YOUR LONDON AIRPORT
Gatwick

# CLIMATE CHANGE ADAPTATION PROGRESS REPORT

## December 2021

Report submitted to:
Department for Environment, Food and Rural Affairs (DEFRA)
Business & Infrastructure Climate Adaptation
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## 1.1 About this report

This report provides an update to Gatwick Airport Limited's previous two Climate Change Adaptation reports published in July 2011 and April 2016. These reports are prepared in response to the Government's powers, pursuant to the Climate Change Act 2008, to request that major infrastructure operators in the energy, water, transport and some other sectors report publicly on their climate change adaptation strategy and forward plans. In line with Defra guidance, Gatwick aims in these reports to provide a concise and accessible summary of our strategic approach and action plans on climate change adaptation, including existing and new measures and insights from our experience so far.

## 1.2 About Gatwick

Located 30 miles south of central London, Gatwick is the UK's second largest airport and flies a range of both short and long-haul point-to-point services. The airport is a vital piece of the UK's national infrastructure and is also a major driver for both the regional and national economies.

Since December 2009, Gatwick has grown annual passenger numbers from 32 million to more than 46 million in 2019, while maintaining very high passenger satisfaction scores. In December 2019, Gatwick's Quality of Service Monitor score was 4.29 out of 5.0 – sustaining the 2018 score which was a ten-year high.

In May 2019, a new long-term partnership was formed with VINCI Airports which purchased the majority shareholding of 50.01% and the remainder owned by a consortium of investors and managed by Global Infrastructure Partners (GIP), who have operated Gatwick since 2009.

VINCI Airports, the world's leading airport operator, manages 45 airports in 12 countries in Europe, Asia and on the American continent. Through its expertise as a comprehensive integrator, VINCI Airports develops, finances, builds and operates airports, leveraging its investment capacity, international network and know-how to optimise operational performance, modernise airports and manage their environmental transition. In 2016, VINCI Airports was the first airport operator to commit to an international environmental strategy aimed at achieving net zero emissions over its entire network looking to 2050. All information available on www.vinci-airports.com

GIP manages the remaining 49.99% interest in Gatwick and is an independent infrastructure investor that makes equity investments in high quality infrastructure assets in the energy, transport and water/waste sectors. GIP has US$68 billion of Assets under Management. Its 41 portfolio companies operate in over 51 countries with more than 67,000 employees and generate annual revenues of circa US$51 billion. For more information on GIP please visit http://global-infra.com

Gatwick's ambition is to compete to grow and become London's airport of choice. In 2019, the airport welcomed over 46 million passengers and over 280,000 aircraft movements. In 2020, the global COVID-19 pandemic saw severe travel and other restrictions placed on all nations and, as a result passenger numbers at the airport fell to 10 million in 2020 and to less than 7 million in 2021. Despite the continued challenges of the COVID-19 pandemic, the airport has remained open throughout and is confident about its recovery, with new airlines and routes being proposed for 2022. In a mark of the Airport's confidence in its recovery, in September 2021, Gatwick ran a 12 week public consultation on its proposals to bring the existing Northern Runway into routine use for departing aircraft. These plans will bring new global connections, improved resilience and allow Gatwick to increase passenger numbers. The Project will follow the process set out in the Planning Act 2008 for nationally significant infrastructure projects and is proposed to come into operation towards the end of the 2020's. The Project is expected to go through a public examination in 2023 and therefore this Progress Report is based on the existing single runway operation.

Sustainability has been part of Gatwick's transformation since 2009 and is integrated in the company's business plan. For Gatwick, this means delivering a world class passenger experience and enabling economic growth whilst being a responsible operator, working closely with our industry partners and stakeholders to achieve quieter and cleaner aircraft operations and being a good neighbour to our local communities. Our Decade of Change Sustainability Policy, launched in 2010 and updated in 2021, sets ten-year goals on ten key issues related to People and Communities, Emissions and Local Environment. These goals have been adopted by the GAL Board, with strategic implementation and performance monitoring led by the Chief Executive and the Chief Planning Officer.

As part of the Decade of Change, Gatwick has committed to becoming a net zero airport for direct emissions before 2040 and for aircraft emissions by 2050.[1] By 2019, GAL had reduced direct (Scope 1 and 2) emissions by 54% compared to the 1990 baseline (and by 60% compared to 2010) while Scope 3 emissions remained broadly similar notwithstanding almost 50% increase in passenger numbers.[2]

Gatwick has achieved and maintains the Airport Council International's Airport Carbon Accreditation at Level 3+ ("Neutral"), with our most recent accreditation completed in May 2020 and the next due by May 2022. ACA "Neutral" accreditation requires ongoing reduction in and offsetting of residual Scope 1 and 2 emissions, and active stakeholder engagement to manage and where feasible reduce Scope 3 emissions, including aircraft and surface access emissions. At Gatwick this programme

[1] https://www.gatwickairport.com/business-community/sustainability/our-policy/

[2] https://www.gatwickairport.com/business-community/sustainability/our-progress/

includes: ongoing investment in energy efficiency in buildings, lighting, mechanical and heating/cooling systems; purchase of renewable electricity; incentivising newer aircraft, providing Fixed Electric Ground Power on aircraft stands and restricting use of aircraft Auxiliary Power Units; investing in electric and ultra-low emission operational vehicles, equipment and charging infrastructure; and promoting public and low emission transport to the Airport.

Gatwick continues to play an active role in the UK Sustainable Aviation coalition's work on decarbonisation, including the Decarbonisation Roadmap for UK aircraft emissions. Gatwick has signed the Sustainable Aviation industry commitment to achieve net zero carbon aircraft emissions by 2050; and participates in the Government's Jet Zero Council delivery group on sustainable aviation fuels (SAF). In October 2021, Gatwick in partnership with easyJet and Q8 Aviation completed a proof-of-concept demonstration that the existing aviation fuel infrastructure at the airport is ready to utilise certified A1 jet fuel that contains SAF.

### 1.3 Corporate risk management and stable operations strategy

Since early 2021, Gatwick has undertaken an exhaustive review of how we approach risk management at the airport. Following the significant restructuring in October 2020, we have reviewed, updated and refreshed our risk policy and procedure, corporate governance structures, risk champion network and the risk tool used. These initiatives were reviewed by the Gatwick Executive team in May, September and November (at the Managing Corporate Risk & Responsibility board meetings). These executive reviews are presented to the board subgroups every two months and to our Audit committee twice per annum.

This review has validated the 13 core risks in our airport business – including extreme weather events - and a further 13 dynamic risks that are challenging the business currently – including heightened risk of a flooding event.

As a top tier risk, we run a regular (usually monthly) multi-agency table-top exercises to test our business continuity plans as well as the regular in-depth testing and practice for adverse conditions over the winter season.

We are also pursuing a strategy of Integrated Airport Control (IAC) which manifests in a weekly review by a cross-functional senior leadership team of each business unit operational plans, the inherent risks and mitigations and the forecast weather (up to 12 weeks in advance) to best manage any extreme weather patterns on the staff and passenger welfare as well as wider operational performance.

## 2. Climate change adaptation

### 2.1 Climate change risk assessment

As reported in our first and second Climate Adaptation Reports (2011 and 2016), our assessment of climate change risks to our facilities, operations and the people who use them is informed by the worst-case scenarios in the UK Met Office's projections for UK climate change. Those earlier reports used UKCP09 projections in assessing that increased risk of pluvial and fluvial flooding is our principal year-round risk while recognising that more frequent but unpredictable instances of sudden winter cold snaps and summer heat waves that conclude with heavy rainfall are also likely.

With the publication in 2018-2019 of updated UK projections (UKCP18) which includes more detail of the UK's regional variations, we have commenced the process of aligning our adaptation strategy and action plans with UKCP18 projections for the region where Gatwick is located.

Using UKCP18, an initial risk assessment of Future Extreme Weather Events for the Gatwick Area has been undertaken as part of Gatwick's Master Plan and Northern Runway Project. This assessment compares a thirty-year baseline (1981-2010) of key climate/ weather parameters with the UKCP18 projected changes in those parameters for 2020-2049 and for 2050-2079; and uses this to assess the likely hazard/ impact risks from the projected changes in long-term average climate/ weather conditions. A summary of this work relating to infrastructure and operations is provided here, for further detail please see the Future Plans section of our website.[3]

**Historical and projected climate conditions at Gatwick Airport**

Information regarding historical climate conditions at Gatwick Airport was obtained from the UKCP18 observed climate data sets. All the data for the current baseline were obtained from this source. Seasonal climate averages for Gatwick Airport are given in Table 1. Information regarding occurrence of extreme weather events, including hot days, frost days, heavy rainfall and dry spells is given in Table 2. The data are presented as the average increase in number of days per year.

Information regarding potential future climate conditions in the Gatwick area has been obtained from the UKCP18 projections using the RCP8.5 global warming scenario. RCP8.5 is the highest GHG scenario used in climate science and is based on little to no reduction in overall global GHG emissions taking place. It is therefore a highly precautionary scenario for adaptation planning in case global collective action does not deliver in time.

[3] https://www.gatwickairport.com/globalassets/company/future-plans/northern-runway/2021/peir/vol1/peir-chapter-15-climate-change-and-carbon.pdf
https://www.gatwickairport.com/globalassets/company/future-plans/northern-runway/2021/peir/vol3/peir-appendix-15.9.1.pdf

Projected values for seasonal climate averages for Gatwick Airport for 2020-2049 and 2050-2079 are shown in Tables 3 and 4; and the projected future occurrence of extreme weather events, including hot days, frost days, heavy rainfall and dry spells is shown in Tables 5 and 6.

The data in Tables 3 and 4 indicate that mean temperatures and mean winter precipitation will increase, and mean summer precipitation will decrease in comparison with baseline temperatures shown in Table 1. Note however that decreases in mean summer precipitation may nevertheless include increased incidence of very heavy rainfall.

Indeed, the projections shown in Tables 5 and 6 indicate that the frequencies of hot days, dry spells and heavy rainfall will all increase in the future compared to the historical baseline, whilst the number of cold days will decrease. This suggests that hot day temperatures (>25°C) and heavy rainfall will pose an increased risk to Gatwick Airport and cold temperatures will pose a decreased risk, and that the need for de-icing is likely to decrease in the medium to longer-term. Whilst winters are expected to be become warmer on average, cold weather spells will still occur up to and during the middle of this century and are expected to be the same magnitude and intensity as today.

**Table 1: Seasonal Climate Averages for the Gatwick Area**

| Parameter | Baseline 1981-2010 |
|---|---|
| Winter mean temperature (°C) | 4.6 |
| Summer mean temperature (°C) | 16.3 |
| Winter mean daily minimum temperature (°C) | 1.4 |
| Summer mean daily maximum temperature (°C) | 21.5 |
| Winter mean precipitation rate (mm/day) | 2.5 |
| Summer mean precipitation rate (mm/day) | 1.7 |

**Table 2: Historical Extreme Weather Events for the Gatwick Area**

| Parameter | Baseline 1981-2010 |
|---|---|
| Number of frost days (daily minimum temperature equal or lower than 0°C) | 53.6 |
| Heatwaves (two days with maximum temperature higher than 29°C and minimum temperature higher than 15°C) | 0.3 |
| Number of hot days (daily maximum temperature higher than 25°C) | 17.3 |
| Dry spells (10 days or more with no precipitation) | 4.9 |
| Number of days per year when precipitation is greater than 25 mm per day (Met Office definition of 'heavy rain') | 1.9 |
| Relative humidity winter (%) | 85.7 |
| Relative humidity summer (%) | 77.3 |

**Table 3: UKCP18 Climate Change Projections for Meteorological Changes for the Gatwick Area**

| Parameter | 2020-2049 (RCP8.5 Percentile) | | |
|---|---|---|---|
| | 10th | 50th | 90th |
| Winter mean temperature (°C) | 4.5 | 5.5 | 6.6 |
| Summer mean temperature (°C) | 16.8 | 17.7 | 18.7 |
| Winter mean daily minimum temperature (°C) | 1.2 | 2.3 | 3.4 |
| Summer mean daily maximum temperature (°C) | 22.0 | 23.1 | 24.4 |
| Winter mean precipitation rate (mm/day) | 2.4 | 2.7 | 3.0 |
| Summer mean precipitation rate (mm/day) | 1.1 | 1.5 | 1.8 |

**Table 4: UKCP18 Climate Change Projections for Meteorological Changes for the Gatwick Area**

| Parameter | 2050-2079 (RCP8.5 Percentile) | | |
|---|---|---|---|
| | 10th | 50th | 90th |
| Winter mean temperature (°C) | 5.3 | 6.7 | 8.3 |
| Summer mean temperature (°C) | 17.6 | 19.7 | 21.8 |
| Winter mean daily minimum temperature (°C) | 2.0 | 3.6 | 5.3 |
| Summer mean daily maximum temperature (°C) | 22.9 | 25.4 | 28.0 |
| Winter mean precipitation rate (mm/day) | 2.4 | 2.9 | 3.4 |
| Summer mean precipitation rate (mm/day) | 0.7 | 1.2 | 1.7 |

**Table 5. UKCP18 Projections for Future Extreme Weather Events for the Gatwick Area**

| Parameter | 2020-2049 | | |
|---|---|---|---|
| | RCP8.5 Min | RCP8.5 Mean | RCP8.5 Max |
| Number of frost days (daily minimum temperature equal or lower than 0°C) | 28.8 | 37.5 | 49.4 |
| Heatwaves (two days with maximum temperature higher than 29°C and minimum temperature higher than 15°C) | 0.2 | 1.8 | 4.9 |
| Number of hot days (daily maximum temperature higher than 25°C) | 23.2 | 37.2 | 61.6 |
| Dry spells (10 days or more with no precipitation) | 4.6 | 5.4 | 6.7 |
| Number of days per year when precipitation is greater than 25 mm per day (Met Office definition of 'heavy rain') | 1.4 | 2.4 | 4.3 |
| Relative humidity winter (%) | 85.5 | 85.5 | 85.5 |
| Relative humidity summer (%) | 73.0 | 73.0 | 73.0 |

**Table 6. UKCP18 Projections for Future Extreme Weather Events for the Gatwick Area**

| Parameter | 2050-2079 | | |
|---|---|---|---|
| | RCP8.5 Min | RCP8.5 Mean | RCP8.5 Max |
| Number of frost days (daily minimum temperature equal or lower than 0°C) | 20.5 | 25.2 | 31.2 |
| Heatwaves (two days with maximum temperature higher than 29°C and minimum temperature higher than 15°C) | 2.9 | 8.0 | 14.9 |
| Number of hot days (daily maximum temperature higher than 25°C) | 43.2 | 69.0 | 92.8 |
| Dry spells (10 days or more with no precipitation) | 5.4 | 6.6 | 7.8 |
| Number of days per year when precipitation is greater than 25 mm per day (Met Office definition of 'heavy rain') | 1.6 | 3.1 | 4.7 |
| Relative humidity winter (%) | 85.1 | 85.1 | 85.1 |
| Relative humidity summer (%) | 69.0 | 69.0 | 69.0 |

## Risk assessment using UKCP18

In line with Defra guidance for these reports, we are reporting our updated strategic climate risks using a 5x5 likelihood/ impact risk grid to categorise risk levels for our infrastructure, operations and the people using them. Our internal risk assessment uses a more detailed risk scoring system which we have aligned to a 5x5 grid for this report.

This shows that our High-risk assets and activities relate primarily to either excess water (flooding) and lack of it (drought and water supply stress); and to increased incidence of very hot weather relative to typical summer UK weather.

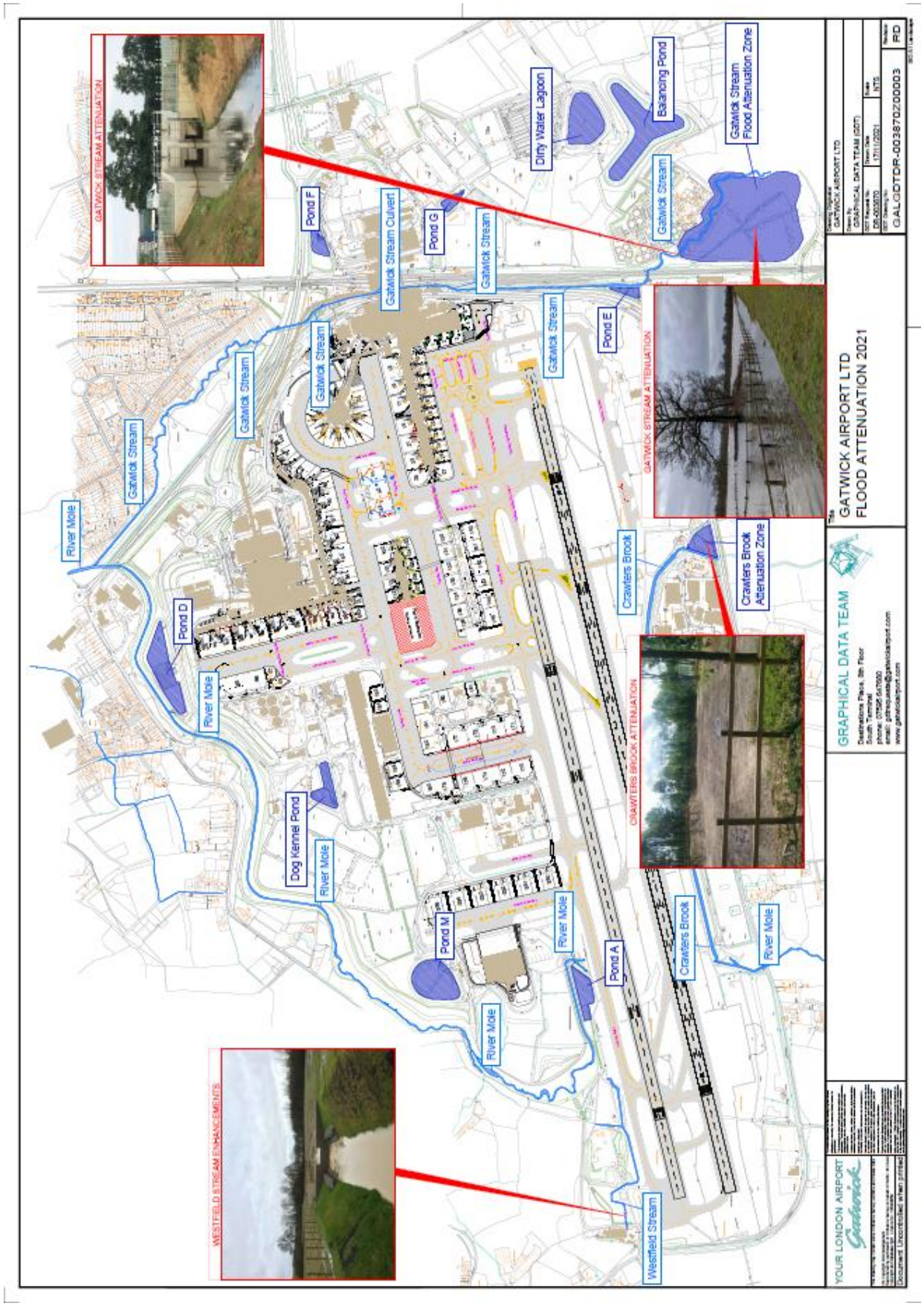
**Risk Levels as a function of combined likelihood and consequence**

| Likelihood | Consequence | | | | |
|---|---|---|---|---|---|
| | Minimal | Minor | Moderate | Major | Catastrophic |
| Very unlikely | Very low (1) | Very low (2) | Low (3) | Low (4) | Medium (5) |
| Unlikely | Very low (2) | Very low (4) | Low (6) | Medium (8) | Medium (10) |
| As likely as not | Low (3) | Low (6) | Medium (9) | High (12) | High (15) |
| Likely | Low (4) | Medium (8) | Medium (12) | High (16) | Very high (20) |
| Very likely | Medium (5) | Medium (10) | High (15) | Very high (20) | Very high (25) |

**Climate change risk assessment: infrastructure and operations (based on UKCP18 projections 2020-2049)**

| Climate Change Hazard | Asset Group | Climate Change Impact | Risk |
|---|---|---|---|
| Increased number of extremely hot days | Airport Operation | Overheating in terminal buildings, hotels, and other buildings leading to thermal discomfort and heat stress for passengers and staff during the operation of the airport, and negative customer experience. | Medium |
| | Airport Infrastructure | Changes to takeoff procedures (e.g. rescheduling flights to take off during cooler times of the day, increasing weight restrictions on flights) or increasing the length of the runway to enable flights to take off under hotter temperature conditions. | Medium/ High |
| | Electronic Equipment | Sensitive electronic equipment and mechanical operating mechanisms may fail to operate correctly due to high temperatures. | Medium |
| | Flights | Flashpoint of aviation fuel exceeded on hot days, leading to delays in re-fuelling procedures. | Low |
| | | Possible increase in occurrence of days outside the acceptable range of temperatures affecting aircraft and their utilisation schedule, due to air density changes affecting maximum take-off weight capacity. | Medium |
| Extreme cold weather | Electronic Equipment | Sensitive electronic equipment and mechanical operating mechanisms may fail to operate correctly due to low temperatures or freezing. | Medium |
| | Airport Infrastructure | Reliability of journeys may reduce at low temperatures due to cracking of pavement surfaces and snow/ice accretion on aircraft and runways/airfield pavements causing delays. | Medium |
| | Airport Operation | Possible negative health implications for passengers and staff, disruption to service operation. | Low |
| | Airport Infrastructure | Possible increase in number of days outside the normally acceptable range of conditions for heating systems and increased risk of heating, ventilation and air conditioning failure. | Very low |
| Increased frequency of flooding from river, surface and groundwater sources | Airport Infrastructure | Flooding of infrastructure during operation: inundation of airfield, airport building basements and sub-structures, utility cables/tunnels. | Medium |
| | | Flooding of road infrastructure connecting to the airport during operation: inundation of access roads and railways. Effects of infrastructure interdependencies. | Medium |
| | Airport Operation | Flooding of electrical equipment and mechanical operating mechanisms. | High |
| | Landscaping | Increased drought stress to plants/landscaped areas. | Medium |

| Climate Change Hazard | Asset Group | Climate Change Impact | Risk |
|---|---|---|---|
| Increased risk of drought | Airport Operation | Increased water stress for new buildings (Hotel and office space). | High |
| Extreme wind speeds | Airport Infrastructure | Possible debris on runways and other airport infrastructure causing delays (foreign object debris). | Medium |
| | | Tree fall due to strong winds leading to road and rail disruption. | Medium |
| | | Failure or damage to parts of structure or infrastructure as a result of changes in strong winds and gustiness. | Medium |
| | Flights | Aircrafts not permitted to take off or land causing delays. | Medium |
| Increased risk of lightning strikes. | Airport Infrastructure | Indirect and direct damage to buildings, infrastructure, aircraft, equipment from lightning strikes. | Low |
| | Flights | Suspension of activities on the ramp by ground handling agents, delaying the service and turnaround times for aircraft and stressing terminal/gatehouses. | Low |


GATWICK STREAM ATTENUATION
Pond F
Gatwick Stream Culvert
Pond G
Gatwick Stream
Dirty Water Lagoon
Balancing Pond
Gatwick Stream Flood Attenuation Zone
Gatwick Stream
Pond E
Gatwick Stream
Gatwick Stream
Gatwick Stream
Gatwick Stream
River Mole
Pond D
River Mole
Dog Kennel Pond
River Mole
Pond M
River Mole
River Mole
Pond A
Crawters Brook
Crawters Brook Attenuation Zone
CRAWTERS BROOK ATTENUATION
Crawters Brook
River Mole
Westfield Stream
WESTFIELD STREAM ENHANCEMENTS
GATWICK AIRPORT LTD
FLOOD ATTENUATION 2021
GRAPHICAL DATA TEAM
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Gatwick

## 2.2 Climate adaptation programme

### Flood risk management and resilience

**Risk rating 2020-2045**

| Inherent rating | Current rating | 2030 target rating | 2045 target rating |
|---|---|---|---|
| 20/ 25 | 16/25 | 12/25 | 12/25 |

Given Gatwick's location at the confluence of several waterways in the upper reaches of the River Mole catchment, flood risk management and resilience continue to be of utmost importance. Since our 2016 climate adaptation report, we have:

- Collaborated extensively with the Environment Agency and technical experts Jacobs to develop and agree the Upper Mole Flood Model in June 2019. Using this, Jacobs are preparing a combined Fluvial/ Pluvial model which will enable us to predict the combined effects of river and surface water flooding on airport infrastructure which will assist the prioritising of further risk reduction measures.
- Finalised our Flood Risk Management Policy which governs the review, development and implementation of all flood mitigation measures at Gatwick.
- Completed the Clays Lake scheme, the third of three elements of the Upper Mole Flood Alleviation Scheme (UMFAS), a £20 million scheme undertaken in partnership with the Environment Agency between 2010 and 2019.

**Based on the Jacobs/Environment Agency model agreed in June 2019, Gatwick's Flood Risk Management Policy aims to achieve "dry" protection in 1:100-year events; and "flood safely" protection in up to 1:200-year events.**

In line with this Policy, we are pursuing three strategic workstreams that aim to reduce flood risk at Gatwick:

- **Increase Resilience:** In 2017 we commissioned Jacobs to produce a study of all critical infrastructure at Gatwick to assess possible flood risk. Since then, we have completed a package of protection projects and more will be scheduled for 2023-2025.
- **Reduce the risk from Pluvial flooding:** Plans to uprate onsite infrastructure will be investigated to reduce the risk of the surface water systems being overwhelmed by intense rainfall events.
- **Reduce the risk from Fluvial flooding:** The Gatwick Stream and River Mole both pass under the airport and present the main risk. Further solutions to these risks need to be explored to understand the feasibility of possible mitigations.

*Clays Lake project completion hand-over in 2019*

## Electrical system resilience

**Risk rating 2020-2045**

| Inherent rating | Current rating | 2030 target rating | 2045 target rating |
|---|---|---|---|
| 20/ 25 | 11/25 | 5/25 | 5/25 |

As we reported in 2016, airport electrical resilience is a strategic priority within the overall context of stable operations as well as flood resilience. It is also of growing importance due to the role of electricity in decarbonising heating and transport.

Since our 2016 report we have continued to focus systemically on electrical resilience, with the creation of an initial five-year work programme comprising 26 work packages and a dedicated Power Resilience risk register. In 2018, the Power Resilience risk register was re-baselined to include additional risks and the number of work packages increased to 35. In the first two years of the programme, a 33% reduction in risk against the updated baseline was delivered.

One of the drivers of this reduction in residual risk is the use of innovative condition monitoring techniques, particularly in the case of the high-voltage (HV) switchgear population. Working with EA Technology, we assessed the entire population of GEC VMX switchgear at Gatwick. The findings were largely favourable and have led to the installation of online partial discharge monitoring as well as enhanced dehumidification at key sites. This survey is repeated on an annual basis until the

replacement of all affected switchgear however it gives us a valuable insight into the condition of our assets and enables us to prioritise replacement within the constraints of budget and resource. This particular switchgear is also subject to an enhanced inspection and maintenance regime.

We have also protected our most critical and vulnerable Substation assets through the Flood resilience programme – this has included high-capacity pumps, installation of flood barriers, sealing of brickwork and ducts, and replacement of existing conventional doors with flood-proof doors.

To prevent potential disruption in the first place, we focus on service strikes and their avoidance, through ensuring robust service identification and excavation practices, and investigations to ensure lessons learned were put into practice to continually reduce the number of events.

In parallel with these works, a comprehensive Electrical Power Strategy has been developed incorporating capacity, resilience, risk, asset management, compliance, and smart networks. This included a review and validation of the resilience categories of all transformer supplies and the creation of initiatives to address any remedial actions required to enhance resilience. The opportunity was also taken to review and update airport contingency plans with respect to power, taking various failure/disruption scenarios into account.

In a similar vein, we improved our electrical asset management practices by incorporating a comprehensive risk-based approach. Working with EA Technology, we developed a CBRM-based Asset Investment Management model for our low voltage (LV) switchgear population, a global first in the aviation sector. We are doing the same for our HV assets. The models utilise comprehensive condition data (gained from inspection and maintenance) and knowledge of specific asset types (e.g. asset failure rates) and predict the probability and consequence of failure. The model's algorithms enable prioritisation of asset replacement works based on the potential impact to the business and include inputs such as health, probability of failure, risk and asset criticality. The model enables us to evaluate the effects of various intervention strategies (such as refurbishment or replacements) and the impact on total risk and give a comprehensive overview of asset health and performance across the population. We use this information to reduce the risk of failure and consequent disruption to our operation.

These initiatives have been complemented by a parallel Electrical Safety Management audit, assessing the management of electrical safety in a structured process against defined criteria in the IET's Electrical Safety management Code of Practice.

We have also looked ahead at the increase in electrical capacity required for the electrification of transport and heat and developed a design for the construction of a new intake substation and enhanced interconnection between the new and existing intakes. This proposal enables us to have firm and resilient capacity to 2035 and beyond and enables rapid recovery from power loss when coupled with a suitable ADMS (an existing risk and project on the Power Resilience risk register).

We are reviewing our options with respect to integration of renewables, both on-site and off-site, and this will include the use of leveraging V2G technology and potential storage solutions to increase the resilience of the airport to grid constraints and mitigate the intermittency issues inherent to renewable technology. This review includes understanding our options with respect to self-generation.

Due to the impact of the COVID-19 pandemic, the Power Resilience programme was paused in 2020-2021, however asset replacement and maintenance works have continued and overall risk continues to reduce, albeit more slowly. As of the end of 2021, we have delivered 62% of the overall risk reduction (delta) required and identified in our Power Resilience risk register. The internal risk reduction metric that is reported to the Board's Environment, Health & Safety and Operational Resilience (EHSOR) forum uses a scale of 80 to 20; i.e. if we did nothing with respect to the Power Resilience programme, the risk index would be 80 and if we complete all of the recommended actions the residual risk will be 20. Using this scale, the score at the end of 2021 is 43 (i.e. we have reduced by 37 points and have 23 to go to reach our target). Funding of the Power resilience programme is expected to resume in 2023.

## Heat stress resilience

Our approach to heat stress resilience comprises three main elements:

- Heatwave wellbeing procedures for airport staff and passengers
- Runway and taxiway resilience to heatwave impacts
- Low carbon cooling strategy for buildings

### Heatwave wellbeing procedures

Gatwick has a clear graduated response to extreme heat events in its published Adverse Weather Plan (most recent version v8 – republished Oct 2021). The primary focus of this incident response is staff and passenger welfare (Declared Heat States 1 ~ 4). Set actions exist around pre-checking of HVAC and potable water systems as well as provision of sunscreen, bottled water and shaded areas. This is supported by a heightened monitoring programme from duty management on staff welfare during an extreme heat event. The Gatwick Airport Heat Plan is reviewed annually by the Airside Operations Manager in conjunction with Stable Operations Incident Operations Manager.

Runways and taxiways resilience

**Runway Resurfacing Case Study**

The resurfacing of the Main Runway, planned for 2022, involves the removal of 50-110 mm of the existing asphalt surfacing and the inlay of a new Marshall Asphalt surface. By analysing the past performance of the runway surface and focussing on the root causes of observed defects, the design has reduced the amount of new material required by 75% compared to a standard design.

The design focuses on the traffic pattern of the runway. By delivering an inlay solution the design removes the requirement for resurfacing the un-trafficked shoulders which represent 40% of the surface area. This in turn removes the need to raise 600 pits as well as raising the grassed areas surrounding the runway. Maintaining adequate friction levels in wet conditions is also vital for a runway surface. This is achieved using a grooved Marshall Asphalt surface. The design also includes localised reprofiling which will improve surface water run-off in critical areas.

Prior to use on the project, the aggregates used in the new asphalt mixes undergo a range of specific tests to help ensure they will retain their integrity under extreme weather conditions or during maintenance operations associated with these conditions, such as snow removal or rubber removal, which is required more frequently in hot weather. The new asphalt mixes also undergo tests for their resistance to de-icing fluid.

During its lifetime, further performance data will be gathered to help inform the design of future rehabilitation schemes.

Low carbon cooling strategy for buildings

With longer periods of hotter than average weather in summer already being experienced in south-east England and further increases in duration and temperatures projected for the decades ahead, transitioning to a low-to-zero carbon cooling system at the airport is an integral part of climate change adaptation.

The current cooling systems are a mix of old and new that have been installed incrementally. In 2018 we commenced a strategic review of airport cooling systems to consider how cooling could be delivered more efficiently and with increased reliability and flexibility for expansion while also meeting requirements to transition to low GWP refrigeration. The strategic review groups cooling system actions into three high level options: Bronze, Silver and Gold. It is anticipated that a combination of actions will be taken forward from 2023.

Alternative technologies such as ice/chilled water storage, ground source heating and cooling, and ‘free cooling’ systems were investigated, however at this stage these have not been included as part of the base options as they are dependent on detailed load analysis and fine tuning to provide

further energy and carbon emission optimisation. This analytical work is expected to resume in 2023.

The strategic review also shows that there are a range of measures that have been or could be considered to reduce cooling demand. These include the fitting of more efficient lighting and associated controls, enhanced solar control using plants and shading devices, using biophilia to move passengers from warmer parts of the terminal or predictive and demand control of ventilation air to provide only as much as is required by the number of occupants. This approach can release some of the current capacity to be used in other areas to enhance comfort or support additional activity.

**Cooling Strategy strategic options**

**Bronze**, **Asset Review and Improvement.** This keeps the current strategy of ad hoc provision of cooling as required to support operations. It recommends the improvement of existing systems with the replacement of various system components. This would allow them to operate more efficiently while providing better control and feedback on energy consumption.

**Silver**, looks to **Combine, Enhance and Improve.** This strategy includes the upgrades of the Bronze strategy but looks to connect compatible cooling systems together. A larger system allows the available cooling to be pooled so that it is used where it is needed. This reduces the amount of equipment that needs maintenance as well as the number of points of failure. Furthermore, it reduces the amount of refrigerant used on site, and the associated Global Warming Potential (GWP).

**Gold**, looks to **Integrate, Centralise and Optimise.** This is an expansion of the Silver strategy so that one cooling system serves each terminal. This allows high efficiency water cooled chillers to be installed with zero GWP refrigerants, full use of demand-based pump strategies, system diversity and load flexibility. With this scenario, it is possible to locate a centralised energy centre at a land-side location, which would greatly simplify the ongoing maintenance of the equipment.

## Severe and extreme weather readiness and resilience

As a certified aerodrome Gatwick Airport is required, under UK CAA regulations, to have an Adverse Weather Plan. The plan details how Gatwick Airport Ltd (GAL) sustain stable operations, as far as reasonably practicable, in the event of an adverse weather event.

The overarching objectives remain the same in response to an extreme weather event:

- Sustain the safety and security of passengers and staff
- Minimise operational disruption
- Maintain effective communications
- Sustain the welfare of affected passengers and staff
- Recovery of airport operations.

The Gatwick Airport Adverse Weather Plan details the structures, procedures and processes, logistics and communication requirements that are required to sustain operations for as long as is reasonably practicable. The plan is divided into sections:

1. Gatwick Airport Adverse Weather Plan
2. Monitoring Weather Conditions and Weather Forecasting
3. Weather States for Adverse Weather
4. Snow & Ice Plan
5. Flood Plan
6. Rain Plan
7. Wind Plan
8. Heat Plan
9. Low Visibility Operations Plan
10. Volcanic Ash Plan
11. Cumulonimbus Activity
12. Communications
13. Gatwick Control Centre
14. Engineering
15. Security
16. Passenger Operations

## 3. Consolidated list of adaptation actions with implementation status

| Planned new actions next five years 2022-2026 | Lead business unit |
|---|---|
| Resume Flood resilience protection project funding in 2023 starting with remaining priorities as detailed in Jacobs (2018) *Gatwick Flood Resilience Review Phase 2/ Volume 1/ V4.0*. | GAL Engineering |
| Resume mitigation options evaluation for areas where Gatwick Stream and River Mole pass beneath airport infrastructure. | GAL Engineering |
| Progress option planning for increasing airport surface water storage capacity. | GAL Engineering and Development |
| Resume power resilience workstream in 2022 with a focus on continuing replacement of the VMX switchgear population; the relocation of G substation; and ongoing asset replacement programme for large electrical assets including switchboards 5/6 and 7/8 in the NT basement. | GAL Engineering |
| Finalise heatwave wellbeing plan and communicate to all airport staff. | GAL Stable Operations and EHS |
| Incorporate climate resilience as a goal for the airport's Biodiversity action plans, habitat management and monitoring work. | GAL Stable Operations and EHS |
| Incorporate climate adaptation physical risk management into integrated Climate Strategy aligned with TCFD. | GAL Finance; and Corporate Planning |
| **2021 progress updates on actions listed in 2016 climate adaptation report** | |
| McMillan report recommendations on flood prevention and alleviation planning (published February 2014, implemented in 2014 and 2015) | |
| **1. The Airport's planned Review of its flood prevention and alleviation plans should be undertaken urgently.** | |
| **STATUS: Completed 2015**<br>• Revision of Upper Mole flood modelling (already agreed as part of a longer-term work programme with the Environment Agency) was brought forward by two years. A Collaborative Agreement relating to Upper Mole Flood Risk and Scenario Modelling was signed in July 2014. GAL is funding 90% of the flood modelling work.<br>• The model software and scenario testing was completed by March 2015. The modelling includes 1:100, 1:200 and 1:200 plus climate change events. | |
| **2. Existing flood alleviation plans currently under construction should be prioritised and reviewed to assess whether they can be completed earlier than currently planned.** | |
| **2021 Status:** Clays Lake Scheme completed in 2019.<br><br>**2016 status:** The Gatwick Stream Flood Alleviation Scheme was completed and in full use by August 2014. Three of the four UMFAS scheme components had been completed prior to the December 2013 flood event. Planning approval for the final part of the UMFAS, Clays Lake, was given after December 2013. The contract was awarded in July 2014. | |
| **3. Consider bringing forward the Ifield element of UMFAS, with a contribution from GAL.** | |
| **2021 Status:** Gatwick has continued to investigate various flood mitigation options and strategies. At this stage the Ifield Lakes element of UMFAS is not being pursued further by GAL or the EA.<br><br>**2016 status:** We are working with the Environment Agency to devise relevant additional flood alleviation schemes based on the revised Upper Mole catchment flood modelling undertaken in 2014-15. This will include obtaining an independent review of the benefits to GAL of the Ifield Lakes project. | |

**4. The review of Gatwick flood protection plans should include an assessment of potential impact of flooding at Gatwick on local communities upstream and downstream of the airport.**

**2021 status:** Work continues with our consultants Jacobs. The latest modelling work will combine our Surface Water model with the Fluvial model to fully understand how future flood risk mitigation works will impact the Airport and others in the catchment.

**2016 status:** We are using the revised Upper Mole flood risk modelling work to test a range of development and catchment change scenarios to assess the impact on areas both up and downstream of the Airport. Upon completion, the scenarios will be built into the Airport's forward plan for flood protection and alleviation.

**5. Consider increasing the resilience and redundancy between switch rooms.**

**2021 Status:** Resilience has been improved by flood proofing works in switch rooms and ensuring that key switchboards in both terminals are supplied from different substations to mitigate risk of a single circuit or substation failing. Replacement of switchboards and back indication system is planned but presently on hold during COVID.

**6. Consider providing alternative and back-up power switching for critical systems.**

**2016 status:** An agreed list of critical systems was drawn up and a standby generation system developed.

**7. Enhance the electronic monitoring systems deployed in switch rooms and check all sensitive equipment regularly at periods of high risk.**

**2021 Status:** Further action needed to replace obsolete equipment.

**2016 status:** The Flood Monitoring Area Check List of critical assets was implemented from December 2014 and has been incorporated within the Gatwick Flood Contingency Plan.

**8. Any sensitive equipment e.g. IT, currently located in basements or other areas susceptible to flooding should be moved urgently, or protected where relocation is not practical, and no future designs should locate sensitive equipment in areas susceptible to flooding.**

**2016 STATUS: COMPLETED**

- During 2014, resilience and relocation works were undertaken to all critical areas below the modelled datum.
- Building standards have also been implemented to prevent any further building below the datum for a 1:100 year flood event plus allowance for climate change.
- During the December 2013 flood event, critical IT infrastructure was impacted by extended loss of power caused by substation flooding. The flood protection works implemented in 2014 and UPS and generator installations will in combination significantly reduce the already low risk of a critical service outage occurring due to a flooding of a critical IT computer equipment room or power substation.
- A further assessment of IT infrastructure that supports GAL's critical operations was conducted during 2014 with the findings incorporated into the network resilience programme.

**9. GAL should consider securing water pumping capacity (assets and operatives) in addition to its own needs so as to assist in evacuating flooding on assets that belong to others that impact on the operation of the airport e.g. local authorities, Highways Agency.**

**2021 Status:** The new 'Flood Threat Plan' will provide comprehensive detail regarding how these pumps (and additional hire pumps) would be deployed in emergency scenarios.

**2016 STATUS: COMPLETED**

- During 2014, two high volume pumps and eight smaller pumps have been acquired to enhance Airfield fluvial (river) and pluvial (surface water) pumping capacity; and the relevant contingency, training and maintenance procedures have been implemented.

**10. The Airport's Contingency Plans should be reviewed, in close collaboration with airlines and ground handlers to ensure: these organisations are fully committed to the plans; the plans are fit for purpose; the plans secure the right participants from each organisation in times of disruption; the plans provide**

| |
|---|
| **suggested actions for predictable events through having basic Standard Operating Procedures and check lists that all parties agree are relevant.** |
| **2021 Status:**<br>All Electrical contingency plans have been reviewed and updated since 2016, including GAL and UKPNS contingency plans for various power failure scenarios.<br><br>**2016 STATUS: COMPLETED**<br>Contingency Plans review took place during 2014 and incorporated actions undertaken to implement other McMillan Report recommendations. The review included consultation with all relevant stakeholders and external review of specific elements e.g. the Adverse Weather Plan. |
| **3. Actions listed in 2011 climate adaptation report** |
| **Upper Mole Flood Alleviation Scheme (UMFAS):** In 2010, GAL entered into a legal agreement with the Environment Agency (EA) to contribute to the Upper Mole Flood Alleviation Scheme (UMFAS) which aimed to improve flood risk protection from 1:20 year events to 1:50 year events. The works comprised of three projects: Tilgate Lake Scheme, Clays Lake Scheme and Worth Farm & Gratton's Park Scheme.<br>**STATUS: COMPLETED**<br>• Tilgate Lake scheme was completed in 2011.<br>• Worth Farm and Gratton's Park Scheme was completed in 2012.<br>• Clays Lake Scheme was completed in 2019. |
| **Gatwick Stream:** With the EA, explore further measures to reduce flood risk from the Gatwick Stream in 1:50 year flood events and to protect the airport from 1:100 year flood events.<br>**2016 STATUS:** Gatwick and its specialist consultants explored various options and the decision was made to proceed with Gatwick Stream Flood Alleviation (GSFA) in its present format. The GSFA was completed in November 2014. The £12m project provides 186,000m3 of flood attenuation storage and protects the airport from flooding at the South Terminal culvert. |
| **Pond D:** Evaluation of options to extend the operational life of Pond D, the airport's main surface water attenuation pond which was 20 years old in 2011; and planning of further improvements to Pond E.<br>**2016 STATUS:** Major refurbishment of the infrastructure at D Pond was completed in 2014. The project included the addition of a new pollution lagoon which significantly increases our resilience. |
| **Regular reviews:** Undertake regular reviews of flood protection measures and improvements for airport users and critical facilities. **STATUS: Continuing.** |
| **Ice and snow:** In 2009 and 2010, the airport's snow clearing equipment and de-icer storage facilities were upgraded, and enhanced snow and ice contingency plans were agreed with airlines and airport partners.<br>**2016 STATUS: Completed.** |