preparations for Summer Adverse Weather.

- 2.4.1 Document sets out potential challenges which the aviation system – with a particular focus on airports - may face from adverse weather during future summers and provides response options that airports could take. In order to reduce the impacts. As Gatwick could also be impacted by these challenges, it is recommended that they implement the actions recommended in the guidance.

Weather condition	Recommended actions present in GAL's AWP and applicable?
Thunderstorms and heavy rain	<p><b>Yes, recommended actions provided.</b></p> <p>The AWP mentions thunderstorms as part of the Cumulonimbus (CB) Activity (Section 11 of the AWP). The AWP mentions actions to conduct in the occurrence of thunderstorms and heavy rain, as well as actions done to prepare and plan prior to that. The EUROCONTROL places emphasis on planning ahead for timely application of any actions.</p>
Heat wave	<p><b>Yes, recommended actions provided.</b></p> <p>The AWP includes actions to be conducted prior to and in the event of MET office heat wave forecast. The Passenger Operations Plans states for heat are in Section 16 of the AWP.</p>
Strong winds	<p><b>Yes, recommended actions provided.</b></p> <p>The AWP mentions actions to conduct prior and in the event of receiving MET reports for strong winds. The Passenger Operations Plans states for wind are in</p>

Weather condition	Recommended actions present in GAL's AWP and applicable?
	Section 16 of the AWP.
Low visibility	<p><b>Yes, recommended actions provided.</b></p> <p>The AWP outlines low visibility operations actions in Section 9 of the AWP.</p>
Any of the above	<p><b>Yes.</b></p> <p>The AWP provides different states for different weather conditions, including actions and tasks prior to and in the event of any weather state occurrences. The Passenger Operations Plans states are in Section 16 of the AWP.</p>

2.5 Document 4. ACI, EUROCONTROL (2023b): Aviation Preparations for Winter 2023 Adverse Weather.

2.5.1 Document sets out potential challenges which the aviation system – with a particular focus on airports - may face from adverse weather during future winters and provides response options that airports could take, in order to reduce the impacts. As Gatwick could also be impacted by these challenges, it is recommended that they implement the actions recommended in the guidance.

Weather condition	Recommended actions present in GAL's AWP and applicable?
Snow, thundersnow, hail, heavy rain / downburst / prolonged and extreme rain	<p><b>Partial actions are present.</b></p> <p>The AWP outlines actions for various states for snow, rainfall &gt;10mm in the hour, and freezing rain (section 16 of the AWP). The AWP states weather warnings by the MET office for heavy rainfall and hail but there are limited recommended actions for hail. Review of whether hail requires a separate category, or if it falls under snow / CB Activity states is currently being assessed by the Stable Operations teams. Expecting this to be reviewed for the next publication (October 2024).</p>
Ice, hail	<p><b>Partial actions are present.</b></p>

Weather condition	Recommended actions present in GAL's AWP and applicable?
	Comprehensive actions for ice states are included in the AWP in Section 16 for Passenger Operations Plans. There is no mention of recommended actions for hail. Review of whether hail requires a separate category, or if it falls under snow / CB Activity states is currently being assessed by the Stable Operations teams. Expecting this to be reviewed for the next publication (October 2024).
Strong winds / gales	<b>Yes, recommended actions are present.</b> Comprehensive actions for strong winds and gale force wind states are included in the AWP in Section 16 for Passenger Operations Plans.
Low visibility	<b>Yes, recommended actions are present for low visibility states in Section 9 of the AWP.</b> The AWP plan notes that low visibility is usually caused by snowfall conditions and related to frost and ice conditions.
Any of the above	<b>Actions are present for most states above in Section 16 for Passenger Operations Plans,</b> and some specific weather conditions (thundersnow and hail) are limited in recommended actions.

### 3 GAL's response on the construction risks

- 3.1.1 GAL's AWP includes the following weather events: cumulonimbus (CB) activity, flooding (fluvial), heat, ice, low visibility, rain (pluvial), snow, volcanic ash and wind. Whilst the list of hazards considered is comprehensive, the AWP only considers these risks as part of the Gatwick Control Centre (GCC) Plans, Engineering Plans, Security Plans, and Passenger Operations Plans. It does not consider them during construction, except for wind.
- 3.1.2 **It is proposed that the AWP is to be updated prior to construction starting, to consider how the hazards mentioned above also address the risks during construction** and note that the actions may have more of a temporary nature. It is expected that this updated AWP will then be used as the reference

document for contractors developing their own risk assessments (and adverse weather measures).

## 4 Summary

### 4.1 Summary of the findings from the review.

<b>Review categories</b>	<b>Summary of findings on best practices for handling of adverse weather (Document 1, EUROCONTROL 2021a)</b>
Present / Aligned	Recommendations from EUROCONTROL Document 1 are already highlighted in the AWP or are part of BAU.

<b>Review categories</b>	<b>Summary findings from review of climate change risks for aviation (Document 2, EUROCONTROL 2021b)</b>
Present/ Aligned	AWP includes changes in wind patterns.
Uncertainties/ Clarification needed	No explicit mention of storm intensity in the AWP. However, it is covered implicitly by wind speeds, rain volumes, and CB Activity states.
Not mentioned	Tourism demand not mentioned. However, changes in tourism demand have no impact on GAL's response to weather and should be considered as part of the business plan.
Not related	Sea level rise as Gatwick is not near the coast.

Review categories	Summary findings from review of preparations for summer adverse weather (Document 3 ACI and EUROCONTROL, 2023a) and winter adverse weather (Document 4 ACI and EUROCONTROL, 2023b)
Present / Aligned	AWP includes recommended actions for summer weather conditions. Although some not explicitly mentioned to be summer, can be inferred through different states descriptions. Partial actions present for winter. Review of whether hail requires a separate category, or if it falls under Ice or Cumulonimbus (CB) Activity states is currently being assessed by the Stable Operations teams. Expecting this to be reviewed for the next publication (October 2024).
Uncertainties / Clarification needed	Clarifications needed for winter weather actions. Hail has been stated to have weather warnings by the Met Office, but no actions have been outlined for it. Review of whether hail requires a separate category, or if it falls under Ice or Cumulonimbus (CB) Activity states is currently being assessed by the Stable Operations teams. Expecting this to be reviewed for the next publication (October 2024).

## 5 Recommendations and Next steps

Based on the review, the following recommendations are proposed to GAL in terms of enhancing Gatwick’s Adverse Weather Plan to account for both construction and climate change.

### 5.1.1 Recommendations on best practices for handling of adverse weather (Document 1)

Recommendations from the EUROCONTROL document are already incorporated in GAL’s AWP. However, it is recommended making it clearer when certain actions are part of BAU operations, as it is not always evident when reading the AWP.

### 5.1.2 Recommendations on review of climate change risks for aviation (Document 2)

It is recommended that GAL include explicit mention of storm intensity, ensuring clarity and precision in the wording (#1). Additionally, considering the importance of tourism demand in the operational context and mentioned in the EUROCONTROL documents, even if changes in tourism demand sit with different operations planning team, it is recommended to make reference to it within the plan and signpost the relevant documents and/or processes (#2).

As sea level rise is not a pertinent factor for Gatwick Airport due to its inland location, it does not require inclusion in the AWP.

### 5.1.3 **Recommendations on review of preparations for summer, and winter, adverse weather (Documents 3 & 4)**

It can be inferred from the weather state descriptions that weather states include actions for most summer and winter conditions. However, there are some uncertainties regarding one weather state, particularly regarding hail, which has weather warnings from the Met Office but lacks corresponding actions in the plan. It is recommended to add specific state for hail or to expand upon the descriptions for Cumulonimbus (CB) Activity and or Ice states to address this gap.

Given the **new findings from Climate Change Technical Note: Wildfire and fog**, and the new emerging risk from wildfire and climate change, it is also recommended that the inclusion of wildfire in the AWP is considered in future updates, where planning would be similar to the volcanic-ash and heat plans measures.

### 5.1.4 **Recommendations for extreme weather events not being considered during construction**

It is recommended that the AWP is updated prior to construction starting, to consider how risks from extreme weather events other than wind are addressed during construction and note that the actions may have more of a temporary nature.

## 5.2 **Next steps**

- 5.2.1 The above recommendations from this review, and ready for the NRP, are being included in the next update of the AWP, which has started with the consultation as part of the post winter review (March 2024) and will go for further internal consultation in mid-July 2024 and is planned to be published in October 2024.

## 6 References

Airports Council International (ACI) Europe and EUROCONTROL (2023a): Aviation Preparations for Summer Adverse Weather. Available online:

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